
CHAPTER 3 AFFECTED ENVIRONMENT

This chapter addresses those resources and resource uses managed by the Bureau of Land Management (BLM) Little Snake Field Office (LSFO). Resource/resource use sections are separated into subsections that describe current conditions and characterization of each resource/resource use. The characterization of the resource/resource use includes the indicators (which assess the resource condition), trends (which express the direction of change between the present and some point in the past), and forecast (which predicts changes in the condition of resources given current management).

3.1 CURRENT RESOURCE CONDITION AND CHARACTERIZATION

3.1.1 Public Land Health

3.1.1.1 Background

The BLM implemented regulations in 1995 for livestock grazing administration in response to public concern about management of livestock grazing on western public lands and to improve rangeland management. The regulations in Title 43 Code of Federal Regulations section 4180 (43 CFR 4180) require the State Directors, in consultation with Resource Advisory Councils (RAC), to develop rangeland health standards for lands within their jurisdictions. This process includes conducting local-level assessments and evaluations for ascertaining rangeland health status. Procedures and guidance to implement these regulations was provided in Washington Office IM No. 2000-153 (*Standards Assessment Procedures and Guidance*). The BLM has agreed to work with the RACs to expand these rangeland health standards so that public land health standards are relevant to all ecosystems, not just rangelands, and that they apply to all actions, not just livestock grazing (Manual Handbook H-1601-1 *Land Use Planning*).

The Secretary of the Interior approved the *Standards for Public Land Health and Guidelines for Livestock Grazing Management* for BLM offices within Colorado on February 3, 1997. The *Colorado Standards for Public Land Health*, Appendix A, describes conditions needed to sustain public land health, and relate to all uses of the public lands. The Colorado Standards are applied on a landscape scale and relate to the potential of the landscape for the following resources:

- ❑ Standard 1: Upland soils
- ❑ Standard 2: Riparian areas and wetland areas
- ❑ Standard 3: Native species
- ❑ Standard 4: Special Status Species
- ❑ Standard 5: Water quality.

The *Guidelines for Livestock Grazing Management* provides the management tools, methods, strategies, and techniques (e.g., best management practices [BMP]) for maintaining or achieving healthy public lands as defined by the Standards (listed above).

3.1.1.2 Little Snake Field Office

Field offices are expected to conduct local assessments based on the Colorado Standards and to follow the developed guidelines. Information specific to each BLM field office is used to evaluate whether Standards are achieved.

To provide a spatial framework for conducting local assessments, the LSFO has divided the Little Snake Resource Management Plan Planning Area (RMPPA) into 16 distinct landscapes (Map 3-1), within which the Standards are assessed. The landscape boundaries were delineated based on physical features, geographic boundaries, watershed boundaries, and landscape characteristics. The LSFO staff conducts systematic assessments and evaluations on numerous sites within each landscape to determine if the Standards and fundamentals for rangeland health are being achieved within that landscape. The sites are selected so that each grazing allotment within that landscape contains a site, and ideally, that each range site within an allotment is represented (Map 3-2). The initial conduct of these assessments was prioritized in conjunction with grazing permit renewals; however, the LSFO has a mandate to complete all assessments once every 10 years. These landscape health assessments determine whether areas are meeting the standards. The LSFO does not intend for these studies to be used for the purpose of monitoring or inventory. The studies are only intended to be qualitative assessments and determinations of site conditions.

Methodology

The field offices are to consider all assessment requirements for the watershed or landscape being assessed and select assessment methods that will provide information needed to fulfill those requirements. When a field office invests its resources in a landscape health assessment, the end product should substantially meet all assessment needs to avoid conducting multiple assessments for multiple needs.

There is no specific written protocol used by the LSFO to conduct a landscape health assessment; however, the staff uses a methodology similar to the evaluation processes outlined in BLM Handbook 4180. The methodology is an organized, flexible process that can be characterized as follows:

- Scoping/interdisciplinary (ID) team assembly
 - Announce the evaluation process
 - Initiate scoping
 - Invite involvement
 - Create or assemble the ID team (e.g., resource specialists, BLM, local parties, permittees)
- Evaluation process
 - Determine evaluation areas and identify important or impaired sites to be analyzed
 - Prioritize evaluation areas
 - Select indicators
 - Select evaluation methods
- Conduct evaluation
 - Collect and evaluate data (2 to 7 days of field work)
 - Characterize the landscape—climate, surface water quality and quantity, ground water, watershed function (erosion processes and stream channel characteristics), riparian and wetland areas, soils, geology, vegetation and plant communities, and human influences and uses
 - Characterize the relative abundance and distribution of Species of Concern
 - Complete upland and proper functioning condition (PFC) data forms through interactive group discussion and consensus-based decisions
 - Synthesize and interpret information or results
- Landscape health assessment (LHA) report
 - Prepare the LHA report, which summarizes the data collected from various sites within the landscape area assessed. The LSFO generally organizes LHA reports in the following fashion:
 - Executive summary
 - Assessment discussion
 - List of the standards
 - Map of watershed/landscape area

- Map of geology
- Map of riparian areas
- Catalog of U.S. Geological Survey (USGS) quadrangles within landscape
- Catalog of soil types
- Listing of range sites
- Listing of grazing allotments and permittees
- Summary of sites that meet/do not meet the standards
- Field data collection forms
- Photographs.

Results of LSFO Landscape Health Assessment Reports

Ten of the 16 landscapes within the RMPPA have been through, or are currently going through, the LHA process. The current status of the completed LSFO LHA reports and whether they meet or do not meet the standards is shown in Table 3-1 below. The table also summarizes the condition of the landscape relative to the factors used in evaluating whether the standards are met and identifies associated concerns.

Table 3-1. Summary of Landscape Health Assessments

Standard	Assessment¹	
LANDSCAPE	AXIAL	
Status	LHA planned in 2006—number of sites to be determined (TBD)	
LANDSCAPE	BOONE DRAW (A.K.A. DOUGLAS DRAW)	
Status	Completed in 2004—site analysis ongoing	
LANDSCAPE	COLD SPRINGS	
Status	Completed in 2000—27 sites (all analyzed)	
Standard 1	M	Generally meets standard—except for toe slope or bench soils in canyon bottoms along Vermillion, Canyon, and Talamantes Creeks. Physical indicators were generally intermediate or plus; vegetation indicators were generally intermediate.
Standard 2	NM	Vermillion, Canyon, and Talamantes Creeks were mostly functioning at risk (FAR) and slightly to moderately incised with high sediment loads except where beaver established. Beaver, NS, and Two Bar Creek met standards; lentic riparian areas on gentle and moderate slopes did not meet standards because of livestock and elk trampling that results in erosion and rapid runoff.
Standard 3	M	Most sites have diverse, perennial grass species. The quantity of grasses was considered good on two-thirds of the sites, but production was less than desirable on half of the assessments. The rating was an overall plus for community composition/structure and weeds/invasive plants; and was intermediate for plant community age/health, density/production, and vigor, plus cryptogamic crusts. Two sites dominated by halogeton and greasewood did not meet standard; several sites lacked forbs and had low production; several sites had shrubs lacking in vigor.
Standard 4	M	Most of the landscape supports a variety of native vegetation and consequently is a suitable habitat for species of concern. At least 8 of the 28 Sensitive Plant Species in the RMPPA occur here as do eight documented remnant plant associations. The landscape is also a suitable habitat for a number of sensitive wildlife species occurring in diverse habitat types. None of the concerns for individual habitat types threaten the existence of these species within the landscape.
Standard 5	M	No use impairment problems were noted; thus water quality is sufficient to support beneficial use classifications, including healthy rangelands. However, elevated sediment and salinity are problems noted in Vermillion, Canyon, and Talamantes Creeks.

Standard	Assessment ¹	
LANDSCAPE	DOUGLAS MOUNTAIN	
Status	Completed in 2003—21 sites (20 analyzed)	
Standard 1	M	No unacceptable accelerated erosion occurred at any site, but 1one site failed the upland soil standard because of substantial flow patterns, and insufficient plant cover indicated that accelerated erosion was imminent. Twenty-one percent of sites had slight signs of accelerated erosion in small areas (e.g., flow pattern development, soil movement, and diminished surface litter). Plant cover and diversity were adequate to maintain and protect soil quality except at two sites where dominant plants were sparse and annual, indicating site vulnerability to future erosion.
Standard 2	NM	Riparian resources are sparse, occur only as lentic systems, and are very important to wildlife. Riparian habitat was absent at the 20 sites that were analyzed. However, 10 springs identified in the 1980s and 1 more recently identified spring were evaluated for riparian resources: these springs variously had insufficient flow to support riparian resources, were severely trampled by wildlife, were vegetated by willows, or had insufficient data to evaluate the likely state of their resources—overall these springs appear to be degraded.
Standard 3	NM	The quality of habitat for native species was insufficient to meet the standard at 6 of the 20 sites evaluated, primarily because of poor species diversity and community structure and the dominance of weeds such as cheatgrass and leafy spurge. One of these sites also failed the standard for productive diverse wildlife habitat: weed dominance was enhanced by a wet spring following a period when forbs and perennial grasses were lost, possibly as a result of drought and heavy grazing in the past. Elsewhere, production, vigor, and plant composition were good with strong leader development on shrubs, abundant perennial grass seedlings, and good forbs diversity; a few additional sites or habitat types were below the overall high standard provided by productive resilient wildlife habitat at most sites.
Standard 4	M	Most of the landscape supports a variety of native vegetation and consequently is suitable habitat for Species of Concern. Suitable habitat was identified for several sensitive wildlife species occurring in diverse habitat types. None of the concerns for individual habitat types threaten the existence of these species within the landscape, and no federally listed threatened or endangered plant species occur here.
Standard 5	M	No impairment problems identified and water quality appears sufficient to meet the designated uses for which the various reaches of the Little Snake River have been classified. The sediments that individual tributaries in this watershed contribute to the Little Snake River should be reduced as BMP mandated by BLM use authorizations are implemented.
LANDSCAPE	DRY CREEK	
Status	Completed in 2002—23 sites (20 analyzed)	
Standard 1	M	Even though drought had resulted in many plants remaining dormant, residual forage, litter, and canopy cover of diverse plant communities protected surface soils from excessive erosion, and all sites met the upland soil standard. Active rills were observed only at two sites where moderately steep slopes were present. One site appeared to have a severe die-off of Nuttall's saltbush and was identified for monitoring of possible erosion, if the plant does not recover.
Standard 2	M/NM	Vermillion Creek, the only lotic system in the landscape, met the standard, and evidenced increased stability in two reaches; present were expanding beaver dams (that serve to control erosion and siltation) in one reach and willow stands that have survived where ground water is available, in spite of the drought. Springs and seeps, the lentic systems in the landscape, were FAR or were considered nonfunctional; seven of the eight springs found suffered erosion and shrinking riparian soils and vegetation from hoof action and runoff flow; damage was attributed to elk and deer because they would be most likely to use water sources near the top of a high ridge; another grouping of springs had continuous riparian soils and supported wetland vegetation in the presence of moderate livestock grazing, but the water sources for these springs were less apparent

Standard	Assessment ¹	
		than previously recorded.
Standard 3	M	All sites but one were rated as plus or intermediate for community diversity/composition, community structure, community age/health, plant density/production, and plant vigor. The single site was rated a minus for these factors; however, across the landscape, plant vigor in shrub, grass, and forb components and species diversity were diminished as a result of the drought.
Standard 4	M	The diversity of habitats across this landscape supports a variety of Special Status Species and the standard was met by all sites. A decline in the recent use of historic nesting sites (attributed to increased oil and gas and other travel near nesting sites) and the absence of forbs and diminished vigor of shrub species used by sage-grouse (even though grouse numbers and distribution were as expected) were noted as concerns.
Standard 5	M	The water quality of Vermillion Creek and its tributaries (Dry Creek, Shell Creek, and others) was sufficient to support the use classes assigned to this stream, thereby meeting the standard.
LANDSCAPE	GREAT DIVIDE	
Status	LHA planned in 2006—number of sites TBD	
LANDSCAPE	GREEN RIVER	
Status	LHA planned in 2005—number of sites TBD	
LANDSCAPE	LITTLE SNAKE GULCH	
Status	Completed in 1998—18 sites (all analyzed)	
Standard 1	M	
Standard 2	NM	The Lotic system is FAR or nonfunctioning as a result of lateral movement of the stream and the resulting excessive bedload movement and unstable stream channel. This activity is not attributed to current livestock management. Most lentic systems meet the standard.
Standard 3	M	
Standard 4	M	
Standard 5	M	
LANDSCAPE	FOURMILE CREEK	
Status	Completed in 2003—34 sites (all analyzed)	
Standard 1	M	Overall, the soil standard was met, based on stable erosion conditions, the absence of plant pedestalling, appropriate levels of biological soil crusts, minimal soil erosion, and protective plant cover at most sites. At eight sites, there were deviations from these favorable conditions, with five sites having slight erosion conditions, four having deficient vegetative cover (especially of perennial grasses), three also having plant pedestalling, one having disturbed and fragmented biological soil crusts, and one exhibiting flow patterns. On three other sites, although there was little observable soil movement, all had high levels of invasive plants or decadent sagebrush canopies, which served to protect the soil surface even though they were undesirable plant communities.
Standard 2	M	Larger riparian systems in Fourmile Creek watershed meet the standard and are in PFC or FAR with an upward trend; these systems have improved since the early 1990s as a result of limiting livestock presence along streams. Some tributaries in Timberlake Creek, East Timberlake Creek, Mud Spring Draw, and other Fourmile Creek tributaries have sandy substrates, loss of contact with the water table, headcuts, and incised stream channels that affect their functionality. About 41 percent of the lentic systems were in PFC or FAR with an upward trend, but 31 percent of the streams were FAR without a discernable trend, and 20 percent were FAR with a downward trend. A few of the lentic systems evidenced trampling, but many showed a downward trend because they were originally evaluated in an unusually wet year.

Standard	Assessment ¹	
Standard 3	NM	Most sites had high species diversity and good vigor and plant composition, although some sites were lacking in grass species. However, plant communities in six sites had poor species diversity and community structure and/or the presence of weeds, which resulted in failure to meet this standard overall. Contributing factors were loss of forbs and perennial grasses caused by past grazing practices and recent drought, weed proliferation in the current higher moisture regime, and presence or absence of fire. All of these contributing factors that were addressed with changes in grazing management when permits were renewed on five of the six sites; for the sixth site, these contributing factors were not identified.
Standard 4	M	Habitat conditions for all threatened, endangered, and Special Status Species appear to meet the needs of the respective species for the various life cycle stages for which they are used; continuation of existing management should ensure that this remains the case.
Standard 5	M	Water quality standards for both surface and ground water are presently being met; no stream segments or tributaries were found to have impaired water quality.
LANDSCAPE POWDER WASH		
Status	Completed in 2003—40 sites (38 analyzed)	
Standard 1	M	All but four of the sites analyzed met the standard, having excellent soil condition, lacking signs of accelerated erosion, and having adequate cover and diversity of plant species. The four sites with slight signs of accelerated erosion had various combinations of flow pattern development, slight pedestalling, evidence of soil movement, or less than ideal surface litter distribution in a small area. Two of these sites also were dominated by annual pepperweed, lacked adequate perennial grass in shrub interstices, and were vulnerable to accelerated erosion in the future.
Standard 2	NM	Although 33 percent of the lotic riparian miles were in PFC or FAR with an upward trend, 65 percent were FAR with no apparent trend and 2 percent were not functioning; fluctuating water levels as a result of drought and agricultural irrigation and overuse by livestock and wildlife are the primary causes; changes in livestock grazing management have resulted in some improvement, but do not address all causative factors. Of the 29 lentic systems evaluated, 12 were in PFC or FAR with an upward trend, 10 were FAR with no apparent trend, 6 were FAR with a downward trend, and 1 was not functioning, with the undesirable conditions resulting primarily from heavy livestock use and amenable to improvement with changes in livestock management.
Standard 3	NM	Most sites have strong leader growth on shrubs, abundant perennial grass seedlings, and good forbs diversity, providing for a productive, resilient wildlife habitat that can sustain healthy populations, although some sites were trending toward decadent sagebrush, diminished grass density, and weediness. Poor species diversity and community structure, weed dominance, and loss of resilience in native communities was evidenced on 26 percent of the sites, causing this standard to not be met.
Standard 4	M	Habitat conditions for all threatened, endangered, and Special Status Animal Species appear to meet the needs of the respective species for the various life cycle stages for which they are used; continuation of existing management should ensure that this remains the case. Sensitive Plant Species are not known within the watershed.
Standard 5	M	No use impairment problems have been identified, and water quality appears sufficient to support the designated uses classified for the Little Snake River and its tributaries; sediments within this watershed will be diminished by the BMP mandated on BLM-managed land.
LANDSCAPE SAND HILLS		
Status	Completed in 2001—31 sites (30 analyzed)	
Standard 1	M	All of the sites evaluated met the soil standard; although two sites exhibited compaction and one of these lacked forbs, contained cheatgrass throughout, and had sagebrush that was overly dense. The occasional plant pedestalling observed was attributed to water erosion and past activities rather than current grazing practices.

Standard	Assessment ¹	
Standard 2	NM	<p>Lotic systems (primarily the Yampa River and Deception and Bob Hughes Creeks) exhibited overuse of riparian vegetation in some reaches by deer and cattle, the encroachment of tamarisk in coyote willow sites, and limited potential for extensive riparian areas in some reaches because of the high stream banks, but were otherwise in fair to good condition.</p> <p>Lentic systems were variable across the landscape, with springs in good condition on the east side of Twelvemile Mesa, dryer or FAR with a downward trend on the west side of Twelvemile Mesa, FAR with a downward trend in Lower Crooked Wash, and inaccessible to wildlife and livestock but with soils too thin for extensive plant growth on Cross Mountain. The identified problems in lentic systems were largely the result of flashy flows in ephemeral stream channels undercutting the rooting depth of riparian plants, trespass cattle, and increasing elk herds.</p>
Standard 3	M	<p>Most sites supported diverse perennial grass species, good plant density and production and adequate canopy and ground cover; were in the plus category for community diversity/composition, community structure, rills, canopy and ground cover, gullies, and litter distribution; and in the intermediate category for community age/health, plant density and production, noxious weeds and invasive plants, plant vigor, cryptogamic crusts, plant pedestalling, and crusted soils. Identified problems included a lacking forb component, low production, low sagebrush vigor (six sites), crested wheatgrass presence (two sites—but these are returning to natives grasses); however, only one site failed to meet the standard because it was burned in 1993 and subsequently was dominated by cheatgrass.</p>
Standard 4	M	<p>Habitat conditions for all threatened, endangered, and Special Status Animal Species appear to meet the needs of the respective species for the various life cycle stages for which they are used. Continuation of existing management should ensure that this remains the case. The large cottonwood trees along the Yampa River provide important winter roost and potential nest sites for raptors. Three Sensitive Plant Species have been documented within the watershed.</p>
Standard 5	M	<p>No use impairment problems have been identified, and water quality appears sufficient to support the designated uses classified for the Yampa River and its tributaries and for the two tributaries of the White River within the landscape.</p>
LANDSCAPE SAND WASH		
Status	Completed in 2001—34 sites (all analyzed)	
Standard 1	M	<p>All sites within the landscape meet the standard. The plant pedestalling rated a minus at one site—the only minus recorded for physical indicators within the landscape. Upland soil problems were noted at one site on a slope that exhibited rills, and on steep slopes where off-highway vehicle (OHV) activity is causing soil stability problems (soils are eroding off the bedrock shale of the Clay Buttes and north of State Highway 318 on break slopes near the intersection with County Road 67).</p>
Standard 2	M	<p>The riparian standard is considered to be met, even though not all the riparian systems are in PFC; most streams are not far from their potential, which is constrained by naturally occurring salts that accumulate in swales and floodplains, by water diversions, and by bedload.</p> <p>Lotic systems, primarily reaches of the Little Snake River (most of which flow through private land) are influenced by high flows, terrace banks, infrequent floodplains, annually scoured sandbars, the removal of trees by beaver, and a heavy silt and sand bedload—factors that cannot be managed by BLM; healthier, better vegetated riparian communities occur along Sand Wash and its tributaries.</p> <p>Lentic areas occur frequently along the western and eastern edges of the landscape and on the slopes of Cross Mountain and Douglas Mountain to the south. Riparian vegetation is more common in the west. Diversity is lacking in riparian vegetation because of the presence of salts. The only lentic area rated as FAR with a downward trend exhibited heavy hoof traffic and salt accumulations.</p>

Standard	Assessment ¹	
Standard 3	M	Most sites support diverse, perennial grass species with a good quantity of grasses on 2/3 of the sites, but less than desirable production on seven sites; most sites were judged intermediate for community age/health, plant density and production, cryptogamic crusts, and plant vigor, but judged to be in the plus category for all the physical indicators; several sites lacked a forb component and had relatively low production, and 3 sites did not meet the minimum standards for vegetation; weed infestations of cheatgrass and halogeton, plus some annual forbs and, at one site, Canada and Russian thistle were present; the area of most concern is around Clay Buttes where heavy OHV use is causing degradation to the vegetation.
Standard 4	M	Habitat conditions for all threatened, endangered, and Special Status Animal Species appear to meet the needs of the respective species for the various life cycle stages for which they are used. Continuation of existing management should ensure that this remains the case. No Sensitive Plant Species are known to occur on this landscape.
Standard 5	M	No use impairment problems have been identified, and water quality appears sufficient to support the designated uses classified for the Sand Wash watershed. Potential issues with sediment in the Little Snake River are being evaluated and monitored.
LANDSCAPE SLATER		
Status	Completed in 1999—27 sites (all analyzed)	
Standard 1	M	
Standard 2	NM	All but one reach were determined to be FAR. Livestock grazing problems existed and changes in livestock management and grazing rotation have been implemented.
Standard 3	M	
Standard 4	M	
Standard 5	M	
LANDSCAPE SPRING CREEK		
Status	Completed in 1998—19 sites (all analyzed)	
Standard 1	M	
Standard 2	M	
Standard 3	M	
Standard 4	M	
Standard 5	M	
LANDSCAPE STEAMBOAT LAKE		
Status	Parcels in the Steamboat Lake LHA will be assessed on a case-by-case basis because they are small and dispersed.	
LANDSCAPE WILLIAMS FORK		
Status	LHA Planned in 2007—number of sites TBD	

¹M=standard met; NM=standard not met.

Most of the Colorado Standards were met for the landscapes that were assessed. Generally, those landscapes that did not meet all five standards typically failed to meet Standard 2 (riparian systems) and Standard 3 (native species). The LHAs and these standards in particular are part of the resource discussions that follow.

If grazing is at least partially responsible for a landscape failing to meet a standard, BLM, with involvement of the interested parties, is required to prescribe actions that ensure progress toward meeting the standard. Corrective management actions may be part of an activity plan, management plan, or

administrative decision in the context of permit renewals. Actions can include changing the amount of grazing, the season of use, and other such adjustments.

If landscapes are not meeting a standard because of activities other than grazing (e.g., OHV, recreation), BLM must use more of a cooperative, collaborative approach, since such activities may not be directly a part of BLM's mandate. Such an effort is typically more geographically and politically challenging; however, it can yield beneficial results and help the landscape meet the Standards.

The LHAs provide the foundation of data, along with monitoring data, weather data, information from operators and consultants, as well as professional judgment that BLM uses to make its management decisions. The degree of specificity provided in these documents for each resource is noted below in more detail.

3.1.2 Air Quality

Clean, breathable air, expansive vistas, and minimal acidification of the lands, streams, and lakes are significant values to be pursued in the RMPPA. Some of the activities on BLM-administered lands related to minerals development, recreational use, wildland fire management, and construction could affect those air-quality-related values both in the RMPPA and on lands adjacent to the RMPPA. Accordingly, activities on BLM-administered lands must comply with federal air quality regulations. Deterioration of air quality could result in imposed restrictions on those activities.

3.1.2.1 Current Conditions

The region of influence (ROI) for air quality includes both the RMPPA and the area within 100 kilometers (km) of its boundaries. Any impacts on air quality from activities within the RMPPA are not anticipated to extend beyond a 100-km distance from the boundaries. Climate and existing air quality are discussed in this section to describe the setting and current conditions. Appendix I provides details on air quality conditions.

Climate

Air quality is directly related to the dynamics of the atmosphere (meteorology and weather). Atmospheric conditions transport air pollutants from the sources to the receptors. Climate is a characterization of the atmosphere over a long period of time, which takes into account temperature, precipitation, and wind. The climate in the RMPPA is characterized as desert and semiarid steppe with areas of mid-latitude highland or alpine in mountainous areas (Trewartha and Horn 1980; Martner 1986). Both of these climatic zones have large seasonal variations in temperature and precipitation. The desert and semiarid steppe climate is relatively dry, but precipitation varies annually and is sufficient for the growth of short, sparse grass and shrubs. The mid-latitude highland or alpine climate is characterized by large variations in local climates, depending on elevation and slope exposure, but is generally a similar but cooler version of nearby lowland climate (Trewartha and Horn 1980).

Meteorological data are collected at several weather stations scattered throughout the RMPPA at elevations from 5,230 feet in the western portion of the RMPPA to 7,892 feet in the eastern portion. Mean annual temperatures range from 39 degrees Fahrenheit (°F) at higher elevations to 47 °F at lower elevations. Mean temperatures vary between 75 °F in the summer and 3°F in the winter in the eastern portion of the RMPPA and between 89 °F in the summer and 12 °F in the winter in the western portion. Temperature extremes recorded in the RMPPA are -61°F and 106 °F. Mean annual precipitation ranges from 8.5 inches at the lower elevations in the west to 23.3 inches at the higher elevations in the east. Precipitation is generally greater in the spring and fall, except for the higher elevations where 175 to 300

inches of snowfall can be expected between November and April (Western Regional Climatic Center 2002).

Wind speed and direction are highly variable at the surface throughout the RMPPA because of the topographical differences between the lower elevations in the west to the higher elevations in the east. Topography strongly affects wind direction, particularly at night and under low wind-speed conditions. The wind direction in the western portion of the RMPPA tends to blow from the west across the gently rolling landscape. The best long-term record of wind data for the area is found in Craig and Hayden, Colorado; however, wind rose data are not available for these locations. The average annual wind speed in Craig is 5.5 miles per hour (mph) and 7.5 mph in Hayden (Western Regional Climate Center 2002), with speeds generally increasing during the spring and summer months. Surface level wind speeds in the RMPPA vary between these two sites and generally increase with elevation. The wind direction at both locations is generally west. Winds typical of higher elevation mountainous locations in the RMPPA are represented by the wind rose for Steamboat Springs in Figure 3-1.

The behavior of a pollutant in the atmosphere varies with vertical and horizontal mixing, referred to as dispersion. The extent of dispersion is related to atmospheric stability, the atmosphere's capacity to disperse pollutants, and mixing height (the distance from the ground to the top of the atmospheric layer in which pollutants can be dispersed). Distributions of these factors are only available for Craig and are representative of other towns in the area. For Craig, stable conditions that are unfavorable for pollutant dispersion exist 40 percent of the time, annually. The mixing heights are lowest in the morning and generally lift to higher elevations in the afternoon.

Sources of Air Pollution

Small towns and communities within the RMPPA generally have similar sources of air pollution, which include particulate emissions from wood burning stoves/fireplaces, sanding of roadways, and wind-blown fugitive dust from open fields and unpaved roads. Manmade particulates are created during the burning of fossil fuels associated with industrial processes or heating. The State of Colorado estimates that about 75 percent of coarse particle (PM₁₀) emissions in typical small mountain communities come from street sand, soil, and road dust sources (Air Quality Control Commission Report 2003–2004). These particulates include fly ash from powerplants, carbon black from automobile and diesel engine exhaust, and soot from fireplaces and woodstoves. The PM₁₀ particulates from these sources contain a large percentage of organic carbon that affects visibility and public health. Sources of air pollution generated on BLM-administered land are primarily fugitive particulate emissions from OHVs, surface soil disturbances, construction activities, controlled burns, and wildfires.

Steamboat Springs was designated a moderate nonattainment area for particulate matter (PM₁₀) in 1993, but has since attained compliance with the PM₁₀ National Ambient Air Quality Standards (NAAQS) by implementing control measures outlined in the Steamboat Springs PM₁₀ Nonattainment State Implementation Plan (SIP) Element (1996 SIP, approved by the Environmental Protection Agency [EPA] on Dec. 31, 1997). Subsequently on November 15, 2001, a PM₁₀ Redesignation Request and Maintenance Plan for the Steamboat Springs Area was adopted by the Colorado Air Quality Control Commission. EPA approved this maintenance plan in October of 2004, and it became effective November 24, 2004. It is required that a maintenance plan revision be submitted to the EPA 8 years after the original redesignation request or maintenance plan is approved to provide for an additional 10-year maintenance of the NAAQS.

Coal-fired powerplants located in Craig and Hayden are the largest sources of criteria pollutants within the RMPPA. The Hayden powerplant began service in 1965, and the Craig plant started producing power in 1980. Both powerplants are considered major stationary sources regulated by Title V operating

permits. These plants are the largest single sources of sulphur dioxide (SO₂) and oxides of nitrogen (NO_x) emissions within the RMPPA. In 1999, the Hayden power plant emitted more than 7,000 tons of NO_x and over 6,000 tons of SO₂ (Colorado Department of Public Health and Environment's [CDPHE] technical review document for Operating Permit 96OPRO132, Public Service Company—Hayden Station).

Existing Air Quality

Elements of air quality addressed in this analysis include ambient air quality concentrations, visibility, and atmospheric deposition. Air quality monitoring data provided by the State of Colorado show that air quality in the RMPPA is considered to be in compliance with the NAAQS (Table 3-2).

Table 3-2. Summary of Air Quality in the Vicinity of the Little Snake RMPPA

Air Quality Component	Status
Air Pollutant Concentrations	
Criteria air pollutants	Concentrations are in compliance with the NAAQS.
Nitrogen compounds	Nitric acid (HNO ₃) concentrations in Rocky Mountain National Park are slightly higher than concentrations in other remote areas. Concentrations of nitrate (NO ₃ ⁻) and ammonium (NH ₄ ⁺) are consistent with other remote areas.
Sulfur compounds	Sulfur dioxide SO ₂ and sulfate (SO ₄ ⁻²) concentrations in Rocky Mountain National Park and Mount Zirkel Wilderness Area are consistent with concentrations in remote areas.
Visibility (Rocky Mountain National Park)	
Visual range	Visibility data are typical of the Western U.S.: 20 percent cleanest: 133–162 miles Average: 89–109 miles 20 percent haziest: 60–73 miles
Atmospheric Deposition	
Precipitation pH	Precipitation acidification from 1994 to 1998 (pH: 4.7–4.9) Precipitation near natural 1986 to 1993 and 1999 to 2003 (pH: 4.9–5.4)
Total deposition	Total nitrogen deposition in Rocky Mountain National Park has been equal to or lower than the guidelines set for Bridger Wilderness in Wyoming: Nitrogen deposition from NH ₄ ⁺ and NO ₃ ⁻ is less than 5.6 kilograms per hectare year (kg/ha-yr). ¹ Sulfur deposition from sulfate SO ₄ ⁻² and sulfur dioxide SO ₂ is less than 2.7 kg/ha-yr. ²

¹ Proposed acceptable level of total nitrogen deposition is from 3 to 5 kg/ha-yr (Fox et al. 1989).

² Proposed acceptable sulfur deposition is 5 kg/ha/yr (Fox et al. 1989).

Ambient Air Quality Concentrations for Criteria Pollutants

In accordance with the Clean Air Act, both Colorado and the federal governments have established ambient air quality standards for criteria pollutants (listed in Table 3-3) considered harmful to public health and the environment. Lead is also a criteria pollutant; however, because lead is no longer used as a gasoline additive, it is not considered to be a pollutant of concern from any activities in the area. The CDPHE administers the Clean Air Act for Colorado and collects data to establish background air quality levels. CDPHE has adopted the NAAQS; therefore, there are no ambient air quality standards specific to Colorado.

Data gathered from the nearest monitoring stations indicate that current concentrations for criteria pollutants are in compliance with applicable standards as shown in Table 3-3; however, current and complete data on criteria air pollutant concentrations for the RMPPA are not available.

Table 3-3. Concentrations of Criteria Air Pollutants within or Adjacent to the Little Snake RMPPA

Pollutant ¹	Averaging Time	Monitored and Modeled Concentration (µg/m ³)	Percent NAAQS ²
Carbon monoxide (CO) ³	1 hour	2,299	6
	8 hour	1,148	11
Nitrogen dioxide (NO ₂) ⁴	Annual	3.4	3
Ozone (O ₃) ⁵	1 hour	76	63
	8 hour	68	85
Particulate matter (PM ₁₀) ⁶	24 hour	119	79
	Annual	25	50
Particulate matter (PM _{2.5}) ⁷	24 hour	20.2	31
	Annual	7.5 ⁸	50
Sulfur dioxide (SO ₂) ⁹	3 hour	132	10
	24 hour	43	11
	Annual	9	11

¹ Lead is also a criteria pollutant; however, since lead is no longer used as a gasoline additive, it is not considered to be a pollutant of concern from any activities in the area.

² CDPHE has adopted the National ambient air quality standards (NAAQS); therefore, there are no ambient air quality standards specific to Colorado.

³ Data collected at Rifle and Mack, CO, along Interstate 70 in conjunction with proposed oil shale development during the early 1980s (CDPHE 1996).

⁴ Data collected at Green River Basin Visibility Study site, Green River, WY, during Jan. and Dec. 2001 (ARS 2002).

⁵ Highest composite values; data from Mesa Verde National Park (CDPHE 2004).

⁶ Data collected at Steamboat Springs air quality monitoring station (CDPHE 2004).

⁷ Data collected at Steamboat Springs air quality monitoring station (CDPHE 2004).

⁸ Indicates less than 75 percent data for the year.

⁹ Data collected at LaBarge Study Area at the Northwest Pipeline Craven Creek, WY, site from 1982 to 1983.

Visibility

Visibility impairment in the form of regional haze obscures the clarity, color, texture, and form of what can be seen. Regional haze regulations were developed to maintain visibility on the least impaired days, and improve visibility on the most impaired days in mandatory federal Class I areas across the United States. Federal Class I areas are defined as certain national parks (greater than 6,000 acres), wilderness areas (greater than 5,000 acres), national memorial parks (greater than 5,000 acres), and international parks that were in existence as of August 1977. There are five federal Class I areas within 100 km of the RMPPA, which are listed in Table 3-4 and displayed on Map 3-3. There are no federal Class I areas either in Utah or Wyoming within 100 km of the RMPPA.

Table 3-4. Federal Class I Areas Within or Adjacent to the Little Snake RMPPA

Federal Class I Area	Location	Managing Agency
Mount Zirkel Wilderness	Routt National Forest Routt and Jackson Counties, CO	U.S. Forest Service
Flat Tops Wilderness	Routt and White River National Forests Rio Blanco, Garfield and Eagle Counties, CO	U.S. Forest Service
Eagles Nest Wilderness	Arapaho and White River National Forests Eagle and Summit Counties, CO	U.S. Forest Service
Rawah Wilderness	Roosevelt and Routt National Forests Larimer County, CO	U.S. Forest Service
Rocky Mountain National Park	Rocky Mountain National Park Jackson, Larimer, Grand, and Boulder Counties, CO	National Park Service

Perceived changes in visibility are measured in terms of deciviews (dv). One dv is defined as a change in visibility that is just perceptible to an average person, about a 10 percent change in light extinction. Without human-caused visibility impairment, natural visual range is estimated to average about 8 dv (visual range of about 110 to 115 miles) in the Western United States (Malm 1999). Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring stations in Rocky Mountain National Park and Mount Zirkel Wilderness Area record visibility conditions annually. Annual visibility recorded at these monitoring stations is depicted in Figures 3-2 and 3-3. Conditions are reported in three categories ranked from clearest to haziest at each monitoring station (Table 3-5). No significant deterioration of visibility in Rocky Mountain National Park and Mount Zirkel Wilderness is apparent from the data. Another visibility study conducted from 1987 to 1993 at Craig showed that the best visibility occurred in the summer and fall months (BLM 2002). The recorded visibility conditions are typical of clear skies associated with remote areas in the Western United States. In addition, visibility data were collected using photography in Craig, Colorado, (with the target area of Black Mountain) from 1987 to 1993. The photography monitoring technology was discontinued because new techniques were superior. These data are generally comparable to those for the Mount Zirkel and Rocky Mountain National Park.

Table 3-5. Recorded Visibility Conditions in the Little Snake RMPPA¹

Visibility Measurement	Rocky Mountain National Park	Mount Zirkel Wilderness Area	Craig
20% clearest ²	4–6 dv (162–133 miles)	3–5 dv (180–147 miles)	0.8 dv (182 miles) ³
Average ⁴	8–10 dv (109–89 miles)	6–9 dv (133–99 miles)	9 dv (99 miles)
20% haziest ⁵	12–14 dv (73–0 miles)	10–12 dv (84–73 miles)	17.2 dv (43 miles) ⁶

¹Deciview numbers are inversely related to visual range (miles), with the largest visual range being the smallest dv.

²Mean visibility for the 20 percent of days with the best visibility.

³Data collected in Craig were for the 10 percent clearest days.

⁴The annual mean visibility.

⁵Mean visibility for the 20 percent of days with the poorest visibility.

⁶Data collected in Craig were for the 90 percent haziest days.

Atmospheric Deposition

Atmospheric deposition refers to the processes by which air pollutants are removed from the atmosphere and deposited in terrestrial and aquatic ecosystems. Air pollutants are deposited by wet deposition (precipitation) and dry deposition (gravitational settling of particles and adherence of gaseous pollutants to soil, water, and vegetation). Substances deposited include—

- ❑ Nitrogen and sulfur compounds (nitrates, nitrites, sulfates and sulfites)
- ❑ Acids (sulfuric acid [H₂SO₄] and nitric acid [HNO₃]), also known as acid rain
- ❑ Air toxins (such as pesticides, herbicides, and volatile organic compounds [VOC])
- ❑ Nutrients (such as NO₃⁻ and NH₄⁺).

Estimation of atmospheric deposition is complicated by contribution to deposition of several components: rain, snow, cloud water, particle settling, and gaseous pollutants. Deposition varies with precipitation, which in turn, varies with elevation and time.

Total deposition (the sum of both wet and dry deposition) data from the Clean Air Status and Trends Network (CASTNet) for Rocky Mountain National Park and for the Snowy Range, Wyoming, (Centennial Station) is further discussed in this section. Figures 3-4 to 3-7 compare total deposition in Rocky Mountain National Park and in the Snowy Range, Wyoming, with the total deposition guidelines, or identified levels of concern (LOC), set for the Bridger Wilderness in Wyoming (Fox et al. 1989). Total nitrogen deposition in Rocky Mountain National Park has been equal to or lower than the Bridger Wilderness from 1986 to 2002, although values exceeded 5 kg/ha-yr in 1996 (Figure 3-4). Total sulfur deposition has been well below the LOC for the same time period (Figure 3-5). Total nitrogen and sulfur deposition for the Snowy Range in Wyoming are higher compared with values in Rocky Mountain National Park. Total nitrogen for the Snowy Range, Wyoming, is consistently higher than the LOC, and in 1998 approached the red line LOC value (Figure 3-6). Total sulfur deposition has averaged 3.2 kg/ha since 1991, which is well within the LOC (Figure 3-7).

3.1.2.2 Characterization

Indicators and trends of air quality conditions are provided in ambient air quality concentrations for criteria pollutants, visibility, and atmospheric deposition discussed in Section 3.1.2.1. Because of limited available data, it is only possible to trend air quality-related values for a few locations: for those locations, ambient air quality concentrations are below standards, visibility is typical of clear skies associated with remote areas in the Western United States, and there have been improvements in total deposition at Rocky Mountain National Park in recent years.

Future changes to air quality conditions in the 100-km radius of the RMPPA would occur according to the intensity and expansion or reduction of activities that produce air pollutants; however, the use of air pollution mitigation techniques can also minimize air quality impacts and, in some cases, reduce emissions from sources. BLM will adhere to the smoke management requirements for the State of Colorado to minimize emissions; therefore, the nature of proposed activities on BLM-administered lands and the mitigation measures planned for those activities must be evaluated on a case-by-case basis to determine if an air quality consequence could occur, and whether the activity would be in compliance with air quality regulations.

At this time, future impacts on air quality within the RMPPA from non-BLM sources (e.g., powerplants and fireplaces) are uncertain; however, it is not anticipated that existing sources would increase their emissions in the future. In addition, major sources such as powerplants, are operating under State-

administered air permits and are subject to periodic inspections. Future trends for PM₁₀ cannot be anticipated at this time because of the high dependency on meteorology.

3.1.3 Soil Resources

Livestock grazing, prime farmlands, wildlife habitat, fisheries, recreation, water quality, and forestry depend on the presence of suitable quality soils for their successful existence; therefore, soil attributes and condition are important to BLM management decisions.

3.1.3.1 Current Conditions

The ROI for soils is the RMPPA, which is in the Moffat, Routt, and Rio Blanco Soil Survey areas. The Moffat and Routt surveys, which cover most of the RMPPA, are unpublished. The Rio Blanco survey has been published, but it applies to a very small portion of the RMPPA. Soil attributes that are most important to BLM's management decisions are fragility, rangeland soil fertility, and upland soil health. These attributes are discussed below together with the LHA characterization of soils within the RMPPA.

Fragile Soils

Soils are defined as fragile if they are rated highly or severely erodible by wind or water, have slopes greater than or equal to 35 percent, and also have one of the following soil characteristics: (1) a surface texture that is sand, loamy sand, very fine sandy loam, fine sandy loam, silty clay, or clay; (2) a depth to bedrock that is less than 20 inches; (3) an erosion condition that is rated as poor; or (4) a K factor (see glossary) greater than 0.32 (Little Snake Record of Decision [ROD]; BLM 1989).

Problems with fragile soils are compounded when they are close to surface water sources. When eroded sediments flow directly into stream channels, subsequent increases in sediment and salinity can be dramatic, which is a major concern because increases in salt and sediment can make water unsuitable for beneficial uses, such as irrigation or livestock and wildlife watering, and because the RMPPA is part of the Colorado River System. Through the Colorado River Basin Salinity Control Act of 1974 and the Clean Water Act of 1977, BLM and other federal agencies are charged with developing a comprehensive program for minimizing salt additions to the Colorado River. The actual contribution of salt and sediment to the Colorado River Basin from drainages in the RMPPA is unknown; however, soils derived from Mancos shale or from other saline sedimentary formations (particularly in the western half of the RMPPA) tend to be high in salts. Because of the salt content in these soils, vegetative cover grows sparsely, resulting in soil particles not being anchored in place and easily eroded by wind and water. The presence and condition of biological soil crusts is also very important to these soils.

Soil texture also contributes to its integrity. Fine textured soils, such as clays or silty clays, have slow infiltration rates and, as a result, often have high runoff rates. In these soils, rills and gullies are easily formed during storms. Coarse textured soils such as sands, loamy sands, and sandy loams tend to be picked up and carried by winds. This movement often results in the formation of blow-outs and sand dunes. Shallow soils that are close to bedrock or other impermeable layers have a low tolerance level for erosion. Once the topsoil is eroded, it cannot be replaced by parent materials below it. Consequently, the soil could become unproductive over a short period of time.

Many of the soils in the western half of the RMPPA exhibit some combination of the above properties. Management unit 12 contains the largest expanse of fragile soils, but other isolated locations of fragile soils occur throughout the RMPPA. The badland areas in management unit 12 (e.g., on the northwest-facing slopes of Vermillion Bluffs) contain some of the most fragile soils in the RMPPA. They are steep, sparsely vegetated, shallow, and often fine textured. Soils along the steep canyons of several creeks, such

as the Deception, Sand, Vermillion, Canyon, Shell, and Dry Creeks, Conway Draw, and Buffalo Gulch, are extremely erodible because of slope, soil depth, and in some areas, high salt concentrations that result in sparse vegetative cover. Soils along the Little Snake River, Sand Wash, and Yellow Cat Wash are often saline and extremely susceptible to wind and water erosion. In the Milk Creek area, where much of the soils are derived from shales, salinity and erosion have historically been problematic. Existing planning has identified about 33,000 acres (about 3 percent of the RMPPA) of areas with fragile soils.

Important Farmlands

There are four categories of important farmlands meriting federal protection: prime farmlands, unique farmlands, additional farmland of statewide importance, and additional farmland of local importance (Section 1540(c) of the Farmland Protection Policy Act). These categories are used to characterize the soils in individual soil surveys.

The Moffat Soil Survey (which includes most of the RMPPA) identifies three categories of prime farmland: prime farmland if irrigated, prime farmland if irrigated and reclaimed of excess salts and sodium, and prime farmland if protected from flooding or not frequently flooded during the growing season. There are 16,200, 2,400, and 17,600 acres, respectively, of these farmland categories in the RMPPA (Map 3-4). Most of these acres are located on private lands. The Moffat Soil Survey also identifies 61,800 acres of additional farmland of statewide importance in the RMPPA, the vast majority of which is on private lands. The survey did not identify any soils of unique or local importance within the RMPPA. Other soil surveys were either not completed or not in a format that allowed such information to be determined.

Landscape Health Assessment of Soil

Upland soils must meet Standard 1 of the *Colorado Standards for Public Land Health*. All landscape units evaluated to date meet Standard 1, although every site within a landscape might not meet the standard. It should also be noted that because landscapes are evaluated at selected individual sites, the LHAs might not identify all site-specific problems in soil conditions or productivity.

Specific areas of concern were noted in some of the LHAs. In some areas, accelerated, although not unacceptable, erosion and compaction were noted. In some cases, this was observed in small, isolated areas (<100 ft²) or at a level acceptable and/or expected for the topography and soil type. Usually the increased erosion was in association with toe slopes, moderately steep slopes, or bench soils in the canyon bottoms. Areas with compaction, which was substantial in some places, did not exhibit other substantial site health problems.

Some sites that exhibited slight erosion also were deficient in onsite vegetation. There were undesirable characteristics, such as high occurrence of invasive plants and decadent sagebrush canopies, and a lack of perennial grasses in the shrub interspaces. Some sites in the LHA units did not fully meet Standard 1 because of these deficiencies in the plant community, which resulted from current use by both livestock and wildlife (which had been displaced from nearby areas that had become infested with exotic vegetation species) and from past vegetation conditions that did not protect the soil surface. In the Sand Wash landscape unit, soil stability issues exist, in part, because of open OHV designations that allow for hill climbing.

3.1.3.2 Characterization

If the Standard 1 indicators for soil resources (Appendix A) are met, the soils should exhibit infiltration and permeability rates that are appropriate for the soil type, climate, landform, and geologic processes. In

addition, adequate soil infiltration and permeability minimize surface runoff, and allow for the accumulation of soil moisture necessary for optimal plant growth and vigor.

At a landscape level, the soils within BLM-administered lands of the RMPPA are stable and functioning in a manner consistent with the Standard 1 criteria, which is an improvement over determinations from previous planning efforts; however, individual problem areas still exist.

It is difficult to forecast the future condition of the soils in the RMPPA because many other resources and uses depend on and influence soil quality. Livestock grazing, prime farmlands, wildlife habitat, fisheries, recreation, water quality, and forestry depend on the presence of suitable quality soils for their successful existence, and the intensity of these uses influences soil condition. Non-fragile soils will likely continue to meet Standard 1, and fragile soils will vary in condition based on site- and time-specific uses and related intensity.

3.1.4 Water Resources

Water resources include surface and ground water sources, which are integral in maintaining healthy plant communities and wildlife habitats and in providing drinking water for wildlife and people. Surface water also provides important habitat for aquatic organisms. The water present in the RMPPA must be of sufficient quantity and quality to sustain these uses, and BLM management decisions on both uplands and in drainages influence water quantity and quality.

3.1.4.1 Current Conditions

Ground Water

The RMPPA is underlain by the greater Colorado Plateaus aquifers (Figure 3-8), and specifically the Mesaverde and the Dakota-Glen Canyon aquifers (*Ground Water Atlas of the United States, Arizona, Colorado, New Mexico, Utah* (U.S. Geological Survey 1995)).

The Colorado Plateaus aquifers underlie about 110,000 square miles in western Colorado, northwestern New Mexico, northeastern Arizona, and eastern Utah. The distribution of aquifers in the Colorado Plateaus is partly controlled by the structural deformation and erosion that has occurred from the deposition of sediments that compose the aquifers. The principal aquifers in younger rocks are present only in basins, such as the Uinta, Piceance, and San Juan Basins. Although the quantity and chemical quality of water in the Colorado Plateaus aquifers are extremely variable, much of the land in this sparsely populated region is underlain by rocks that contain aquifers capable of yielding usable quantities of water of a quality suitable for most agricultural or domestic use.

The aquifers in the Colorado Plateaus area are typically composed of permeable, moderately to well-consolidated sedimentary rocks. These rocks range in age from Permian to Tertiary and vary greatly in thickness, lithology, and hydraulic characteristics. The stratigraphic relations and nomenclature of these rocks is complex. The many water-yielding units in the area have been grouped into four principal aquifers for purposes of this discussion. Of these, the Mesaverde and Dakota-Glen Canyon are the principal aquifers in the RMPPA, and are the most reliably mapped aquifers within the water division (Colorado Water Division No. 6). Most widespread and productive water-yielding units are included in these aquifers; however, some locally productive water-yielding units also exist. Detailed data on ground water quantity within BLM-administered lands of the RMPPA are limited to site-specific areas where, typically, oil and gas wells have been drilled or evaluated and ground water quantity analyses have been submitted to BLM.

Surface Water

The RMPPA is located within three basins of the Colorado River Region (Figure 3-9). Most of the RMPPA is within the White-Yampa River Basin and the Upper Green River Basin. The Yampa River, formed by headwater creeks in the eastern end of the RMPPA, is joined by the Elk River, Elkhead Creek, Fortification Creek, Williams Fork River, Little Snake River, and other more minor tributaries before it joins the Green River at the western end of the RMPPA. The Yampa River serves as the southern boundary of the western portion of the RMPPA (Map 3-5). There are no major reservoirs or impoundments on BLM-administered land in the RMPPA.

The Colorado River Basin is composed of smaller watersheds that are identified by hydrologic unit code (HUC) and a descriptive name. The Colorado River Basin is a level one watershed (the largest), and the 31 level 5 watersheds contained at least partially within the RMPPA (Map 3-6) are at a scale more commonly used in BLM management decisions. Each of these watersheds contains a number of streams, totaling 88 documented streams within the RMPPA (Table 3-6). The major stream segments within the RMPPA are shown on Map 3-5.

Table 3-6. Stream Segments Within the Little Snake Field Office

Stream Segments		
Two Bar Creek	Flycreek	Sand Springs Gulch
Beaver Creek	Fortification Creek	Scandinavian Gulch
Berry Gulch	Fourmile Creek	Second Creek
Big Gulch	Gill Reservoir	Shell Creek
Bighole Gulch	Government Corral Creek	Slater Creek
Bobhughes Creek	Hayden Gulch	South Fork Cottonwood Gulch
Boxelder Gulch	Horse Gulch	South Fork Fourmile Creek
Browse Spring Draw	Jeffway Gulch	South Fork Little Snake River
Bunker Creek Tributary	Jesse Gulch	Spring Creek
Butcher Knife Creek	Johnson Creek	Spring Gulch
Butler Creek	Little Middle Creek	Sulphur Gulch
Cantling Creek	Little Snake River	Talamantes Creek
Canyon Creek	Little Trout Creek	Taylor Canyon
Castor Gulch	Long Gulch	Temple Gulch
Chase Spring Draw	Maudlin Gulch	Thornburg Gulch
Coal Creek	Milk Creek	Timberlake Creek
Cottonwood Creek	Morgan Gulch	Trib to Martin Cull Reservoir
Cottonwood Gulch	Morrison Creek	Trout Creek
Day Creek	Mud Spring Draw	Ute Gulch
Deadman Draw	Mule Creek	Vermillion Creek
Deal Gulch	NS Creek	Watson Creek
Deception Creek	Oak Creek	West Fork Sand Creek
Deep Creek	Pagoda Creek	Williams Fork River
Deer Creek	Phillips Creek	Willow Creek
Dry Creek	Pole Gulch	Woodbury Gulch
Dry Fork Little Bear Creek	Red Creek	Wymore Gulch

Stream Segments		
East Timberlake Creek	Roaring Fork Slater Creek	Yampa River
Elkhead Creek	S. Fork First Creek	Unnamed Tributary to Steamboat Lake
First Creek	Sage Creek	
Fisher Creek	Sand Creek	

Generally, surface water in the RMPPA flows in a southwesterly direction from the mountains on the eastern edge of the RMPPA (Map 3-5). Most of the streams are intermittent and flow only for brief periods during snowmelt and high-intensity thunderstorms. Snowmelt in spring and early summer provides the major source of runoff for perennial streams, with subsurface flow being a contributor during the remainder of the year. Many of the perennial streams and their major tributaries are diverted for irrigation, including the Little Snake, Yampa, and Elk Rivers.

Historic streamflow data are available for two gauging stations on the Yampa River—at Steamboat Springs and downriver near Maybell. At both stations, flow data for 2004 are within the 1909 (Steamboat) and 1916 (Maybell) to 2003 range of mean flows and above the minimum mean flows for this same time period, although June 2004 flows were close to historic minimum flows. In 2004, flows at Steamboat Springs ranged from about 100 cubic feet per second (cfs) in January to 1,800 cfs in early May. Flows at the station near Maybell ranged from about 250 cfs to 6,000 cfs during this same time period; however, as of October 2004, the cumulative departure from mean flows since January 1, 2000 at these two stations was 150 percent (Steamboat Springs) and 170 percent (Maybell).

Water Quality

Current data on ground water quality within BLM-administered lands of the RMPPA are generally limited to data from site-specific areas where oil and gas wells (or pilot projects) have been drilled and ground water quality analyses have been completed and submitted to BLM.

Data on surface water quality are available for the Colorado River Basin and subbasins from the State of Colorado and LSFO LHA reports. Surface water quality in the Colorado River Basin is generally satisfactory, although runoff from agricultural areas, abandoned mines, and naturally occurring saline springs causes localized problems associated with elevated salinity levels. Salinity is a measure of total dissolved solids including all inorganic material in solution. High levels of salinity threaten the multitude of uses supported by Colorado River water.

Water resources within each landscape unit are evaluated against Standard 5 of the *Colorado Standards for Public Land Health* (Table 3-7). As shown in Table 3-7, water quality is generally good, and Standard 5 is being met on all landscapes that have been assessed. Salts, pollutants, and sediment loads increase in downstream segments, as ground cover diminishes, water temperatures increase, pollutants from livestock and wildlife accumulate, and sediments increase from runoff and snowmelt. Although overall surface water quality is good, some streams have elevated levels of sediment loads and salinity. Salinity issues are of particular concern in the RMPPA because it lies within the Colorado River Basin, which is subject to the Colorado River Basin Salinity Control Act (PL 98-569). Section 203(b)(3) of this act directed the Secretary of the Interior to “develop a comprehensive program for minimizing salt contributions to the Colorado River from lands administered by the Bureau of Land Management (BLM).”

Table 3-7. Status of Water Quality by Landscape Assessment Units per Watershed

Landscape	Status
Axial	Not available
Boone Draw (Douglas Draw)	Not available
Cold Springs	Standard met. No use impairment problems have been identified, and water quality apparently is sufficient to support uses.
Douglas Mountain	Standard met. Runoff waters from rain and snowmelt drain from the landscape into the Yampa River, which is presently supporting classified uses. No stream segments or tributaries are currently listed as having impaired water quality. Although the landscape is sandy and contributes sediments, implementation of BMP will help reduce the overall sediment load carried by individual tributaries to the Yampa River. Ground water quality standards are presently being met. BLM actions and resource conditions are not affecting ground water quality.
Dry Creek	Standard met. Runoff waters from rain and snowmelt will drain towards Dry Creek, Shell Creek, or Vermillion Creek. Water quality of Vermillion Creek and its tributaries and the Green River is sufficient to support the classified uses that are assigned to them.
Fourmile Creek	Standard met. Runoff waters from rain and snowmelt will drain from the watershed into stream segments that are presently supporting classified uses. No stream segments or tributaries are currently listed as having impaired water quality. Ground water quality standards are presently being met. BLM actions and resource conditions are not affecting ground water quality.
Great Divide	Not available
Green River	Not available
Little Snake River	Not available
Powderwash	Standard met. No use impairment problems have been identified, and water quality apparently is sufficient to support designated uses. The Little Snake River tributary stream segments are designated use protected; therefore, higher use classifications would not be expected for these tributary stream segments in the future. It is apparent that this watershed contributes sediments to associated waterways; however, implementation of BMP will help to reduce the overall sediment load carried by individual tributaries to the Little Snake River.
Sandhills	Standard met. The tributary stream segments to the Yampa River are designated use protected; therefore, higher use classifications would not be expected for these tributary stream segments in the future. There is no specific listing for any of the Yampa River tributaries below the confluence with the Little Snake River. McAndrews Gulch and Crooked Wash, two tributaries of the White River within the landscape, drain a portion of the HUC 1405000505 watershed. Runoff waters from rain and snowmelt will drain from the Sandhills Landscape into stream segments that are presently supporting classified uses. No stream segments or tributaries are currently listed as having impaired water quality.
Sand Wash	Standard met. Runoff waters from rain and snowmelt will drain from the Sand Wash watershed into stream segments that are presently supporting classified uses. No stream segments or tributaries are currently listed as having impaired water quality.
Slater	Not available
Spring Creek	Not available
Steamboat Lake	Not available
Williams Fork	Not available

Data to ensure that State water-quality standards are being met and collected pursuant to Section 303(d) of the Clean Water Act (as amended) would identify water resources as “water quality limited” if they are

not currently achieving or are not expected to achieve those standards. Surface water quality problems are detailed in Colorado's 303(d) list of impaired waters. Total maximum daily loads (TMDL) will be developed for all streams listed on Colorado's 303(d) list for not meeting water quality standards. Several streams within the RMPPA have been identified with water quality impairment problems and listed on the State of Colorado 303(d) list, as show in Table 3-8. It is important to note that the Little Snake River was listed as impaired in 1996 on the basis of somewhat qualitative data that were insufficient to support such a listing in 1998 when the criteria for listing were more stringent. More data are needed to clarify the status of the Little Snake River with regard to its water quality impairment.

Table 3-8. Water Bodies Within the RMPPA Listed on Colorado's 2004 Section 303(d) List: Water Quality Limited Segments Requiring Total Maximum Daily Loads

Water Body Name	Segment Description	Portion	Impairment	Priority
COUCYA02b	Stagecoach Reservoir	All	DO	H (high)
COUCYA13b	Foidel Creek and tributaries, Fish Creek, Middle Creek and tributaries	Middle Creek	pH	L (low)
COUCYA13d	Dry Creek	Below Seneca sample location 8	Se (selenium)	L (low)

Source: CDPHE 2004.

State regulations prompt the Water Quality Control Commission to release the Colorado Monitoring and Evaluation (M&E) list in conjunction with the State's 303(d) list (Table 3-9). The M&E list identifies water bodies that are suspected of having water quality problems. This list includes water bodies that are impaired, but the cause of impairment is unclear.

Table 3-9. Water Bodies Within the Little Snake RMPPA Listed on Colorado's Monitoring and Evaluation List (2004)

Water Body Name	Segment Description	Portion	Impairment
COLCLY02	Yampa River, Lay Creek to Green River	All	Sediment
COLCLY16	Little Snake River, Powder Wash to Yampa	All	Sediment fecal coliform
COUCYA03	All tributaries to Yampa River except for specific listings, on Forest Service land	First Creek in Elkhead Watershed	Sediment
COUCYA03	All tributaries to Yampa River except for specific listings	Spronks Creek, Middle Hunt Creek Watershed	Sediment
COUCYA03	All tributaries to Yampa River except for specific listings	S. Fork Slater Creek	Sediment
COUCYA03	All tributaries to Yampa River except for specific listings	Puppy Dog Creek in Fish Creek Watershed	Sediment
COUCYA03	All tributaries to Yampa River except for specific listings	Muddy Ck., Morrison Creek Watershed	Sediment
COUCYA03	All tributaries to Yampa River except for specific listings	Brush Creek, Morrison Creek Watershed	Sediment

Water Body Name	Segment Description	Portion	Impairment
COUCYA03	All tributaries to Yampa River except for specific listings	Beaver Creek	Sediment
COUCYA13b	Foidel Creek and tributaries, Fish Creek, Middle Creek and tributaries	Foidel Creek	E. coli
COUCYA13b	Foidel Creek and tributaries, Fish Creek, Middle Creek and tributaries	Middle Creek	E. coli
COUCYA19	All tributaries to Little Snake River on Forest Service lands in Routt County	S. Fork Little Snake	Sediment
COUCYA19	All tributaries to Little Snake River on Forest Service lands in Routt County	Johnson Creek	Sediment
COUCYA19	All tributaries to Little Snake River on Forest Service lands in Routt County	Oliver Creek	Sediment
COUCYA19	All tributaries to Little Snake River on Forest Service lands in Routt County	Silver City Creek, Upper Middle Fork, Little Snake Watershed	Sediment

Source: CDPHE 2004.

Water Use

Water in the RMPPA is primarily used for irrigation and livestock and wildlife watering. Other water uses include municipal/domestic, commercial, thermoelectric generation, mining, industrial, snowmaking and golf course maintenance. Because of the scarcity of water in this part of the continent, these uses are strictly controlled by water rights laws. Early settlers in the Western United States established the fundamental principle that those who made beneficial use of water should be entitled to its use and have seniority over those who followed, a principle known as the “doctrine of prior appropriation.” Rights to the use of water were acquired by actual diversion and application of water to beneficial use or by legislative grant under a rule that “first in time is first in right.” As streamflows recede, diversions are cut off in order of priorities. BLM obtains water rights for the use of springs, reservoirs, wells, and for diversions from intermittent and perennial streams. Applications for diversions are submitted to the State of Colorado.

3.1.4.2 Characterization

Larger and more consistent quantities of water and a greater number of water sources are in demand in the RMPPA. Although no trends towards depletion of ground water resources have been observed as a result of development on BLM-administered lands, additional demands for oil and gas development could impact ground water quantity. Management actions that continue to protect and maintain present ground water quantity will reduce future impacts on this water resource.

Surface waterflow data, expressed as cubic feet per second, acre-feet, or percent of some norm, are the best indicators of surface water quantity. Long-term flow data are available only for the Yampa River. The data on cumulative departure from mean flow (based on the historic data periods noted above) indicate that the RMPPA has been experiencing a drought since early 2000. As a result, BLM might need to take drought response measures. These measures may include attempting to improve vegetative cover over streams to lower water temperatures, restricting developments that deplete water sources critical for wildlife use, or constructing additional water developments in locations where surface water sources become inadequate to satisfy all projected uses.

Indicators of water quality are physical, chemical, and/or biological parameters that are set by State and federal regulations for particular stream segments or particular water uses. The trends of water quality in the RMPPA are dependent on uses within both riparian and upland areas. Because water quality trends are influenced by many factors, they are highly variable and often beyond the control of BLM's land management practices.

BLM's goal of maintaining or improving water quality within BLM-administered lands of the RMPPA result in adequate management of surface disturbing activities and maintenance of good water quality. Management strategies that prevent loss of vegetative cover, channelization, bank destabilization, excessive runoff, and sedimentation will continue to have beneficial impacts on water quality. Riparian vegetation communities that continue to be managed and improved through PFC goals and objectives will help maintain water quality, and protect downstream beneficial uses of water and riparian habitat. The continuation of water quality studies on BLM-administered lands through the LHA process will help identify water quality issues that could arise in the future. In addition, because water sources cross administrative boundaries, coordination with other land management agencies and private parties is necessary to ensure water quality standards continue to be met.

3.1.5 Vegetation

Vegetation serves multiple purposes on the landscape and provides many ecosystem services. Vegetation stabilizes soils, prevents erosion, uses carbon dioxide (CO₂), releases oxygen (O₂), increases species diversity, and provides habitat and food for animals and products for human use. Many of BLM's land management policies are directed toward maintenance of healthy vegetation communities. Vegetation can be generally characterized by ecological provinces, and more specifically characterized by plant communities. The plant species discussed below are those that provide the most important land cover across the RMPPA. Special Status Plant Species are discussed in Section 3.1.7.

3.1.5.1 Current Conditions

Ecological Provinces

Bailey's (1995) description of North American ecoregions places the RMPPA in three ecological provinces (Map 3-7)—the Intermountain Semi-Desert Province (341 and 342), Nevada-Utah Mountain Semi-Desert-Coniferous Forest-Alpine Meadow Province (M431), and Southern Rocky Mountain Steppe-Open Woodland-Coniferous Forest Province (M331).

The Intermountain Semi-Desert and Desert Province (341 and 342) is contained within the intermountain basins of Wyoming and northern Colorado. The chief vegetation type, sagebrush steppe, is made up of sagebrush, saltbush, and a mixture of grasses and forbs. The Intermountain Semi-Desert Province is sometimes considered a cold desert, as the summers are hot and the winters can be extremely cold. The growing season is short, and the annual precipitation varies between 5 and 12 inches. Winter snow accumulation and runoff provide available moisture for spring plant growth. Snow distribution patterns caused by wind, topography, and existing vegetation develop pockets of highly productive sites within the drier, less productive surrounding areas. This area lies predominantly in the southwestern and northeastern regions of the RMPPA at elevations below 8,000 feet. Forest and alpine areas dissect this vegetation province; therefore, these areas provide winter habitat for many wildlife species. Livestock, wild horse, and wildlife grazing are the primary uses of the area.

The Nevada-Utah Mountain Semi-Desert-Coniferous Forbs-Alpine Meadow Province (M431) consists of broken hills, mesas, and lower mountains and occupies the highest elevations of the Colorado Plateau and the Great Basin of Colorado, Utah, and eastern Nevada. The lower elevations are dominated by shrubs

and bunchgrasses. Where soils are saline, salt tolerant species such as greasewood dominate. Woodland areas consist of pinyon pine and juniper, which give way to aspen, willow, and cottonwood in wetter areas (Bailey 1995; Cronquist et al. 1972). The area is typically cold in the winter and warm in the summer. The valleys and basins are generally higher than 5,000 feet and the upper peaks can be as high as 12,000 feet. Precipitation ranges from 5 to 8 inches per year in the lowest and driest basins to over 25 inches per year in the mountainous areas. These areas provide ideal year-round habitats for many species of wildlife, and are used extensively for livestock grazing.

The Southern Rocky Mountain Steppe-Open Woodland-Coniferous Forest Province (M331) is a transition from grass- and shrub-dominated areas to shrub- and tree-dominated areas. Juniper, shrub, and grass communities dominate at elevations between 8,000 and 9,000 feet. The middle elevations of pine and spruce forest are between 8,500 and 12,000 feet. Alpine tundra occurs only above 10,000 feet where cushion-type forbs and grass communities occur, as well as krummholz patches of spruce and fir. Riparian vegetation also varies according to elevation; however, willows and water-tolerant grasses, sedges, and rushes often dominate from the foothills to the alpine (Bailey 1995; Knight 1994). The climate of these areas is variable and dynamic because of factors, such as elevation, aspect, slope, and topographical change. Eastern and southern slopes are generally drier and warmer compared to western and northern slopes. As the elevation rises, the mean temperature decreases and the growing season shortens. Annual precipitation generally rises from 14 inches in the foothills to over 60 inches in the alpine area. Winter mountain snow pack could reach over 200 inches per year and provides a reservoir for lower elevation water users (Martner 1986; Knight 1994). Mountain ranges within the RMPPA considered part of this vegetation province include the Sierra Madre Range, Middle Mountain, Cold Springs Mountain, and Diamond Peak area. These areas provide summer forage for wildlife and livestock, and important habitat for many nongame mammals, birds, and fish.

Plant Communities

A plant community is a group of plant populations that coexist in space and time, and affect each other's population dynamics directly or indirectly. Distinct plant communities within the RMPPA are influenced by characteristics, such as soil depth, texture, and salinity, climate variables, particularly temperature, total and seasonal distribution of precipitation, wind, and topographic features—most importantly elevation, aspect, and slope. The following discussions of plant communities that occur within the RMPPA show the diverse and complex nature of vegetation resources in the area.

Plant communities can be represented by plant cover types that reflect the dominant species present in an area, such as the plant cover types documented by data from the Gap Analysis Program (GAP), a cooperative effort among regional, federal, and State agencies and private groups to provide regional assessments of the conservation status of native vertebrate species and natural land cover types. To better reflect the level of community aggregation that is managed by BLM, the 34 GAP land cover types have been combined into 15 general vegetation cover types (Table 3-10, Map 3-8), which are discussed below. These cover types are aggregated into three physiognomic groups: rangelands, forests and woodlands, and riparian areas and wetlands. Table 3-10 shows how the aggregations were prepared, and provides acreages for both the entire RMPPA and BLM-administered lands.

Table 3-10. Vegetation in the Little Snake RMPPA

Mapped Vegetation Zone	Report Heading	GAP Land Cover Types	Overall Acres	Percent of Total Acreage	BLM Acres	BLM Land Utilization (LU) Acres ¹
Agricultural lands	Other cover types		346,720	8.2	6,231	206
		Dry land crops	272,065	6.4		
		Irrigated crops	74,656	1.8		
Aspen	Aspen	Aspen forest	507,529	12.0	23,827	0
Bare ground/rock	Other cover types	Strip mines/quarries	3,754	0.1	825	0
Coniferous forest			504,330	12.0	24,670	0
	Mixed conifer	Spruce-fir	296,170	7.0		
	Mixed conifer	Spruce-fir-clearcut/logged	6,297	0.1		
	Douglas-fir	Douglas-fir	7,414	0.2		
	Lodgepole pine	Lodgepole pine	162,417	3.9		
	Lodgepole pine	lodgepole pine—clearcut/logged	2,308	0.1		
	Ponderosa pine	Ponderosa pine	27,572	0.7		
	Mixed conifer	Mixed forest-general	2,152	0.1		
Developed land	Other cover types	Urban or built-up land	5,750	0.1	5	0
Grasslands	Grasslands		104,884	2.5	11,804	0
		Mid grass prairie	38	0.0		
		Foothill/mountain grassland	53,022	1.3		
		Subalpine meadow	51,825	1.2		
Mountain shrub	Mountain shrub		566,663	13.4	154,375	0
		Mesic upland shrub	50,121	1.2		
		Deciduous oak	349,403	8.3		
		Bitterbrush shrub	154,246	3.7		
		Xeric upland shrub	12,893	0.3		
Pinyon-juniper	Pinyon-juniper woodland		382,681	9.1	261,059	0
		Juniper	82,073	1.9		
		Pinyon-juniper	300,608	7.1		
Riparian herbaceous	Riparian and wetland	Grass/forb dominated wetland	4,453	0.1	120	0
Riparian shrub/tree	Riparian and wetland		14,309	0.3	6705	0
		Forested wetlands	4,696	0.1		
		Shrub dominated wetlands	9,612	0.2		
Sagebrush	Sagebrush		1,193,462	28.3	387,482	31,648
		Mountain big sagebrush	28,995	0.7		

Mapped Vegetation Zone	Report Heading	GAP Land Cover Types	Overall Acres	Percent of Total Acreage	BLM Acres	BLM Land Utilization (LU) Acres ¹
		Wyoming big sagebrush	110,684	2.6		
		Basin big sagebrush	1,053,783	25.0		
Salt Desert shrub	Salt desert shrub	Desert shrub	4,254	0.1	3,955	0
Saltbush	Saltbush	Saltbush fans and Flats	557,168	13.2	431,657	4,685
Tundra	Other cover types		19,282	0.5	0	0
		Prostrate shrub tundra	6,190	0.1		
		Meadow tundra	2,331	0.1		
		Bare ground tundra	705	0.0		
		Mixed tundra	10,056	0.2		
Water	Other cover types	Open water-lakes	3,179	0.1	1	0
TOTALS			4,218,416	100	1,312,716	36,539

¹Lands acquired under Title III of the Bankhead-Jones Farm Tenant Act of July 22, 1937, which are administered by the BLM.

Rangelands

Grasslands. The 11,804 acres of grassland managed by BLM occur in the eastern one-third of the RMPPA. On sandier soils, where water is more available and soil, climate, or water availability restricts shrub establishment, desert grasslands commonly occur as a variant of shortgrass prairie. Common grass species include thick spike wheatgrass, slender wheatgrass, bluebunch wheatgrass, Indian ricegrass, needle-and-thread, Sandberg bluegrass, and sand dropseed. Other shrubs and forbs growing among the grasses are sand sagewort, phlox, Hooker sandwort, bud sagebrush, fringed sagebrush, Wyoming big sagebrush, rubber rabbitbrush, horsebrush, globemallow and prickly pear cactus (Knight 1994).

Saltgrass meadows occur in shallow depressions or adjacent to playa lakes where ground water is near the desert surface. These areas are characterized by inland saltgrass, alkaligrass, alkali sacaton, and, in wetter areas, alkali cordgrass (Knight 1994). Desert grasslands provide palatable forage and often provide islands of diversity within the desert shrublands.

Crested wheatgrass was planted in areas to mitigate disturbances by roads, well pads, oil and gas production activities and vegetation treatments, such as brush beatings and prescribed burns. These plantings were needed to provide ground cover, prevent erosion, and reduce the influx of weeds. These areas are now dominated by crested wheatgrass with native plants voluntarily coming in, such as big sagebrush, rabbitbrush, globe mallow, slender wheatgrass, thick spike wheatgrass, bluebunch wheatgrass and needle-and-thread. Native grasses have been used to reseed similarly disturbed areas for the last several years. These grasses include slender wheatgrass, thick spike wheatgrass, Indian ricegrass, and needle and thread.

Shrub Communities. Shrublands dominate most of BLM-administered lands in the RMPPA. The 977,469 acres of shrub communities comprise 74 percent of the land managed by BLM and cover vast areas of the RMPPA. These communities are very diverse in plant composition, in the sites where they

occur in the RMPPA, and in the habitats and forage they provide to wildlife and livestock. This section discusses several shrub community types.

Mountain Shrub. Mountain shrub communities include bitterbrush shrub steppe, mesic upland shrub step, xeric upland shrub steppe, and mountain mixed shrub/pinyon-juniper community types. These areas are important wildlife summer and transition ranges, as well as spring, fall, and summer livestock ranges. They lie between the high-elevation mountain meadow and open park ranges and the low-elevation desert rangelands. The four plant communities described below comprise 11.8 percent of the BLM-managed land and occur generally in the eastern one-third of the RMPPA or in the southern half of the western two-thirds of the RMPPA.

Bitterbrush-dominated plant communities exist on sand and sandy loam soils in the 10- to 14-inch annual precipitation zones. Bitterbrush varies in height depending on soil depth, precipitation, and browsing. It might appear as a low spreading shrub about 6 inches tall or as a tall shrub reaching 6 feet in height. Bitterbrush is often co-dominant with mountain or basin big sagebrush and could be intermixed with silver sagebrush, basin big sagebrush, and rabbitbrush in deep sandy soils. At higher elevations and higher precipitation levels, it occurs in mixtures with sagebrush, snowberry, serviceberry, mountain mahogany, and an occasional chokecherry. Herbaceous plants associated with bitterbrush include grasses such as needle-and-thread, prairie sandreed, Indian ricegrass, sand dropseed, and thick spike wheatgrass and forbs such as lupine, penstemon, sego lily, wild onion, larkspur, and prickly pear cactus.

Bitterbrush is probably the most important winter browse species for deer and pronghorn, and is used by elk and cattle in the fall and spring. It responds best to sagebrush-killing fires (burns occur in the fall and spring), although it's resprouting response is fair to moderate at best even under such conditions. Hot summer fires will kill bitterbrush.

Kinnikinnik, serviceberry, chokecherry or a combination of these species dominate the mesic upland shrub steppe, often in conjunction with snowberry, currant, skunk bush sumac, and wood rose. These shrubs could reach 10 to 15 feet in height, occurring in dense stands or in scattered patches, often adjacent to aspen or willow. Understory grasses include basin wildrye, green needlegrass, Columbia needlegrass, and Kentucky bluegrass, and forbs include bluebell, columbine, aster, violet, elkweed, chickweed, and stinging nettle. This community provides hiding and thermal cover for deer, elk, and other wildlife species. The dominant shrubs provide sufficient forage for browsing animals when their softer leaves and shoots are within reach. These shrubs will reestablish following fire, often in less dense patches, making them more accessible to wildlife and livestock.

Mountain mahogany dominates the xeric upland shrub steppe community in the central and western portions of the RMPPA on dry rocky slopes or in very shallow, undeveloped soils in the 10- to 14-inch precipitation zone. It occurs, as both the dominant shrub and as an understory of juniper, at higher elevations, mixing with bitterbrush, snowberry, serviceberry, green rabbitbrush, broom snakeweed, and Wyoming big sagebrush. Commonly associated herbaceous plants include bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, and mat-forming forbs such as phlox, buckwheat, locoweed, Hooker sandwort, goldenweed, and milkvetch. Mountain mahogany is an important wildlife fall and winter forage.

Gamble oak dominates much of the eastern slopes of the RMPPA. This plant community is often intermixed with large aspen colonies in the lower foothills below expansive conifer forests. Other trees and shrubs found in these areas are juniper, mountain mahogany, shrubby cinquefoil and big sagebrush. Herbaceous plants include Indian paintbrush, columbine, bluebunch wheatgrass and green needle grass. These areas are important year-round transitional and winter habitat for deer and elk. Fire typically lessens the density of these shrub stands, allowing grasses and other herbaceous plants to increase, while

still providing wildlife browse. When the shrub cover is removed, herbaceous production is greatly increased.

Sagebrush. The GAP coverage of the RMPPA maps sagebrush as Wyoming big sagebrush, mountain big sagebrush, and basin big sagebrush, which are mapped collectively as sagebrush on Map 3-8. These three categories are broadly described below. Collectively, they make up 29.6 percent of the BLM-administered lands in the RMPPA and are especially prominent across the central portion of the RMPPA and along its northwestern border, although smaller patches of this community are scattered elsewhere. Other sagebrush types that occur as minor plant communities within other vegetation types include silver sagebrush/grassland, which occurs in riparian habitat along streams above the wet sedge and willow riparian zone, and juniper/sagebrush and juniper/pinyon pine/sagebrush mixed vegetation types found at higher elevation slopes on rockier or shallow soils where precipitation is more abundant and these plants can take advantage of aspect-influenced precipitation and snow accumulation.

Wyoming Big Sagebrush/Grassland. The Wyoming big sagebrush/grassland is a common vegetation cover type in northwest Colorado. It occurs in shallow to moderately deep coarse soil types at lower elevations between 6,000 and 7,500 feet, giving way to basin big sagebrush in deeper and clayier soils, and to mountain big sagebrush in areas above 6,500 feet that are within the 9- to 16-inch annual precipitation zone (Knight 1994). Shrub height varies from as little as 8 inches on shallow sites to around 30 inches in deeper soils. Canopy cover is not as extensive as for either basin or mountain big sagebrush, usually topping out between 30 to 40 percent.

Wyoming big sagebrush often appears as the dominant plant in mosaic communities intermixed with other shrubs and open grasslands. In shallow, rocky to gravelly soils, Wyoming big sagebrush may be co-dominant with black sagebrush, green rabbitbrush, and sometimes winter fat. Grass and forb species vary depending on soil texture, aspect, and slope. Common grass and grass-like species include bluebunch and thick spike wheatgrass, Sandberg and mutton bluegrass, Indian ricegrass, needle-and-thread, threadleaf sedge, and bottlebrush squirreltail. Common forbs include phlox, Hooker sandwort, buckwheat, penstemon, Indian paintbrush, globemallow, and prickly pear cactus. Wyoming big sagebrush is the most frequently eaten sagebrush species and is a staple for pronghorn and greater sage-grouse. It is also one of the dominant species found on antelope and mule deer-crucial winter ranges. Fire is an important component of all sagebrush-dominated plant communities. Depending on the nature of the site, the fire return interval can be between 25 and 100 years (Knight 1994).

Basin Big Sagebrush. Basin big sagebrush is found in moderately deep to deep soils of all soil textures in zones of 10 to 16 inches of annual precipitation (Beetle 1960). It occurs as pockets within Wyoming big sagebrush and Gardner saltbush communities, as the dominant plant type along valley bottoms and canyons, and along isolated ephemeral washes. This subspecies of big sagebrush may reach 12 feet in height, with canopy cover reaching 70 percent.

Basin big sagebrush can intermix with serviceberry, green and rubber rabbitbrush, snowberry, bitterbrush, silver sagebrush, and mountain mahogany, depending on the soil depth, annual precipitation, and elevation. Grasses occurring in these communities include basin wildrye, green needlegrass, Idaho fescue, thick spike wheatgrass, Kentucky and mutton bluegrass, and bottlebrush squirreltail. Common forbs include bluebells, groundsel, wild onion, violet, buttercup, false dandelion, buckwheat, penstemon, Indian paintbrush, globemallow, and prickly pear cactus.

Basin big sagebrush is not a very palatable forage, and usually shows little or no use, even in extreme winters when use levels of other plants is severe; however, it can serve as hiding and thermal cover for mule deer and elk and as habitat for other wildlife species. In some areas, it also provides critical winter habitat for greater sage-grouse when snow covers most other shrubs. Basin big sagebrush often increases

in density and cover with livestock overgrazing, and serve as interruptions in the fire cycle. To increase diversity in basin big sagebrush, prescribed fires and chemical and mechanical treatments are employed, resulting in increases of grasses and other understory plants.

Mountain Big Sagebrush/Grassland. Mountain big sagebrush is located in shallow to moderately deep soils at elevations above 6,500 feet, in 12- to 20-inch annual precipitation zones. Mountain big sagebrush also occurs as smaller plant communities at the lower mountain elevations, and intermixes with aspen and conifer woodlands at the periphery of mountain ranges. Shrub height varies from 10 to 30 inches, with canopy cover reaching 50 to 60 percent.

Mountain big sagebrush is usually the dominant shrub in foothill and mountain sagebrush communities, with bitterbrush, serviceberry, snowberry, and mountain mahogany providing subdominant brush diversity. Grasses include Idaho fescue, king spike fescue, green and Colombian needle grass, Kentucky, mutton, and big bluegrass, elk sedge, and Ross' sedge. Common forbs found in these areas include Indian paintbrush, globemallow, lupine, larkspur, penstemon, and Oregon grape.

Mountain big sagebrush is palatable to wildlife, although browsing is limited during the winter when these habitats become unavailable because of snow. Following fire, mountain big sagebrush reestablishes as the dominant species more quickly than other sagebrush types, often providing dense canopy cover after only 20 to 30 years. The natural fire recurrence interval in this sagebrush type is 25 to 75 years.

Saltbush. The saltbush vegetation type is perhaps the most arid vegetation type in the intermountain West (Knight 1994). Gardner saltbush dominates the salt desert shrub community type and, in some instances, makes up to 90 percent of the vegetation cover. These areas are characterized by accumulations of salt in poorly developed deep soils. Soils in these areas usually have a pH of 7.8 to 9, which restricts the uptake of water by all but the most salt-tolerant plants (halophytes). Soil textures can be sandy loam, sandy clay loam, or loam and clay. Salts accumulate around these plants each year with leaf fall. Halophytes function essentially to redistribute salts from the soil depths to the surface, which concentrate salts around the perimeter of the plant, and thereby eliminate competition for scarce water and nutrients from less salt-tolerant plants (Goodin and Mozafar 1972).

Gardner saltbush normally grows no higher than 12 inches and could grow along the ground, forming a mat. Subdominant shrubs include birdfoot sagebrush, bud sagebrush, spiny hopsage, greasewood, broom snakeweed, shadescale, basin big sagebrush, rabbitbrush, and winterfat. Grasses associated with these sites are Indian ricegrass, bottlebrush squirreltail, Sandberg bluegrass, and western wheatgrass. Forbs found in these areas include wild onion, biscuit-root, woody aster, globemallow, halogeton, and prickly pear cactus.

In the RMPPA, saltbush covers 32.9 percent of the BLM-managed land and is primarily located in the north central portion of the RMPPA. Saltbush shrublands occur at elevations between 6,000 and 7,600 feet within the lowest precipitation areas of the RMPPA. These areas are typically flat or rolling hills. Excellent examples of this vegetation type exist in the Powder Wash area. Gardner saltbush is a valuable forage species on winter and spring ranges. In spring, Gardner saltbush has higher protein concentrations than does late season alfalfa, and is a preferred livestock forage for lambing sheep and calving cattle.

Salt Desert Shrub. Salt desert shrublands are characterized by drought tolerant shrubs, with few grasses and forbs in the understory. The soils of these areas are shallow saline clays and loams. Typical shrubs in these vegetation types are shadescale, four-wing saltbush, spiny hopsage, greasewood, winterfat, broom snakeweed and bud sagebrush. Big sagebrush and rabbitbrush occur in looser and rockier soils and are much less abundant than in the other desert shrub types. Juniper is occasionally found on the lee

side of rocky hills and ridges. Understory vegetation includes globemallow, wild parsley, prickly pear cactus, bluebunch wheatgrass, needle-and-thread, and Indian ricegrass.

The topography of these areas is rough with steeply sloped hills, canyons, and rock escarpments. These areas are often important winter ranges for wildlife and livestock, as they provide forage that is not buried in snow, and the shrubs and rough topography provide cover from wind and predators. The forage of these areas is excellent in the winter, as these shrubs maintain relatively high levels of protein and carbohydrates. This vegetation cover type occurs on 0.3 percent of the lands managed by BLM and is located along the Wyoming border in the western quarter of the RMPPA.

Forests and Woodlands

Forest and woodland vegetation is primarily made up of ponderosa pine, Douglas-fir, mixed spruce-fir, lodgepole pine, aspen, and pinyon-juniper woodland. Forested areas within the RMPPA are mainly located within three mountainous areas—Diamond Peak, Middle Mountains and Douglas Mountain. There are also a number of forested areas located on the fringe of USDA Forest Service boundaries (Map 3-8). Forested lands managed by BLM within the RMPPA total 309,556 acres, or 23.6 percent of BLM-managed land, and 33.1 percent of the overall RMPPA (Table 3-10).

Ponderosa Pine. Ponderosa pine occurs on the higher mesas and mountains of the planning area from about 6,000 to 8,000 feet in elevation. Ponderosa pine is a dry forest type where historically, frequent, low-intensity ground fire maintained open park-like stands with large widely spaced trees and little understory vegetation. Lack of these low intensity fires over the last century has allowed dense understory conditions to develop. Overstory trees in these stands are stressed with additional competition for water and nutrients. The overall health of the dry forest types has declined and the stressed trees are susceptible to forest insect attack.

Douglas-Fir. This forest type is generally found in association with lodgepole pine on the lower-elevation mountainous areas. Many of these trees are residual trees from prior stands. Douglas-fir is also a dry forest type and has experienced similar fire history and related consequences as ponderosa pine, as described above.

Mixed Spruce-Fir. The major species component of the mixed spruce-fir type is subalpine fir, with occasional Engelmann spruce. This forest type is even-aged and fairly young, considering the longevity of Engelmann spruce and subalpine fir. Spruce-fir exists as small, isolated stands away from the large acreages of dense lodgepole pine and has the same date of origin as its neighboring stands. Old, remnant lodgepole pine trees are not found within the spruce-fir stands. The occurrence of the spruce-fir forest type is probably a result of less intense wildfire and an available seed source. There is also an established understory (more than 50 trees per acre) of young subalpine fir seedlings and/or saplings in a portion of the lodgepole pine and aspen forest. These forested areas will convert to subalpine fir forests, but this process could take 100 years or more, and will only occur in the absence of wildfires.

Lodgepole Pine. This forest type is the result of past, stand-replacing wildfires, dating from the 1860s to the 1910s. This forest type is generally healthy, but will decline in vigor and productivity as the forest becomes over mature. The current age class distribution is heavily unbalanced to the older age classes, reflecting the long period since the last fires. Just east of the RMPPA, in the north central part of Colorado, mature lodgepole pine forests are currently being attacked by mountain pine beetle at epidemic levels. The large percentage of mature forests within the RMPPA makes the lodgepole type highly susceptible to bark beetle attack. There are also disease concerns where stands are infected with dwarf mistletoe. Another concern is the present lack of late successional lodgepole pine forest. Any future

wildfire or bark beetle epidemic has the risk of reverting this entire forest type back to early successional forests.

Aspen. The aspen forest type, like the spruce-fir type, is not well represented in the area. Because aspen are found primarily on steep, rocky slopes or in low wet areas, opportunities for management are limited. Conifer invasion is also occurring in most of the aspen stands, which could result in further reductions in aspen presence. Barring any major surface disturbance (e.g., fire, mechanical treatment), most the aspen stands will eventually be replaced by conifers; however, this conversion is not expected to occur within the next 20 years. Aspen is a minor component in more than one-third of the lodgepole pine stands. Removal of the conifers would promote aspen regeneration.

Pinyon-Juniper Woodlands. Consisting of about 261,000 acres, pinyon-juniper are the climax species within the 6,000- to 8,000-foot zone, with most stands being old growth, which is evidenced by a lack of understory and suppressed reproduction. Many of the woodlands exhibit a greater dominance of juniper than pinyon with many communities entirely dominated by juniper. Juniper has strong allelopathic effects that suppress shrub and grass presence. These effects become greater as the stands age. The more dense woodlands are found mainly at the intermediate elevations where precipitation averages 12 to 14 inches per year. The distribution and characteristics of these woodlands are influenced by fire more than any other factor. As such, old growth stand areas are likely to be on steep, rocky slopes that are naturally protected from fire. In many areas, lack of fire has resulted in dense, less diverse, continuous stands that are actively expanding into adjacent shrub and grasslands. Historical evidence suggests that, under natural fire regimes, juniper and pinyon-juniper woodlands on low slopes should contain a variety of age classes, 5- to 20-acre openings within continuous stands, and dynamic boundaries (shifting either way) with neighboring shrub and grass communities. Active management of these communities through prescribed burning and mechanical treatments can promote increased diversity and resilience within these woodlands, as well as in adjacent plant communities.

Riparian Areas and Wetlands

Riparian-wetland areas (Map 3-8) are the “green zones,” or the links between aquatic environments and upland, terrestrial ecosystems (Lewis et al. 2003). These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water. Examples of riparian areas include lands along perennially and intermittently flowing rivers and streams and the shores of lakes and reservoirs with stable water levels (Brimson 2001). The numerous springs and seeps throughout the RMPPA also have associated riparian and wetland areas. Even though riparian and wetland areas occupy only a small percentage of land, these areas provide a wide range of functions critical to many different wildlife species, water quality, scenery, and recreation (Brimson 2001). The distribution of riparian areas and wetlands are documented on GAP vegetation maps, National Wetland Inventory maps or on RMPPA-specific maps of lentic and lotic resources. The GAP vegetation cover types associated with riparian and wetlands areas are grass/forb dominated wetland, forested wetlands, and shrub dominated wetlands. These areas are shown on Map 3-8 as riparian herbaceous and riparian shrub and tree vegetation zones to the extent they have been documented. The 6,825 acres of BLM-managed riparian and wetland areas occur primarily in the Vermillion Creek and Little Snake River drainages.

Information on the condition of specific riparian-wetland resources is available as part of the LHAs. In these assessments, riparian vegetation and wetlands within BLM-administered lands of the RMPPA are evaluated against Standard 2 of the *Colorado Standards for Public Land Health* (Appendix A) using qualitative data collected from PFC assessments. On the basis of hydrology, vegetation, and erosion or deposition (soils) attributes and processes (Prichard et al. 1999), the PFC assessment places the riparian area in one of three categories: properly functioning condition, functional-at-risk, or nonfunctional. Where assessments have not been initiated or are incomplete, the rating is considered unknown.

Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy during high waterflows (Prichard et al 1998). Numerous stream reaches throughout the RMPPA have been evaluated against the PFC criteria. Table 3-11 and Map 3-9 show the results of PFC assessments of streams within BLM-administered lands of the RMPPA. As shown in Table 3-11, 91.12 miles (27 percent) of the 337 miles of streams evaluated on BLM-administered lands exhibit PFC, 159.51 miles (47 percent) are functioning at risk, 24.43 miles (7 percent) are not functioning, and 61.93 miles (18 percent) are unknown. Causal factors for not meeting Standard 2 (Table 3-12) include trampling by elk and cattle, encroachment of invasive plant species such as tamarisk, incised streambeds, and unstable stream channels. Other causal factors were either not apparent or thought to be related to the drought that began in 2000 and continued through 2004. Many of the sites not meeting Standard 2 are considered close to reaching their potential.

Table 3-11. Little Snake Proper Functioning Condition Assessment (as of 2004)

Riparian Name	Assessment Rating* (miles)			
	PFC	FAR	NF	Unknown
Axial Landscape Area				
Box Elder Gulch	2.63	2.95		3.43
Horse Gulch		2.48		1.21
Jesse Gulch	2.37	1.85	0.31	0.12
Maudlin Gulch	2.73	6.98		
Milk Creek		1.88		0.26
Morgan Gulch	4.90	0.56		
Sand Springs Gulch		2.46		
Temple Gulch		3.17		1.99
Yampa River	4.23	4.95	12.72	0.17
Total	16.86	27.28	13.03	7.18
BOONE DRAW LANDSCAPE AREA				
Vermillion Creek		0.02		
COLD SPRINGS MOUNTAIN LANDSCAPE AREA				
Two Bar Creek				0.34
Beaver Creek	5.32	0.33		
Canyon Creek	7.69			
Fisher Creek		0.39		1.23
NS Creek	1.08	2.22		
Talamantes Creek		2.19		
Vermillion Creek	14.12	13.07		0.30
Total	28.21	18.20		1.87
DOUGLAS MOUNTAIN LANDSCAPE AREA				
Yampa River		0.12		
DRY CREEK LANDSCAPE AREA				
Dry Creek				22.46
Shell Creek		6.91		7.78

Riparian Name	Assessment Rating* (miles)			
	PFC	FAR	NF	Unknown
Vermillion Creek	11.86	7.37		0.10
Total	11.86	14.28		30.34
GREEN RIVER LANDSCAPE AREA				
Vermillion Creek		3.24		
GREAT DIVIDE LANDSCAPE AREA				
Big Gulch				1.09
LITTLE SNAKE RIVER LANDSCAPE AREA				
Little Snake River	7.38	6.86	0.51	0.10
FOURMILE CREEK LANDSCAPE AREA				
East Timberlake Creek	0.68	1.82		
Fourmile Creek	0.40	4.67		0.34
Mud Spring Draw	2.58	1.80		
Pole Gulch	1.52	6.01		2.52
South Fork Fourmile Creek				3.41
Timberlake Creek Tributary		0.51	0.37	
Timberlake Creek	2.80	4.03		
Tributary to Martin Cull Reservoir				0.77
Woodbury Gulch		0.05		
Total	7.98	18.89	0.37	7.04
POWDER WASH LANDSCAPE AREA				
Big Hole Gulch	1.06	4.86	0.93	2.48
Controlled Surface Use (CSU) Enclosure (lentic draw)	1.03			
Little Snake River	0.38	7.91		0.07
Scandinavian Gulch			5.32	2.33
Thornburg Gulch		0.70		0.78
Woodbury Gulch		3.99	0.62	
Total	2.47	17.46	6.87	5.66
SAND HILLS LANDSCAPE AREA				
Bob Hughes Creek		1.37		
Deception Creek		0.65		
Yampa River	3.48	1.87		1.18
Total	3.48	3.89		1.18
SAND WASH LANDSCAPE AREA				
Little Snake River	2.93	1.31		0.15
SLATER LANDSCAPE AREA				
Cantling Creek Headwater 1		0.49	0.30	
Cantling Creek Headwater 2		3.45		

Riparian Name	Assessment Rating* (miles)			
	PFC	FAR	NF	Unknown
Cantling Creek Tributary 1		0.94		
Cantling Creek Tributary 2		1.09	0.14	
Deadman Draw		0.34		
First Creek	0.39	1.06		0.27
Fly Creek		2.67	0.95	
Government Corral Creek		0.65		
Johnson Creek				0.02
Little Snake River	0.49			
Mule Creek		0.22		0.77
Roaring Fork Slater Creek				0.10
South Fork First Creek	0.56	1.11		
Second Creek				0.29
Slater Creek		0.87		
South Fork Little Snake River		1.46		
Willow Creek (gold blossom)	0.49	0.22		
Willow Creek (Fourmile)	3.68	13.05		0.31
Willow Creek Tributary 1		0.72		
Willow Creek Tributary 2	0.33			
Total	5.94	28.34	1.39	1.76
SPRING CREEK LANDSCAPE AREA				
Browse Spring Draw	0.15			
Chase Spring Draw		0.37		
Sand Creek		5.96		
Spring Creek	0.95	0.77	0.86	
West Fork Sand Creek		1.21	1.01	
Willow Creek				1.37
Yampa River	0.25			0.12
Total	1.35	8.31	1.87	1.49
STEAMBOAT LAKE LANDSCAPE AREA				
Beaver Creek		0.43		
Deep Creek				0.03
Red Creek		1.65		0.07
Taylor Canyon	0.93			
Unnamed Tributary to Steamboat Lake			0.39	
Willow Creek		2.74		
Total	0.93	4.82	0.39	0.10
WILLIAMS FORK LANDSCAPE AREA				
Berry Gulch		0.91		

Riparian Name	Assessment Rating* (miles)			
	PFC	FAR	NF	Unknown
Castor Gulch				1.56
Deal Gulch		0.61		
Deer Creek		0.22		
Horse Gulch		1.20		
Jeffway Gulch		0.86		
Long Gulch				1.22
Spring Gulch		0.87		
Sulphur Gulch	1.05			
Unnamed Tributary to Williams Fork River				0.80
Ute Gulch				0.27
Williams Fork River				0.12
Total	1.05	4.67		3.97
Total Assessment Ratings	91.12	159.51	24.43	61.93

*PFC= proper functioning condition; FAR= functioning at risk; NF= nonfunctional

The BLM PFC assessment technique, which uses an ID team of resource specialists, is the primary method used to determine the condition of riparian and wetland systems. Additional data collected to monitor stream channels and vegetation composition supplement the PFC assessments. The *Riparian-Wetland Initiative for the 1990s* (BLM 1991) and the *Colorado Standards for Public Land Health* (Appendix A) establish goals and objectives for managing riparian-wetland resources. Using these data, BLM manages riparian and wetland areas in accordance with the resource management plan (RMP) objectives.

Stream reaches determined to be not functioning or functioning at risk are managed by BLM to meet Standard 2. If livestock are determined to be a causative factor, BLM must implement management changes to improve the stream reach within 1 year. When other factors, such as OHV use or wildlife are compromising PFC, more collaborative approaches must be used. Management of vegetation resources, including riparian and wetland areas, is designed to enhance and maintain sustainable ecological condition within plant communities.

Table 3-12. Causal Factors Noted in Landscape Assessments

Landscape or Riparian Name	Causal Factor
COLD SPRINGS MOUNTAIN LANDSCAPE AREA	
Vermillion Creek	Incised channel; lack of active floodplain
Canyon Creek	Incised channel; series of headcuts on reach 3
Talamantes Creek	Reach 1—Lack of active floodplain Reach 2—Narrow leaf cottonwoods were decadent and not regenerating
NS Creek	Reach 1—Large headcuts and wide streambed in places with insufficient vegetation to protect against erosion Reach 5—Moderate hoof action, causing soil heaving; some heavy grazing by cattle and elk on the sedges

Landscape or Riparian Name	Causal Factor
Lentic Areas	Hoof action by cattle and/or elk; some soil compaction and frost heaving that allows excessive overland flow that could create channelization
DOUGLAS MOUNTAIN LANDSCAPE AREA	
Douglas Mountain landscape area	Severe trampling by elk; insufficient water to support riparian system
DRY CREEK LANDSCAPE AREA	
Dry Creek landscape area	Marginal and fragmented riparian resources because of the stream incisement along lower Dry Creek and in portions of Shell Creek
Dry Creek	Incised channel along some segments; limited access to floodplain Cattle trails across floodplain has channelized water and created small headcuts.
Shell Creek	Streamflow begins to collect and channel on the downstream side of the alluvial fans, causing deep headcuts into incised stream channels. If these headcuts continue upstream and cut through the alluvial fans filling the valley, a continuous incised stream channel could develop and lower the ground water table.
FOURMILE CREEK LANDSCAPE AREA	
Fourmile Creek	Deeply entrenched in alluvium materials within reaches 2, 3, and 4. Erosion of this alluvium material is excessive from terrace bank sloughing, soil piping, and tributary drainage through the alluvium breaks. Reach 2—Lack of diversity and density of streambank vegetation; trampling of streambanks and point bars by cattle Reach 4—Lack of access to active floodplain Reach 3—Sloughing high terrace banks, streambank erosion, sheared point bars and a wide stream channel
Timberlake Creek	Reach 2—Excessive livestock grazing
East Timberlake Creek	Reach 3, 5, and 7—Lack of contact with water table
Mud Spring Draw	Headcuts and incised channels
Lentic Areas	Drying trend that has affected riparian vegetation on many sites. These sites show increased susceptibility to overland flows and grazing impacts. Grazing impacts include hoof shear, over utilization, soil compaction, and frost heaving, which inhibits plant growth and streambank stabilization.
POWDER WASH LANDSCAPE AREA	
Powder Wash landscape area	Fluctuating water levels and over utilization by livestock and wildlife
Little Snake River	Presence of tamarisk, livestock grazing, heavy use by pronghorn, antelope, mule deer, and elk
Bighole Gulch	Invasion of noxious weeds; overutilization by livestock and elk
Lentic Areas	Heavy trampling associated with livestock use
SAND HILLS LANDSCAPE AREA	
Yampa River	Proliferation of tamarisk; heavy wildlife browsing Reach 1—Streambank instability on north side of river
Crooked Wash	High salt content of the soils and/or the water source that restricts riparian plant growth
Lentic Areas	Trampling caused by wildlife and livestock in pursuit of water

Landscape or Riparian Name	Causal Factor
SAND WASH LANDSCAPE AREA	
Sand Wash landscape area	An arid environment lacking free water, sandy channel and streambank materials, and salts originating from geologic materials limit the capability of the watershed to support diverse and extensive riparian systems
Little Snake River	Reach 1—Sheared and scoured streambanks from river flow; presence of weedy species (tamarisk, whitetop, poverty weed and wild licorice) Reach 2—Discontinuous active floodplain Reach 5—Sheared streambanks that do not support sufficient hydric species to stabilize them from the receding high waterflows Factors, such as water diversions and bedload are out of BLM management control.

3.1.5.2 Characterization

Indicators for rangeland, shrubland, and forest and woodland communities are the degree to which noxious weeds and undesirable species are present, the distribution, density, composition and frequency of native plant species relative to adequate reproductive capability and sustainability, the presence of mixed age classes sufficient to sustain populations, in spite of recruitment and mortality fluctuations, evident photosynthetic activity, diversity, and density in balance with landscape potential and resilience to human activities, the presence of appropriate accumulation and distribution of plant litter, and the presence of several plant communities in various successional stages and patterns. These are the indicators associated with Standard 3. Other indicators for forests and woodlands include mortality rate, insect and disease, forest type conversion and fuel loading. Riparian-wetland areas are subject to Standard 2, which shares many of these same indicators, but also emphasizes the vertical structure of the community. Indicators include a species composition that is indicative of high water tables and able to withstand high streamflow events, the distribution of vegetation relative to point bars, active floodplains, sediment capture and flood energy dissipation, and the presence of woody debris in stream channels.

The density and cover of shrubby vegetation have consistently increased in rangelands throughout the Rocky Mountain West since the onset of wildfire control and livestock grazing in the late 19th century. This is most commonly observed in big sagebrush vegetation types (Beetle and Johnson 1982) and is apparent in much of the RMPPA. Trends in the percentage of desirable species present in the RMPPA rangeland communities are mixed, with many areas in stasis, some areas with increases in desirable species, and other areas with decreases in desirable species and increases in undesirable species. Within the RMPPA, especially in the last 10 years, there has been an increase in noxious and invasive weeds, including salt cedar (tamarisk), halogeton, Russian thistle, Canada thistle, and cheatgrass. These problems are most evident in the oil and gas production fields and other locations where native vegetation has been disturbed. Trends in rangeland health are managed by adjusting livestock, recreation, wild horse, and wildlife usage, as well as by controlled burns, brush beatings, and weed control. These actions manipulate plant composition with the goal of maintaining desirable plant species and communities that, on average, represent mid to upper seral stages of development.

The condition or health of forest stands varies by location; however, the general absence of large fires over the past 80 years has made forests more susceptible to disease, such as dwarf mistletoe and mountain pine beetle infestations, as well as newly introduced diseases, such as white pine blister rust, which has increased the amount of dead wood on the forest floor. In addition, species, such as lodgepole pine have not experienced the natural regenerative properties of fire. Conifers are encroaching on aspen stands, limiting aspen regeneration. The disease known as bleeding rust is currently killing the older mature

aspen clones. There has also been a decline in timber harvesting over the past decade, allowing for additional buildup of overall biomass. Forested areas near Dinosaur National Monument, some of which are in wilderness study areas (WSA), contain ponderosa pine stands with considerable fuel buildup. Three of these WSAs—West Cold Spring, Cross Mountain, and Diamond Break—also suffer from pinyon-juniper encroachment.

The riparian and wetland condition in many areas of the RMPPA has been improved through adjustment and implementation of grazing systems. Monitoring data, such as utilization, photo-points, and general observations, along with LHAs, indicate that riparian and wetland conditions in many areas are improving, and progress is being made in meeting land health standards; however, some issues remain in some riparian-wetland areas. Wildlife and livestock concentrations and high forage utilization rates have led to the development of small hummocks that eventually alter surface flow patterns. Increased soil compaction of moist soils increases surface runoff and damages the riparian system. Lotic riparian areas with headcuts can lead to excessive drainage out of the system, decreasing the capability of the system. Fluctuating water levels as a result climatic conditions and water diversions contribute to these areas not meeting Standard 2. An arid environment, lacking free water, sandy channel and streambank materials, and salts originating from geologic materials limit the capability of the some watersheds to support diverse and extensive riparian systems.

Because plant communities respond to other environmental influences, such as wildlife and livestock foraging, drought, disease, wildfire and prescribed burns, it is difficult to forecast their health. Where BLM has primary authority to manage livestock grazing and where grazing is the primary activity that is potentially diminishing vegetation health, BLM will continue to act to restore the health of plant communities through managing for desired plant communities (DPC) and adjusting the number and seasonal distribution of animal unit months (AUM). Where other agencies or private landowners share or have primary authority over factors causing the decline of vegetation health, the forecast is less clear because the situation is more complex. At best, resolution of landscape health issues is likely to progress slowly over the planning period.

3.1.6 Fish and Wildlife Habitat

Animals represent the top of the ecological pyramid. The types of animals present in various plant communities reflect the plant community type and health. Animals are interrelated in a complex food web that is supported at the base level by animals that eat plants (herbivorous). Other animals could eat both plants and meat (omnivorous), or meat exclusively (carnivorous). People participate in this food web as omnivores.

The aquatic and terrestrial animal resources within the RMPPA include fish and wildlife and their habitats. Although the U.S. Fish and Wildlife Service (USFWS) and the Colorado Division of Wildlife (CDOW) are directly responsible for the management of fish and wildlife species, BLM is responsible for land management; therefore, on the lands under their purview, BLM is directly responsible for the management of habitat for fish and wildlife species, and indirectly responsible for the health and well-being of fish and wildlife populations that are supported by the habitats that public lands provide. In addition, BLM is mandated to ensure that Special Status Species are protected, by virtue of the Endangered Species Act (ESA) and the BLM's *Land Use Planning Handbook* (BLM 2004). This goal is furthered through a memorandum of agreement (MOA) with the USFWS and the USDA Forest Service.

The fish and wildlife habitats in BLM-administered lands have been characterized in other chapters of this plan through discussions of the air quality, water, soil, and vegetation within the RMPPA. The discussions of aquatic and terrestrial habitat below identify attributes of these resources that are particularly important to their role in providing fish and wildlife habitat.

3.1.6.1 Current Conditions

The discussion of fish and wildlife populations and habitat addresses the entire RMPPA, not just the lands managed by BLM, because fish and wildlife are mobile creatures that, even if not documented on BLM-administered lands, could readily move to such lands from nearby areas within the RMPPA. The species discussed characterize the fish and wildlife resources of the RMPPA, but emphasize those taxa that are most important to BLM in their land management, either because they are game species, species that occur in concentrated areas where they might be vulnerable to impacts, or because they are Special Status Species (Table 3-13). The Special Status Species listed in Table 3-13 are discussed in Section 3.1.7.

Table 3-13. Fish and Wildlife Species of Primary Interest in BLM's Environmental Planning

Species	Rationale for Key Designation
FISH	
Bonytail chub	Federal endangered species ¹
Cold water gamefish	Recreational value
Colorado River cutthroat trout	State Species of Concern; BLM Sensitive Species ¹
Roundtail chub	State Species of Concern; BLM Sensitive Species ¹
Humpback chub	Federal endangered species ¹
Mountain sucker	State Species of Concern; BLM Sensitive Species ¹
Pikeminnow	Federal endangered species ¹
Razorback sucker	Federal endangered species ¹
Warm water gamefish	Recreational value
AMPHIBIANS	
Boreal toad	State endangered species; BLM Sensitive Species
Great Basin spadefoot	State Species of Concern; BLM Sensitive Species ¹
Northern leopard frog	State Species of Concern; BLM Sensitive Species ¹
REPTILES	
Midget faded rattlesnake	State Species of Concern; BLM Sensitive Species ¹
BIRDS	
American white pelican	BLM Sensitive Species ¹ ; uses concentrated nesting and foraging areas
Bald eagle	Federal threatened species; State threatened species ¹
Barrow's goldeneye	BLM Sensitive Species ¹
Black tern	BLM Sensitive Species ¹
Burrowing owl	State threatened species ¹
Columbian sharp-tailed grouse	State Species of Concern; BLM Sensitive Species ¹
Ferruginous hawk	State Species of Concern; BLM Sensitive Species ¹
Geese	High economic and recreational value
Golden eagle	High interest; protected by law; high similarity to immature bald eagles, which are federally listed
Great blue heron	Utilizes concentrated nesting areas
Greater sage-grouse	State Species of Concern; BLM Sensitive Species ¹ ; high interest
Long-billed curlew	State Species of Concern; BLM Sensitive Species ¹

Species	Rationale for Key Designation
Mexican spotted owl	Federal threatened species; State threatened species ¹
Mountain plover	State Species of Concern; BLM Sensitive Species ¹
Northern goshawk	State Species of Concern; BLM Sensitive Species ¹
Other raptors, including osprey, prairie falcon, Cooper's hawk, Swainson's hawk	High interest; top of food chain species
Peregrine falcon	State Species of Concern ¹ ; high interest; protected by law; recently delisted
Sandhill crane	State Species of Concern ¹ ; uses concentrated nesting and foraging areas; may be associated with federally listed whooping crane
Turkey	High recreational value
White-faced ibis	BLM Sensitive Species ¹
Yellow-billed Cuckoo	Federal candidate species; State Species of Concern; BLM Sensitive Species ¹
MAMMALS	
Bighorn	High economic and recreational value
Black bear	High interest; economic and recreational value
Black-footed ferret	Federal endangered species; State endangered species ¹
Elk	High economic and recreational value
Gray wolf	Federal endangered species; State endangered species ¹
Kit fox	State endangered species ¹
Canada lynx	Federal Threatened species; State threatened species ¹
Moose	High interest; economic and recreational value
Mountain lion	High interest; economic and recreational value; top of food chain species
Mule deer	High economic and recreational value
Pronghorn	High economic and recreational value
River otter	State threatened species ¹
Swift fox	State Species of Concern ¹
Townsend's big-eared bat	State Species of Concern; BLM Sensitive Species ¹
White-tailed prairie dog	High interest; association with federally listed black-footed ferret
Wolverine	State endangered species ¹

¹ These species are discussed in Section 3.1.7, Special Status Species.

Fish and wildlife habitat within the RMPPA make up 3,844,006 acres of terrestrial uplands, and 18,761 acres of riparian and wetland systems. Of these, 1,299,654 acres of uplands and 6,825 acres of riparian and wetland areas are managed by BLM. Within these areas, the presence and interspersions of many habitat types support a large number of wildlife species. The extreme northwest corner of the RMPPA, including Cross Mountain, Douglas Mountain, Diamond Breaks, Cold Spring Mountain, Diamond Peak, and Middle Mountain, remains relatively undisturbed and supports a highly diverse ecosystem. Elk, mule deer, pronghorn, bighorn sheep, mountain lion, raptors, and many nongame species, including migratory birds, are in abundance. The diversity and populations of fish and wildlife throughout the RMPPA provide considerable recreational opportunity and economic benefit. A minimum of 68 species of mammals, 189 species of birds, 22 species of amphibians and reptiles, and 22 species of fish occur regularly in the RMPPA (BLM 1989). Most of the discussion that follows is based on BLM Geographic Information System (GIS) data, CDOW GIS data, and BLM LHAs.

Aquatic Resources

Aquatic Habitat

Aquatic habitats in the RMPPA include both lentic (still, as in ponds and lakes) and lotic (moving, as in streams and rivers) resources; however, these are not abundant and are widely dispersed. Among the planned actions stated in the 1989 Little Snake ROD was the completion of aquatic surveys on 3,400 acres of known aquatic wildlife habitat (3,000 acres of riparian and 400 acres of wetland).

Although some of the major lentic habitats in the RMPPA have been mapped and digitized, much of the area to be surveyed remains yet to be addressed. To date, less than 0.02 percent of the RMPPA has been mapped as lentic habitat. As of 2004, the 294 acres of lentic habitat mapped within the RMPPA were found primarily on BLM or BLM/LU managed land. Most of the areas mapped lie in the center and western end of the northern half of the RMPPA. Only 33 percent of the mapped lentic habitats exceed 0.5 acres in size, and are likely to retain sufficient water to support aquatic species. The RMPPA has not yet been addressed by the National Wetlands Inventory.

Many of the lotic habitats within the RMPPA have been mapped. The numerous reaches of the Beaver Creek, Bighole Gulch, Boxelder Gulch, Canyon Creek, Dry Creek, Horse Gulch, Little Snake River, Maudlin Gulch, Morgan Gulch, Pole Gulch, Sand Creek, Scandinavian Gulch, Shell Creek, Vermillion Creek, Willow Creek, and Yampa River systems comprise 66 percent (274 miles) of the 372 river or stream miles mapped to date in the RMPPA; however, not all of these reaches provide perennial aquatic habitats. CDOW has identified stream reaches that provide habitat for native fish species and that are perennial within the RMPPA. These reaches in the central and western portion of the RMPPA include parts of the following streams: Bear Creek, Beaver Creek, Deer Creek, Elkhead Creek (#1, #2, and #3), Fortification Creek, Fourmile Creek, Good Spring Creek, Green River, Indian Run, Jokodowski Creek, Little Snake River, Milk Creek, Morapos Creek, Poose Creek (#1), Slater Creek (#1 and #2), Stinking Gulch, Torso Creek, Vermillion Creek, Williams Fork, Willow Creek, and Yampa River. In the eastern portion of the RMPPA, creeks containing perennial reaches and native habitat are more numerous, but most are up drainage of lands managed by BLM. The reaches with perennial, aquatic habitats on BLM land are limited to relatively short stretches of rivers and streams, including the Little Snake, Williams Fork, and Yampa Rivers, and Beaver, Talamantes, Vermillion, and Willow Creeks (BLM 1989).

Comments in the LHAs regarding aquatic habitat provide the following characterizations:

- ❑ Cold Springs
 - Moose are found in the willow stream bottoms.
 - Beaver occupy stream systems at high and low elevations.
 - Changes associated with overgrazing (poor plant composition, overabundance of weedy forb species, lack of herbaceous riparian vegetation, and an increase in upland vegetation species) reduce habitat quality for wildlife, such as brood rearing habitat essential for greater sage-grouse.
- ❑ Douglas Mountain
 - Riparian habitats are present but provide little aquatic wildlife habitat.
 - Only Yampa and Little Snake Rivers provide fish habitat.
 - Lentic riparian resources are sparse and highly important to wildlife.
 - Some springs are dry; others show signs of severe trampling by elk, particularly where they provide isolated sources of water.
- ❑ Dry Creek
 - Vermillion Creek, Dry Creek, and Shell Creek all provide an oasis of important riparian and aquatic habitat for wildlife species in the eastern and northern end of the landscape

- Riparian areas protect stream banks and fisheries and provide habitat for numerous wildlife species.
- The beaver dams on Vermillion Creek from the confluence with Shell Creek upstream to the Wyoming State line aid in the retention of water throughout the year.
- Fourmile Creek
 - Timberlake Creek, East Timberlake Creek, Fourmile Creek, Little Snake River, and Mud Spring Draw provide important riparian and aquatic habitat for wildlife species in the eastern and northern end of the landscape.
 - The beaver dams on Timberlake Creek aid in water retention throughout the year.
- Powderwash
 - Overutilization by livestock and wildlife is one of the primary factors that limit lotic riparian health within this watershed.
 - Livestock exclosures likely would not exclude all wildlife use.
 - A decrease in deer and elk numbers would likely have a positive influence on riparian systems by reducing pressure on riparian vegetation.
- Sandhills
 - Wildlife habitat quality is limited by excessive browsing by deer and by high terrace banks along the river in some reaches.
 - Many of the spring sites associated with Cross Mountain are fairly inaccessible to wildlife.
 - Many of the small riparian areas associated with springs show impacts caused by wildlife and livestock in pursuit of water.
- Sand Wash
 - No forage utilization problems have been documented in areas vegetated with Baltic rush and inland saltgrass, since these species are not particularly palatable to wildlife and livestock.
 - Most of the hoof disturbance appears to be from wildlife in their pursuit of water.
 - Restricting use of aquatic systems by big game animals could allow the systems to improve the quantity and quality of riparian plants, which could benefit other wildlife species.

Many of these assessments mention locations where overuse of streamside vegetation occurs by terrestrial animals in search of drinking water and succulent forage, but do not provide information on the condition of the habitat used by aquatic organisms, such as fish and amphibians; however, it can be inferred that, if vegetation is trampled, cover for aquatic organisms is degraded or removed, and water quality is diminished by siltation, elevated organic compounds, and consequent diminished oxygen levels.

Key Aquatic Species

The primary species found in aquatic habitats are invertebrates, fish, and amphibians, although most terrestrial species come to aquatic habitats to drink or to use the adjacent riparian habitat. Invertebrates and aquatic plants provide the foundation of the aquatic food chain in which fish and amphibians, as well as some species of invertebrates are herbaceous or carnivorous predators. The primary data on aquatic species throughout the RMPPA are collected during PFC surveys, which evaluate whether aquatic organisms and plants appropriate for the site are present, whether invertebrate species are present, and what water quality they reflect, and whether fish and algae are also present as part of the evaluation of Standard 5 (water quality). For all 10 landscapes with available data, Standard 5 was met, indicating healthy invertebrate populations and a good aquatic food chain foundation; however, over half of these landscapes do not meet Standard 2 (riparian), which could indicate that improvement in invertebrate habitats is also needed. Game fish are limited primarily to the Yampa River, which supports catfish, pike, and brown trout, as well as several species discussed in Section 3.1.7. The Yampa River ranges from poor to average in fisheries quality in the RMPPA, according to the CDOW stream rating (Sealing 1981). Based on CDOW data, brook trout, northern pike, rainbow trout, Colorado cutthroat trout, and suckers

occur in Routt County streams and ponds; rainbow trout, brook trout, and plains killifish occur in Moffat County.

At least 10 species of amphibians occur in or near aquatic and riparian habitats within the RMPPA. CDOW data document the presence of northern chorus frogs and tiger salamanders in both the western and eastern portions of the RMPPA and Woodhouse's toad in the western portion of the RMPPA, as well as species discussed in Section 3.1.7. These observations are confined to the Green River Drainage, along the Yampa River and in the Elkhead Drainage.

Terrestrial Resources

Terrestrial Habitats

Terrestrial species use all 15 of the vegetation types discussed in Section 3.1.5 and, except for extreme specialists, tend to respond to the aspect and characteristics of a habitat or the way it looks (i.e., its physiognomy). Large expanses of the RMPPA support diverse shrub habitats, which are distributed primarily in response to soil type, topography, and moisture. Forest and woodland habitats are made up of pinyon-juniper woodlands, which occur primarily on south-facing slopes in the western portion of the RMPPA, aspen on slopes, especially in the eastern end of the RMPPA, but also in small patches on Cold Spring Mountain and Middle Mountain, and of coniferous forests at the higher elevations, especially in the eastern end of the RMPPA but also on Douglas Mountain. Within the RMPPA boundary, 31 percent of the land is managed by BLM, of which 75 percent is shrubland, 2 percent is aspen, and 21 percent is coniferous forest, and almost all of which is made up of pinyon-juniper woodlands.

Key observations made in the LHAs regarding wildlife habitat and its condition include the following:¹

- ❑ Cold Springs
 - The variety of habitat types is shaped by vegetation, topography, precipitation, and elevation, which ranges from 5,300 feet along the Green River to 9,500 feet at Diamond Peak.
 - Some habitat is fragmented (on a small scale for the size of the landscape) as a result of wildland fires, suppression, and restoration efforts on those fires, powerlines, small agricultural fields, oil and gas development, small recreation developments, and a few historic crested wheatgrass seedings.
 - Additional habitat fragmentation has resulted from the 352 miles of roads (ranging from two-lane highways to faint two-track routes), increased oil and gas activity in the northwest quarter of the landscape, increased OHV use, especially in the southeast area near Vermillion Creek and the badlands, and increased hunting and other forms of motorized recreation, especially along Cold Springs, Diamond Peak, and Middle Mountains.
 - Areas with favored browse species, such as mahogany, serviceberry and winterfat, or that are in important big game winter range, had heavier use levels or poorer vigor shrubs than areas where these features were lacking or inaccessible because of steep slopes or snow depths.
 - In some areas, vegetation has been affected by wildlife or livestock use; taller shrubs on top of Cold Springs Mountain are highlined from past use; aspen regeneration is affected by elk and livestock grazing; sagebrush in some areas of deer winter range has poor vigor as a result of consistent heavy use; historic heavy grazing has reduced plant composition, increased weedy forb species, and diminished herbaceous riparian vegetation.

¹ LHAs have not yet been completed on the Axial, Great Divide, Green River, and Williams Fork landscapes. LHA data on Boone Draw have been collected, but site analysis is ongoing. Detailed data on Little Snake Gulch, Slater, and Spring Creek LHAs are not currently available, but all of these LHAs meet the standard for healthy, productive plant and animal communities. An LHA will not be done for the Steamboat Lake landscape because BLM-managed parcels there are small and dispersed.

- Cold Springs, Diamond Peak, Skeltzer Draw, Galloway Individual, Three Corners and Beaver Basin Allotments include significant habitats at higher elevations, including coniferous forest interfaced with areas of aspen, shrubs and meadows.
- Generally, this landscape supports a wide variety of habitats for numerous wildlife species. The trend in potential habitat condition varies across the landscape. Although habitat concerns have been documented at isolated sites, or in individual habitat types, the vast majority of the landscape is providing productive wildlife habitat. This landscape is currently meeting the standard for maintaining productive wildlife communities.
- Douglas Mountain
 - The variety of wildlife habitats includes sagebrush grasslands, sagebrush mixed shrub, mountain shrub, pinyon-juniper, and aspen forests.
 - Wildland fires play an important role in succession and the creation of diverse wildlife habitats.
 - Primary threats to wildlife habitat within this landscape appear to be encroachment of tree species, especially juniper into sagebrush habitats, invasive and noxious weed species, including cheatgrass and leafy spurge, and insect pests, such as the Mormon cricket.
 - The landscape provides diverse habitats for a variety of small mammal species. Rocky slopes with ponderosa pine and juniper provide high-quality habitat for several ground and tree squirrel species. Standing dead trees throughout the landscape provide quality habitat for cavity nesting mammals and avian species.
 - This landscape is currently not meeting the standard for healthy plant and animal communities. Although productive resilient wildlife habitat is present at a majority of sites, a few sites or habitat types were below this standard, and the quality of habitat for native plant species was insufficient to meet the standard at 30 percent of the sites evaluated. Failure to meet the standard was primarily a result of poor species diversity and community structure and the dominance of weeds, such as cheatgrass and leafy spurge. One of these sites also failed the criteria for productive diverse wildlife habitat.
- Dry Creek
 - The variety of habitat types is shaped by vegetation, topography, precipitation, and elevation that ranges from 6,500 feet along the Vermillion Creek to 8,100 feet at Lookout Mountain. Lower elevation habitats range from semiarid salt desert shrub communities, badlands, and greasewood flats to sagebrush/grass and pinyon-juniper communities.
 - The impact of drought, and possibly longer grazing seasons, on grass quantity and production and on shrub vigor and health, especially at lower elevations, has affected the quality of wildlife habitat. Areas with high-quality browse species that are inaccessible because of steep slopes or snow depth are in excellent condition.
 - Cheatgrass was recorded on all of the stops during the assessment, but not in any significant amount.
 - Wildlife habitat has been affected by wildland fire, suppression, and restoration efforts on those fires, powerlines, oil and gas development, small recreation developments, roads, heavy road use and off-road travel, increased hunting, crested wheatgrass seedings, and invasion of cheatgrass and juniper in some areas. These factors have reduced the diversity and extent of native plant species and fragmented existing habitat, but on a small scale relative to the size of the landscape.
 - Generally, this landscape supports a wide variety of habitats for numerous wildlife species. In addition, these habitats occur in a variety of stages and current resource conditions over the area. The trend in potential habitat condition varies across the landscape. Although habitat concerns have been documented at isolated stops during the LHAs, the most of the landscape is providing productive wildlife habitat. This landscape is currently meeting the standard for maintaining productive wildlife communities.
- Fourmile Creek
 - Lower elevation habitats range from semiarid salt desert shrub communities, badlands, and greasewood flats, to sagebrush/grass, pinyon-juniper and subalpine communities.

- The quality and spatial integrity of wildlife habitat have been affected by wildland fire, suppression and restoration efforts on those fires, powerlines, oil and gas development, recreation developments, roads, brush beating, crested wheatgrass seedings, and juniper encroachment in sagebrush habitat. The scale of these effects is small relative to the size of the landscape.
- The health, vigor, and production of perennial grasses and shrubs were generally average to good, resulting in average to good wildlife habitat. Some habitats were in poorer condition than expected as a result of the drought and winter use by mule deer, while other areas were in excellent condition. Those areas in excellent condition contained high-quality browse species, but were generally inaccessible because of steep slopes or snow depth.
- The standard for healthy productive plant and animal communities is not met in this landscape. Even among the majority of sites, which had high species diversity, good vigor, and plant composition, some were lacking in grass species. Plant communities in six sites had poor species diversity and community structure or the presence of weeds. In areas that failed to meet the standard, identified contributing factors were addressed with changes in grazing management when permits were renewed.
- Powderwash
 - The dominant habitat type within the Powderwash landscape is sagebrush and grassland. Other habitat types that are found within the Powderwash landscape include sagebrush mixed shrub, juniper woodlands, greasewood, and riparian.
 - To an extent within the landscape, habitat diversity has been increased through use of fire to control encroaching juniper and diversify old even-aged sagebrush stands.
 - Most sites had strong leader growth on shrubs, abundant perennial grass seedlings, and good forb diversity and were providing productive and resilient wildlife habitat that can sustain healthy populations, although some were trending toward decadent sagebrush, diminished grass density and weediness. However, poor species diversity and community structure, weed dominance, and loss of resilience in native communities was evidenced in 26 percent of the sites, causing the standard for healthy productive plant and animal communities to not be met.
 - Suitable nesting habitat exists for a variety of nesting songbirds throughout the landscape. All sites visited showed evidence of use by songbirds.
- Sandhills
 - The primary habitat types within this landscape are sagebrush/grass, sagebrush/mixed shrub, and bitterbrush, as well as pinyon-juniper, and mountain shrub.
 - Several decades ago, fire altered the shrub composition of this habitat, reducing bitterbrush, a preferred forage by over 80 percent in nearly the entire 20 percent of the landscape where it occurred. This habitat impact is still reflected in overuse of the small quantities of bitterbrush that remain.
 - Habitats comprised primarily of sagebrush, forbs, and grasses are generally in good to intermediate condition, but nearly half have been invaded by cheatgrass.
 - The landscape provides the necessary habitat components to support a diversity of wildlife species with populations within the ecological capability of the habitat types. Problems identified in the landscape included forb absence, low production, low sagebrush vigor, and crested wheatgrass presence—but even so, only one site failed to meet the standard and the landscape overall meets the standard for healthy productive plant and animal communities.
 - The pinyon-juniper and mountain shrub components provide important habitat for neo-tropical migratory birds.
- Sand Wash
 - The dominant habitat within the Sand Wash landscape is sagebrush and grassland. Pinyon-juniper, sagebrush mixed shrub, greasewood, and badlands habitats also occur. Most of these areas provide good habitat for a variety of wildlife species.

- Where it has occurred on a small scale, fire has been beneficial in turning over older juniper and sagebrush habitats, whereas in habitats where fire has been absent, juniper has encroached and old even-aged stands of sagebrush have become decadent.
- Habitats and their use have been affected by increased OHV use, especially in the Clay Buttes area during the fall hunting season.
- The shrub, forb, and grass components of these habitats were about half in good, and half in marginal condition, with cheatgrass present in significant amounts in over half of the sampled locations. The depressed habitat conditions were attributed to heavy use by livestock and wildlife, drought, and fire suppression.
- Most of the landscape is providing productive wildlife habitat. This landscape is currently meeting the standard for maintaining productive wildlife communities.

Key Terrestrial Wildlife

The key terrestrial wildlife are primarily reptiles, birds, and mammals (Table 3-13). Adequate populations of terrestrial invertebrates are assumed when populations of the vertebrate groups that prey on invertebrates are healthy. Both the LHAs and GIS data maintained by CDOW provide information on terrestrial wildlife distribution in the RMPPA. In addition, CDOW maintains statistics on big game harvests, recreational use days, and population trends.

Reptiles

At least 12 species of reptiles occur within the resource area. Principal species are the short-horned lizard, northern sagebrush lizard, and prairie rattlesnake. Population numbers are not known. Most reptiles occur in lower elevations and in dryer habitats such as sagebrush, greasewood, and pinyon-juniper (DEIS 1989).

Birds

The key bird species for which habitat is provided in the RMPPA can be separated into four groups: water birds, raptors, grouse and turkeys, and other key bird species. Each of these groups is discussed below.

Water Birds. The key water bird species include white pelicans, great blue herons, and geese. Several additional water bird species are discussed in Section 3.1.7. Use areas within the RMPPA are tracked by CDOW. White pelicans forage in a reach of the upper Yampa River that is south of Steamboat Springs, but do not breed in the RMPPA. Great blue heron foraging areas occur along the Yampa River, both in its headwaters above Craig and near its confluence with the Little Snake River. Known nesting areas are scattered within these reaches of the Yampa River and also northwest of Maybell and southwest of Hamilton. The habitat supporting these use areas is primarily, but not exclusively, agricultural land. Canada geese and a few other species winter along the Little Snake River, the Yampa River between Maybell and Dinosaur National Monument, and along the Green River, north of the Canyon of Lodore and in Brown's Park National Wildlife Refuge. Important foraging areas have been identified on the south side of the Yampa River, downstream from Maybell, as well as along reaches of both the Yampa and Little Snake Rivers in this vicinity. Important production areas extend along much of the Yampa, Little Snake, and Green Rivers, with brood concentration areas reflecting the location of the important foraging areas. Molting has been documented along a lower reach of the Little Snake River, as well as along the Green River in the same area where the birds winter. With the exception of the agricultural lands surrounding Craig and extending east, most of these streams are flanked by shrublands and, in localized areas, by pinyon-juniper woodland.

Raptors. Raptors in the RMPPA include eagles, falcons, hawks, and owls. Because they are at the top of food chains and therefore present in fewer numbers than their prey, they serve as important indicators of overall ecosystem health. Data are maintained by CDOW on observations of most raptor species and several species are tracked individually.

Of particular note, with regard to BLM habitat management policies, are the concentrations of raptors (particularly golden eagles) in the Yampa River valley and adjacent uplands between Craig and Maybell, as well as north of Trincherro Creek. Another area frequently used by golden eagles is between the Yampa River and the Williams Fork Mountains, west-southwest of Steamboat Springs.

Accipiters, such as the Cooper's hawk, which are more likely to be found in wooded areas, have been documented primarily in the eastern portion of the RMPPA. Prairie falcon sightings are scattered throughout the RMPPA—in the uplands of the Vermillion Creek, Little Snake River, upper Little Snake River, and Williams Fork drainages. Swainson's hawks have been documented on the broad south slopes of the Vermillion Bluffs, in other locations above the Little Snake River drainage, and in the Elkhead Creek drainage. Active osprey nests have been recorded along the Green River in Browns Park National Wildlife Refuge, and an inactive nest is known along the Yampa River in the vicinity of Hayden. The refuge provides the only CDOW-documented osprey foraging area in the RMPPA. The habitat supporting these use areas is primarily shrublands, especially the broad expanses of sagebrush and saltbush, as well as the agricultural lands surrounding and extending east from Craig.

The following LHA comments on various raptor species, which include species discussed in Section 3.1.7, confirm the suitability of habitat for raptors:

- ❑ **Cold Springs.** High elevation forested zones provide habitat for nesting raptors, including owls. Badlands country to the northeast and Irish Canyon provide suitable lower elevation raptor nesting habitat. Oil and gas operations have probably affected use of these areas by nesting raptors as a result of increased human traffic during critical periods over the last 10 years.
- ❑ **Douglas Mountain.** The entire landscape provides nesting and other habitat for a variety of raptor species including golden eagle, Cooper's hawk, northern goshawk, sharp-shinned hawk, red-tailed hawk, and the American kestrel. BLM's database documents few raptor nests and does not reflect the actual number of nests in the landscape. The Yampa River corridor provides winter roosting habitat for bald eagles and feeding territory for peregrine falcon.
- ❑ **Dry Creek.** CDOW census data on raptors documents golden eagle, red-tailed hawk, ferruginous hawk, and prairie falcon nests. Raptor nest surveys conducted by BLM wildlife biologists in the last several years show a decline in use of historic nest sites in the northwestern portion of the landscape, likely in response to increased oil and gas activity during critical periods over the last 10 years.
- ❑ **Fourmile Creek.** CDOW records document golden eagle, bald eagle, red-tailed hawk, ferruginous hawk, and Swainson's hawk nests.
- ❑ **Powderwash.** There is suitable nesting habitat for a variety of raptor species including golden eagle, bald eagle, prairie falcon, ferruginous hawk, red-tailed hawk, northern harrier and American kestrel. The primary nesting habitat for these species is along the Little Snake River and in sandstone cliffs throughout the watershed. Secondary nesting habitat can be found in juniper woodlands associated with steep slopes. There is also suitable habitat for the burrowing owl.
- ❑ **Sandhills.** Raptor feeding occurs in all habitat types, and nesting is most prevalent in the pinyon-juniper type.
- ❑ **Sand Wash.** Potential nesting habitat for raptor species, including burrowing owls and ferruginous hawks, is widespread, although most raptor nest locations (except for golden eagles) are not well documented.

Grouse and Turkeys. The blue grouse, turkey, and two grouse species discussed in Section 3.1.7 occur in the RMPPA. High elevation forested zones in the Cold Springs Landscape provide habitat for nesting blue grouse. An area just outside Dinosaur National Monument on the north slopes of Douglas Mountain has been identified as overall range for turkeys since their release by CDOW in the area. These birds use this entire range during summer and use the northernmost (and lower elevation) portion in winter. Two roost sites have been recorded by CDOW along the boundary of the winter range. The habitat supporting the turkey use areas is pinyon-juniper woodland.

Other Important Bird Species. Various species of migratory birds summer, winter, or migrate through the RMPPA. The habitat diversity provided by the broad expanses of sagebrush and saltbush vegetation zones (interspersed with patches of salt desert shrubs, coniferous forest, aspen, and riparian and wetland areas) support numerous species of birds. The most characteristic of these species include mourning doves, common nighthawks, dusky flycatchers, horned larks, plain titmice, house wrens, sage thrashers, loggerhead shrikes, green-tailed towhees, Brewer's sparrows, and sage sparrows. Species, such as killdeer, black-crowned night herons, and yellow warblers breed where habitat is available.

Mammals

The distributions of key mammal species and the locations they use within the RMPPA are also documented by BLM LHA data and CDOW GIS data. The CDOW databases also track population trends for selected species. Below is information on big game species and other key mammal species.

Big Game Species

The three primary big game species in the RMPPA are elk, mule deer, and pronghorn. Moose and bighorn sheep occur in more limited numbers.

Harvest data on big game are collected for individual game management units (GMU), which are the smallest geographic subdivisions used for big game data aggregation and hunter distribution within the State. GMU boundaries are based on physical features, such as roads and streams that facilitate the collection of harvest data. GMUs could have the same boundaries for more than one big game species (e.g., elk, deer, and pronghorn). GMUs are aggregated into data analysis units (DAU) for the purpose of game management. Management plans that identify herd objectives, important habitat areas, population targets, and other information are developed for the geographically larger DAUs. Use of DAUs enables management of big game herds as a unit, although they could move seasonally from one GMU to another across a broader landscape. The management plan for a DAU could address its component GMUs separately when it benefits effective management implementation.

Elk. The overall range of elk occupies the entire RMPPA, except for areas on the east side of Cold Spring and Middle Mountains, which together with the areas east toward Hiawatha and east of the Little Snake River along the Wyoming border are designated as limited use areas. Summer range is found in the higher elevations of Routt National Forest to the east and south within the RMPPA, and in the Vermillion Creek drainage, Dinosaur National Monument, and headwaters of the Little Snake River. Summer concentration areas occupy a portion of the summer range. Production occurs in the best habitats within summer concentration areas, which are especially located on the south side of Cold Spring Mountain, in the drainages of the Little Snake River and, farther east, in the drainages of Elk and Elkhead Creeks. These areas are illustrated in Map 3-10. The major migration corridor shown in this map stretches from the vicinity of Black Mountain to the north of Craig almost to the Little Snake River headwaters.

Nearly all the rest of the RMPPA serves as winter range for elk, with severe winter range extending north from Craig along the lower slopes of the Elkhead Mountains and broadly west from Craig to Dinosaur National Monument. Scattered severe winter range areas are also found east and southeast of Craig and along Douglas Draw in the western portion of the RMPPA. Winter concentration areas occupy portions of severe winter range but could also extend beyond severe winter range. These winter use areas are illustrated on Map 3-11. These overall concentration areas are reflected in the highways where elk crossings are noted (Map 3-11). These are especially along U.S. 40 from east of Craig west to the RMPPA boundary, along SH 13 that travels north and south from Craig, and along SH 318 that trends northwest from Maybell.

The habitat supporting these elk use areas is quite varied. Forested and shrublands, especially mountain shrub, are used, with summer habitats tending to be more forested areas, and winter habitats tending to be more in shrublands. Production areas are found in both forested areas and shrublands, with cover sometimes provided by trees and sometimes by topography.

Three elk DAUs, E-1, E-2, and E-6, represent most of the RMPPA (Map 3-12). DAUs E-1 and E-2 are entirely within the RMPPA, with E-1 being north of the Yampa River and west of the Little Snake River (except for the area west of the Green River) and E-2 north of the Yampa River and east of the Little Snake River. DAU E-6 is south of the Yampa River and covers most of the remainder of the RMPPA.² As Figure 3-10 shows, elk populations since 1990 have doubled in both DAU E-1 and E-2.

The comments on habitat impacts within many of the Little Snake RMPPA landscapes reflect these extremely high elk populations, as evidenced by the following:

- ❑ **Cold Springs.** Elk numbers in 1990 were about twice the herd objective, but increased hunting has since reduced elk numbers to desired levels that have been stable over the last several years. Cold Springs, Diamond Peak, Skeltzer Draw, Galloway Individual, Three Corners and Beaver Basin Allotments include significant habitats at higher elevations where large patches of coniferous forest (including limber pine, subalpine fir, Douglas-fir, and lodgepole pine) interface with areas of aspen, mountain shrubs, high elevation sagebrush steppe and where wet and dry meadows provide excellent habitat for big game species, especially elk and deer, during the spring, summer and fall. Corridors along the Green River and CR 10 usually have less snow pack and provide severe winter range for elk, mule deer, and pronghorn that is essential for big game during winters with extreme cold or deep snow levels. Changes in big game use patterns, and possibly livestock grazing during critical growth periods, have put pressure on these limited resources in areas north of the Green River in the Spitzie Draw Allotment where important herbaceous vegetation is lacking. Important elk calving areas are associated with aspen stands along Cold Springs, Diamond Peak, and Middle Mountains. Both elk and livestock grazing appear to affect young aspen sprouts.
- ❑ **Douglas Mountain.** The landscape provides habitat for elk, mule deer, and pronghorn, with some areas providing habitat for elk throughout the year. BLM manages lands in various parts of the landscape that elk use during mild and average winters. Two areas managed by BLM and mapped by CDOW as elk production areas are critical for elk calving between April 16 and June 30. Severe winter range for elk is located on lands managed by other agencies.
- ❑ **Dry Creek.** The entire landscape provides year-round habitat for elk, mule deer, and/or pronghorn, including mild or moderate winters. Sagebrush is in poor vigor because of the continuing drought and consistent heavy use by wintering elk and deer, which are increasing to near or above carrying capacity.

²Population trend data was requested from CDOW for DAU E-6 but not received at the time of publication.

- ❑ **Fourmile Creek.** The entire landscape provides year-round habitat for elk, mule deer, and/or pronghorn, including mild or moderate winters. Elk and mule deer are increasing and currently are near or above carrying capacity, which is reflected in heavy use of shrubs and poor habitat condition.
- ❑ **Powderwash.** Much of the landscape provides habitat for elk in mild winters. High numbers of elk throughout the landscape, especially during winter months, might be adversely affecting big game habitat.
- ❑ **Sandhills.** Available habitats provide critical winter ranges for elk, mule deer, and pronghorn. Because the bitterbrush habitats have been converted primarily to grasses, large numbers of elk have replaced deer and pronghorn during the winter.
- ❑ **Sand Wash.** Increases in numbers of elk in the Seven Mile Ridge area, historically an import area for mule deer and antelope, have severely reduced the quality of severe winter range habitat for both elk and mule deer. Changes in big game use patterns, increases in elk numbers, and possibly livestock grazing during critical growth periods have put more pressure on the limited resources in such areas, where the more shallow snow depths are essential for big game during winters with extreme cold or deep snow levels.

Mule Deer. The overall range of mule deer extends throughout the RMPPA, and nearly all of this range, except a limited use area on the south slopes of Lookout Mountain and the upper Vermillion Creek drainage, serves as summer range (Map 3-13).

Winter range is primarily west of SH 13, extending south into the Danforth Hills and to Lone Mountain, with severe winter areas on the west-facing slopes just east of SH 13 in the Danforth Hills and west along and between SH 313 and U.S. 40 (except for Twelvemile Mesa), as well as in the Brown's Park National Wildlife Refuge (NWR) and the Vermillion/Trinchero Creek drainage (Map 3-14). Winter concentration areas are generally similar, but less extensive and avoid some of the sagebrush habitat just west of Craig and the west side of SH 13. Year-round concentration areas, which include rough break country, riparian areas, small drainages, and large areas of irrigated cropland, are on the south-facing slopes of Diamond Peak, Cold Spring Mountain, in the vicinity of Maybell, in the rough country between Baxter Peak and Long Mountain, and on the slopes along the Yampa River northeast and southwest of Craig, as well as east and west of Fortification Creek. Mule deer highway crossing areas are generally the same as those used by elk. Additional short migration corridors have been identified in the Williams Fork River Drainage, above and below Hamilton along SH 789.

Essentially all of the habitats found in the RMPPA are used by mule deer at one time or another. The Canyon of Lodore, the only area in the RMPPA not used by mule deer in any season is vegetated by pinyon-juniper, mountain shrub, and juniper, but its topography makes much of this habitat unusable. The areas avoided during summer in the upper reaches of Vermillion Creek and on the southeast side of Vermillion Bluffs are sagebrush or saltbush habitats that are used elsewhere in the RMPPA, and they are used to a limited extent during winter. Winter habitat extends throughout the shrublands in the RMPPA, reaching into some of the pinyon-juniper woodlands that provide available forage. Severe winter areas are in these same habitats, but are at lower elevations. Winter concentration areas tend to be in those severe winter areas having the most accessible and best forage (especially mountain shrub communities) and topography that allows for the best thermal balance.

The primary CDOW DAUs for mule deer within the RMPPA are D-1, D-2, and D-7 (Map 3-15). D-1 and D-2 have the same boundaries as E-1 and E-2 mentioned above for elk (except D-1 includes the area west of the Green River). Boundaries for D-7 are the same as the boundaries for E-6. Figure 3-11 shows that mule deer populations have declined by about 50 percent in both DAUs D-1 and D-2. In DAU D-7, populations declined by over 50 percent between 1987 and 1993, but have since rebounded to about 70 percent of their 1987 value.

The comments on habitat impacts within many of the RMPPA landscapes reflect the lower mule deer populations, as evidenced by the following:³

- ❑ **Cold Springs.** Mule deer numbers, which were drastically low in the early 1990s, have been stable or increased slightly since then in response to CDOW's restriction on hunting beginning in 1994. Wintering mule deer numbers are also down for the area, with fewer animals coming in from Utah than what historically occurred. The important south Green River mule deer winter range sagebrush is in poor vigor because of consistent heavy use by wintering mule deer.
- ❑ **Douglas Mountain.** Mule deer use portions of the landscape throughout the year. The eastern half of the landscape is used by mule deer during average winters, while the entire landscape might be used by mule deer during the spring, summer and fall. Severe winter range for mule deer is found within the landscape on lands managed by others. Upland soils at all but one of the sites evaluated in this LHA are stable, and vegetation at 74 percent of the sites visited met production, vigor, and composition standards, indicating that good habitat is available for mule deer in most locales. However, some areas have invasions of weeds and low species diversity.
- ❑ **Powderwash.** Mule deer use the landscape throughout the year. In addition, there are about 35,000 acres of severe winter habitat for mule deer within this landscape.
- ❑ **Sandhills.** A fire that occurred several decades ago reduced the bitterbrush by over 80 percent in nearly the entire 20 percent of the landscape where it occurred. Bitterbrush once provided significant winter forage for a large population of mule deer and pronghorn.

Pronghorn. The overall range for pronghorn is somewhat similar to the winter range used by mule deer (Map 3-16), extending primarily west of SH 13; however, overall pronghorn range does not extend as close to stream valleys and avoids the Dry Mountain and Lookout Mountain areas and the south end of Godiva Rim. Generally, the interior of these areas is used in winter, except for the extreme eastern and northwestern areas, Godiva Rim, the southeast side of the Vermillion Bluffs, and the Vermillion Creek drainage. There is a small limited use area northwest of Steamboat Springs. The most important areas for pronghorn in the RMPPA are used by resident populations, and as winter concentration areas and severe winter areas. These areas are on the northeast, east, and southeast slopes of Cold Spring Mountain, the flats north of Douglas Mountain, the lower slopes on the southeast side of Lookout Mountain, and the uplands on the east side of the Little Snake River and extend broadly into the flats north of Fortification and on either side of SH 13.

The habitat supporting these use areas is exclusively shrubland and grassland. Areas mentioned above as those not used by pronghorn have these same habitat characteristics, but are not used because of topography. Concentration areas, including those used during winter, are found especially in saltbush, but also in sagebrush and mountain shrub habitats. Again, topography is an important determinant of the number under 50 percent. These are startling numbers for a species that is the only species in its taxonomic family and found nowhere in the world but western North America.

The following comments from the LHAs reflect these low population numbers and provide some information on their causes:⁴

- ❑ **Cold Springs.** Pronghorn numbers are currently lower than those documented in the mid- to late 1980s, but have been stable in the area since 1993. Pronghorn use of Cold Springs Mountain has increased slightly over the past few years. Winterfat, saltbush and sagebrush along CR 10 have

³ The comments on elk in Cold Springs, Douglas Mountain, Dry Creek, Pole Gulch, Sandhills, and Sand Wash also address mule deer.

⁴ The comments on elk in Cold Springs, Douglas Mountain, Dry Creek, Pole Gulch, Sandhills, and Sand Wash also address pronghorn.

reduced in vigor as a result of continuous grazing pressure by both antelope and cattle. Weather events often play a significant role in antelope movement into this area from Wyoming.

- ❑ **Douglas Mountain.** Much of this landscape does not provide suitable habitat for pronghorn, but pronghorn use sagebrush grasslands along the lower elevations of this watershed. Pronghorn could use some areas of the watershed during mild or average winters, but there is no severe winter habitat within this landscape for pronghorn.
- ❑ **Powderwash.** Pronghorn use much of this landscape throughout the year. The Little Snake River corridor provides severe winter range habitat for pronghorn. Migration routes between summer and winter habitats are important, and woven wire sheep fence, which is common throughout the landscape, can present a barrier to pronghorn migration.
- ❑ **Sandhills.** A fire that occurred several decades ago destroyed most of the bitterbrush, which provided significant winter forage for a large population of pronghorn and mule deer.

Moose. Moose occur in both the east and western ends of the Little Snake RMPPA. In the east, they especially occupy Routt National Forest, moving to higher elevations in the summer; however, moose also move from these areas downstream along the Yampa River and up Elkhead Creek, where its headwaters have been designated as a moose concentration area. In the western portion of the RMPPA, moose primarily occupy the area surrounding Cold Spring Mountain. Moose are known to use the Green River, Vermillion Creek, Talamantes Creek, and Beaver Creek drainages. Because this is a disjunct population, it remains in largely the same area, during both summer and winter. In the Vermillion Creek/Trinchero Creek drainage, and along the Green River in Browns Park National Wildlife Refuge portion of this use area, concentrations of moose occur.

The habitat supporting moose in the western end of the RMPPA includes sagebrush, saltbush, and mountain shrub shrublands, as well as some willow, pinyon-juniper woodlands, and aspen forests. As mapped, this area is associated more with the road corridors of CR 10N and SH 318 than with the habitats present, which could be an artifact of observer distribution rather than moose distribution.

Bighorn Sheep. Bighorn sheep in the RMPPA occur primarily in the Yampa Canyon, the Canyon of Lodore within Dinosaur National Monument, and in the vicinity of Vermillion Creek and the Green River. Other smaller areas of use have been documented at the periphery of the RMPPA in the Flat Tops to the south and Park Range and Gore Range to the northwest. The bighorn sheep found within the Douglas Mountain Landscape are limited to lands managed by others. The herd of bighorn sheep, which once occupied Cross Mountain Canyon, suffered a complete die off. There are no plans to reestablish a population of bighorn sheep in Cross Mountain Canyon at this time.

The habitat supporting use areas is primarily pinyon-juniper woodlands and adjacent sagebrush and mountain shrub habitat. Topography plays the most important role in the locations used within these habitats.

Other Key Mammal Species

Several other key mammal species are found within the RMPPA, such as the black bear, mountain lion, and white-tailed prairie dog, as well as several other species discussed in Section 3.1.7.

The documented overall range of black bears is primarily in the eastern portion of the RMPPA, east and south of the Yampa River, with summer and fall concentration areas in the headwaters of the Little Snake River near Shield Mountain and east of Steamboat Springs. However, the documented overall range includes substantial areas in the western portion of the RMPPA, including the north side of the Yampa River (including Dinosaur National Monument and Douglas Mountain), the west side of the Canyon of Lodore, Cold Spring Mountain, and the vicinity of Middle Mountain and Diamond Peak. These areas are

managed by the BLM, with the exception of a portion of the north side of the Yampa River, which is in Dinosaur National Monument. The habitats supporting these black bear use areas are primarily pinyon-juniper woodland, and aspen and coniferous forests.

The range of the mountain lion is mapped as the entire RMPPA, with the exception of the area north of Middle Mountain along the Colorado State line and the southeast side of the Vermillion Bluffs. Areas of human conflict with mountain lions have been recorded in the vicinity of Dinosaur National Monument and east of Hamilton. In the case of the Monument, these conflicts probably reflect the density of people in the area more than the density of mountain lions. Within the RMPPA, all habitats provide habitat for mountain lions. The areas avoided by mountain lion have habitat characteristics that are similar to those used elsewhere, and are not avoided on the basis of habitat alone.

White-tailed prairie dog towns, which provide potential habitat for black-footed ferrets are most abundant in the portion of the RMPPA west of SH 13 and north of SH 318 (Map 3-18). This species is found primarily on lands that contain salt desert shrub habitats. Populations in this area have been kept low because of repeated outbreaks of campestral (sylvatic) plague. White-tailed prairie dog towns create unique vegetative conditions that provide potential habitat for the mountain plovers, black-footed ferrets, and burrowing owls (Sensitive Species discussed in Section 3.1.7), while reducing the habitat suitability for other species. Many of the prairie dog towns that were active in the early 1990s are no longer active as a result of campestral plague. Such comments are found in the LHAs for Cold Spring, Douglas Mountain, Dry Creek, Powderwash, Sandhills, and Sand Wash. White-tailed prairie dog towns are confined to shrublands, and almost exclusively to saltbush habitats, although a few colonies have been mapped in sagebrush or mountain shrub habitats.

3.1.6.2 Characterization

The primary indicators of health of aquatic animals and their habitats on BLM-administered lands are Standards 2 and 5 of the *Colorado Standards for Public Land Health*, as discussed above. The most detailed information in the 10 available LHAs addresses Standard 2. For the 60 percent of these landscapes that did not meet the standard, the trends were variable. For some, a trend could not be determined; some had an upward trend; and some a downward trend. Few were nonfunctioning. The forecast is for an increasing number of upward trends in those stream reaches where livestock use is the causative factor and can be controlled; however, in many stream reaches, wildlife or physical parameters that are beyond BLM's management control are the causative factors. As stated in the Sand Wash LHA: "An arid environment lacking free water, sandy channel and streambank materials, and salts originating from geologic materials limit the capability of the watershed to support diverse and extensive riparian systems. There are factors such as water diversions and bed load that are out of BLM management control." In these areas, the forecast could be for no change or a downward trend.

Primary indicators of health of terrestrial animals are their population, the condition of the individuals in these populations, the age structure represented in the population, and the population's distribution relative to its historic range. These are the types of information that are tracked by CDOW for species of game animals and, increasingly, for key species of nongame animals. BLM, in managing the habitat used by these populations, uses a different set of metrics, such as the condition of shrubs, forbs, and grasses that comprise the habitat used by key animal species. Indicators of condition include estimates of overall vegetative cover, in absolute terms, or using a relative comparison between portions of the habitat that are available and unavailable to foraging animals. The vigor and production of individual plants, and various plant indicators could also be evaluated. In evaluating plant indicators, species composition is assessed (e.g., Do the species that provide forage or the species that indicate overgrazing predominate?) as is the form of forage plants (e.g., Do they branch freely or is their growth form clubbed and indicative of heavy feeding by herbivores?). These types of information are in the discussions of terrestrial habitat condition.

The assessment of Standard 3 takes into consideration the presence of noxious weeds and other undesirable species, species composition, species and successional stage diversity, age and spatial distribution, and habitat connectivity and fragmentation for native plant and animal communities.

The current trends exhibited by wildlife habitat have a solid foundation in the LHAs that are being completed for nearly all of the landscapes on BLM-administered land within the RMPPA. Earlier studies were less comprehensive and much of the current information is qualitative; therefore, trends must also be assessed qualitatively. Of the 10 landscapes that have been evaluated against Standard 3, 7 met the standard guidelines, and 3 (Douglas Mountain, Fourmile Creek, and Powderwash) did not. The reasons for failure to meet this standard include the following:

- ❑ **Douglas Mountain.** Thirty percent of sites failed mainly because of over abundance of cheatgrass, presence of leafy spurge, poor grass cover, poor perennial grass diversity and poor sagebrush vigor, and problems with season-long grazing use in combination with persistent drought.
- ❑ **Fourmile Creek.** Eighteen percent of sites failed mainly because of poor species diversity or community structure, presence of weeds, loss of vigor in the native plants, fire, and five of six sites have had grazing management changes within the last permit renewal.
- ❑ **Powderwash.** Twenty-six percent of sites failed mainly because of poor species diversity, high weed dominance and productivity, and low resilience of community as a result of loss of forbs and perennial grass reflecting past overgrazing exacerbated by drought.

In addition to these specific comparisons against Standard 3, other significant trends can be directly influenced by BLM's management practices, and others can only be indirectly and incompletely influenced by BLM's management of fish and wildlife habitat. The trends of concern include—

- ❑ Noxious weeds, particularly leafy spurge and cheatgrass, are spreading into the RMPPA.
- ❑ Only selected raptor species have been monitored with any intensity and currency. Many of these upper food chain species are not well documented.
- ❑ Elk populations are at extreme highs and are having negative impacts on habitat and other big game herbivores, especially pronghorn and mule deer.
- ❑ Pronghorn populations are at extreme lows.
- ❑ White-tailed prairie dog populations are low, primarily because of campestral (sylvatic) plague.
- ❑ The fragility of the habitats throughout the RMPPA is evidenced by the extremely long recovery required after historic overgrazing and after fires that occurred decades ago. The effects of these actions are still evident within the RMPPA landscapes and are likely exacerbated by drought.

BLM's land management practices are becoming more consistent, more focused, and more effective, as evidenced by the good information available in the LHA, the National Sage-Grouse Habitat Conservation Strategy, and the Northwest Colorado Greater Sage-Grouse Conservation Plan (developed as a cooperative effort among community members, landowners, local industry, conservation groups, and county, State, and federal agency personnel known collectively as the Northwest Colorado Greater Sage-Grouse Working Group).

Without marked interagency cooperation and adequate funding, the above trends, which are more negative than positive, are likely to continue. To some degree, these trends are a result of natural factors, such as drought and disease, which are beyond management or regulatory control; however, they can be better understood and potentially aided by better data on population trends, better understanding of epidemiology and antidotes, continually improving cooperation among responsible agencies, and increasing engagement of the public. By continuing to collect data in response to the *Standards for Public Land Health and Guidelines for Livestock Grazing Management*, controlling livestock use of allotments to sustain habitat health, including protective stipulations in leases and permits for

development uses of BLM-administered land, and persistently identifying animal population problems with the appropriate managing agency, BLM can notably contribute toward improving these trends.

3.1.7 Special Status Species

Special Status Species are those plant and animal species populations that are considered rarities. There are many factors that contribute to a species becoming rare, the most important attributes being geographic range, habitat specificity, and population size. Population declines can also be a result of habitat loss, habitat modification, and changes in competition, predation, or disease. Habitat loss and modification from human activities are the primary causes of declining populations, particularly of species that are highly adapted to specific ecological niches. Such species might or might not be legally protected by federal or State agencies. BLM land management practices are intended to sustain and promote species that are legally protected and prevent species that are not legally protected from needing such protection.

3.1.7.1 Current Conditions

Species discussed in this section have been listed by USFWS, the State of Colorado, and placed on the Colorado BLM State Director's Sensitive Species List (Table 3-13 and Table 3-14). Federal threatened and endangered species and designated critical habitat crucial to species viability are managed by USFWS in cooperation with other federal agencies to support recovery. For listed species that have not had critical habitat identified and designated, BLM cooperates with the USFWS to determine and manage habitats to support the species. Candidate species are managed to maintain viable populations, thereby preventing federal listing from occurring. Species identified by the State of Colorado and Colorado BLM are treated similarly. BLM, USFWS, and the State of Colorado have developed formal and informal agreements to provide guidance on the management of species within the RMPPA. Consultation is required on any action proposed by BLM or another federal agency that affects a listed species or results in jeopardy or modifications of critical habitat.

BLM Colorado is addressing long-term management needs for Special Status Species by updating guidance provided in resource management plans. After a review of existing RMPs, BLM sought to update consultations for all land use plans through programmatic statewide consultations. BLM prepared biological assessments covering all listed species or groups of species within the State or biological evaluations for each candidate species within Colorado. The biological assessments or evaluations address the species' ranges across the geographic area under BLM administrative authority; further, they analyze the effects of BLM programs and activities on the species for each of BLM's 11 major planning and resource areas—Glenwood Springs, Grand Junction, Gunnison, Little Snake, Kremmling, Northeast, Royal Gorge, San Juan/San Miguel, San Luis Valley, Uncompahgre, and White River. The final documents were submitted to USFWS in June 2005 initiating formal consultation on all existing RMPs. A biological opinion or concurrence letter is being completed by USFWS. The following species that occur or have potential habitat in the RMPPA were considered in the process:

- ❑ Dudley Bluffs bladderpod (Buys & Associates, Inc. 2003)
- ❑ Graham Beardtongue (Buys & Associates, Inc. 2003)
- ❑ Bonytail chub (BIO-WEST, Inc. 2004)
- ❑ Pikeminnow (BIO-WEST, Inc. 2004)
- ❑ Colorado River cutthroat trout (Ecosystem Management International, Inc. 2004)
- ❑ Humpback Chub (BIO-WEST, Inc. 2004)
- ❑ Razorback Sucker (BIO-WEST, Inc. 2004)
- ❑ Boreal Toad (Real West Natural Resource Consulting 2005)
- ❑ Bald Eagle (TREC, Inc. 2004)

- ❑ Mexican Spotted Owl (R-NEXUS, LLC 2005)
- ❑ Mountain Plover (Buys & Associates, Inc. 2005)
- ❑ Yellow-billed Cuckoo (R-NEXUS, LLC 2005)
- ❑ Black-footed ferret (Buys & Associates, Inc. 2005)
- ❑ Canada Lynx (Western Consulting Group 2005)
- ❑ White-tailed prairie dog (Buys & Associates, Inc. 2005)
- ❑ Wolverine (Logan Simpson Design, Inc. 2003).

There are 12 federally listed species in the RMPPA, including the three species that are candidates for federal listing. These species might also be on the BLM Sensitive Species List, which incorporates the State of Colorado listing. Within the RMPPA, the distribution of most of the Special Status Species is generally known from LHA comments, CDOW GIS data, and other information. Inventories have been completed for some of the listed and candidate plant, fish, and wildlife species. Specific management direction to influence habitat components, leading to species recovery, is integrated into BLM management plans. Critical habitat has been designated for two species that coincides with BLM land managed as part of the LSFO: the pikeminnow and razorback sucker.

Special Status Plants

There are 25 plant species listed by USFWS or placed on the Colorado BLM State Director’s Sensitive Species List (Table 3-14). Many Special Status Plant Species are intrinsically rare because of the low number of known plants or populations, the size of the species distributional range, the number of habitats in which the species occurs, or any combination of these characteristics. Some newly evolving young species have simply not had the geologic time to spread to their full potential range, and thus their numbers remain low.

Table 3-14. Special Status Plant Species in the RMPPA

Species	Designation
<i>Astragalus aretoides</i> , cushion milkvetch	BLM Sensitive Species
<i>Astragalus detritalis</i> , Debris milkvetch	BLM Sensitive Species
<i>Astragalus duchesnensis</i> , Duchesne milkvetch	BLM Sensitive Species
<i>Astragalus jejunos</i> , starvling milkvetch	BLM Sensitive Species
<i>Astragalus nelsonianus</i> , Nelson milkvetch	BLM Sensitive Species
<i>Cirsium ownbeyi</i> , Ownbey's thistle	BLM Sensitive Species
<i>Cirsium perplexans</i> , Rocky Mountain thistle	BLM Sensitive Species
<i>Cryptantha cespitosa</i> , Tufted cryptanth	BLM Sensitive Species
<i>Cymopterus duchesnesis</i> , Uinta Basin spring-parsley	BLM Sensitive Species
<i>Eriogonum acaule</i> , single-stemmed wild buckwheat	BLM Sensitive Species
<i>Eriogonum tumulosum</i> , woodside buckwheat	BLM Sensitive Species
<i>Eriogonum viridulum</i> , Duchesne buckwheat	BLM Sensitive Species
<i>Lesquerella congesta</i> , Dudley bluffs bladderpod	Federal threatened species
<i>Minutaria nuttallii</i> , nuttall sandwort	BLM Sensitive Species
<i>Nama densum var. parviflorum</i> , matted fiddleleaf	BLM Sensitive Species
<i>Oenothera acutissima</i> , narrowleaf evening primrose	BLM Sensitive Species
<i>Penstemon gibbensii</i> , Gibbin's penstemon	BLM Sensitive Species
<i>Penstemon grahamii</i> , Graham beardtongue	Federal candidate species

Species	Designation
<i>Parthenium ligulatum</i> , ligulate feverfew	BLM Sensitive Species
<i>Penstemon scariosus</i> var. <i>albifluvis</i> , White River beardtongue	Federal candidate species
<i>Physaria obcordata</i> , Dudley bluffs twinpod	Federal threatened species
<i>Spaeromeria capitata</i> , rock-tansey	BLM Sensitive Species
<i>Spiranthes diluvialis</i> , Ute ladies'-tresses	Federal threatened species
<i>Townsendia strigosa</i> , Strigose Easter-daisy	BLM Sensitive Species
<i>Trifolium andinum</i> , mountain clover	BLM Sensitive Species

There are five federally listed plants associated with the RMPPA:

- Ute ladies'-tresses—Threatened
- Dudley bluffs twinpod—Threatened
- Dudley bluffs bladderpod—Threatened
- Graham beardtongue—Candidate for listing
- White River beardtongue—Candidate for listing.

Ute ladies'-tresses occurs just west of the RMPPA in Utah, along the Green River in Browns Park in Daggett County, and in the Cub Creek drainage in Dinosaur National Monument in Uintah County. The species is endemic to relatively low-elevation mesic or wet riparian meadows. This species has not been documented in the RMPPA. Dudley bluffs twinpod, Dudley bluffs bladderpod, Graham beardtongue, and White River beardtongue have all been identified near the southwest corner of the RMPPA, but have not been located within it. The area associated with all four species is low elevation habitat typified by soils derived from decomposed shales and barren shale slopes. Population levels of the four plant species are likely declining as a result of loss of habitat and impacts associated with disturbance.

In addition, 20 plant species on the Colorado BLM State Director's Sensitive Species List are known to occur within the RMPPA. Only 13 of these species have documented occurrences within the RMPPA. Documented species are primarily scattered throughout the northwestern portion of the RMPPA near Vermillion Basin and the Irish Canyon area of critical environmental concern (ACEC), with a few scattered occurrences in the southwestern part of the RMPPA.

Special Status Fish and Wildlife

Aquatic Species

Fish. Four federally listed fish species that have historically occupied the Green and Yampa Rivers occur within the RMPPA (Table 3-13):

- Pikeminnow—Endangered (designated critical habitat)
- Bonytail chub—Endangered (designated critical habitat)
- Humpback chub—Endangered (designated critical habitat)
- Razorback sucker—Endangered (designated critical habitat).

The aquatic habitat for the four listed Colorado River fish species is the mainstem Green, Yampa, and White Rivers and their low elevation drainages. Low elevation drainages are used by foraging individuals when water levels are high. These fish species have not been known to migrate into higher elevation

tributaries. All four Colorado River fish species are endangered, with numbers continuing to decline throughout the Colorado River Basin. The identified critical habitat includes most the mainstem and primary tributary habitat throughout the Colorado River Basin, including the lower portions of the Green, Yampa, and White Rivers. In Colorado, river miles of critical habitat are 217 for the razorback sucker, 362 for the pikeminnow, 59 for the humpback chub, and 59 for the bonytail chub. For the razorback sucker and pikeminnow, the lateral boundary of critical habitat is the 100-year floodplain so that productive areas adjacent to the rivers, including the mouths of smaller tributaries and other habitats are encompassed.

In the Upper Basin, critical habitat for the razorback sucker and pikeminnow includes reaches of the Green, Yampa, Duchesne, Colorado, White, Gunnison, and San Juan Rivers. For the humpback and bonytail chubs, reaches of the Colorado, Green and Yampa Rivers are included. All four of these species evolved in the Colorado River and are adapted to its natural seasonal and annual fluctuations of flow. Generally, these species spawn over rocky runs and gravel bars when water rises in the spring and temperatures increase. Young fish appear to remain in shallow littoral zones then disperse to deeper water and are transported downstream, but are poorly known because of their scarcity. Nonbreeding adults occupy a variety of habitats (impounded and riverine areas, eddies, backwaters, gravel pits, flooded bottoms and the flooded mouths of tributaries, slow runs, sandy riffles, with areas having deeper water used in summer). The critical habitat for these species generally overlaps. The primary basis for the different lengths of critical habitat among the four species is the preference of the chubs for canyon waters and the sucker and pikeminnow for the mainstem river, while using its eddies and backwaters for feeding and loafing. Critical habitat for the bonytail and humpback chub occurs only in Dinosaur National Monument and does not include any lands managed by BLM. Critical habitat for the pikeminnow and the razorback sucker includes lands managed by BLM, with the longest stretch of such lands occupying about four miles along the Yampa River upstream of County Road 123, which leads to Dinosaur National Monument.

In addition, the flannelmouth sucker, mountain sucker, Colorado River cutthroat trout, and roundtail chub are Species of State Concern that are on the Colorado BLM Director's Sensitive Species List or the CDOW Listing of Endangered, Threatened, and Wildlife Species of Special Concern (Table 3-13). The Colorado River cutthroat trout has been documented in Beaver Creek and several other creeks in the Routt County portion of the RMPPA, as well as in Johnson and Oliver Creeks, which are east of Shield Mountain and on Forest Service-managed land, and in the Beaver Creek, which is part of the Green River drainage in the far western portion of the RMPPA. Beaver Creek is considered to be in above average condition and has been stocked with Colorado River cutthroat trout. The flannelmouth sucker, mountain sucker, and roundtail chub, are found primarily in the Yampa River and lower reaches of the Little Snake River.

Amphibians. Among amphibians in the RMPPA, the boreal toad is a State endangered species and is on the Colorado BLM Director's Sensitive Species List (Table 3-13). It is found primarily in the vicinity of wetlands, wet meadows, streams, beaver ponds, glacial kettle ponds, and lakes interspersed in subalpine forest (lodgepole pine, Englemann spruce, subalpine fir, and aspen). Within the RMPPA, this includes habitats at elevations ranging from 7,000 to 12,000 feet. CDOW data document the presence of boreal toads in Rio Blanco County, Routt County in the Elkhead Mountains, near Pilot Knob, and further east on private and Forest Service land. Population levels of boreal toad are declining throughout the West as a result of the loss of habitat, non-native species predation, and the impact of diseases. Population viability within the RMPPA has decreased over the past several years.

In addition to the boreal toad, the Great Basin spadefoot and northern leopard frog are Species of State Concern and on the Colorado BLM Director's Sensitive Species List and/or the CDOW Listing of Endangered, Threatened and Wildlife Species of Special Concern. The Great Basin spadefoot occur

primarily in the western, more desert-like portion of the RMPPA and has a significant distribution in this area (B. Petch, personal communication 2004). CDOW GIS data document the presence of northern leopard frogs in both the western and the eastern portion of the RMPPA. Most of the observations of northern leopard frogs have been on Forest Service lands in the eastern end of the RMPPA, but there are also a few records from sites along the Yampa River, Lay Creek, and Beaver Creek near Brown's Park NWR. Population numbers are not known.

Terrestrial Species

Terrestrial Special Status Species found in the RMPPA occupy habitats at low to high elevation. Terrestrial habitats that are known to exist in the RMPPA include low- and mid-elevation grasslands, mid-elevation shrubland, sagebrush, forests, woodlands at mid to high elevations, riparian areas located along river and stream corridors, agricultural lands, and bare ground and rocky areas.

Reptiles. There are no federally listed reptile species in the RMPPA. The midget faded rattlesnake, which occurs in the RMPPA, is a Species of State Concern and on the Colorado BLM Director's Sensitive Species List and the CDOW Listing of Endangered, Threatened, and Wildlife Species of Special Concern. Specific locations have not been documented for this species.

Birds. Two federally listed and one candidate for listing bird species have been found or are likely to occur within the RMPPA:

- ❑ Bald eagle—Threatened
- ❑ Mexican spotted owl—Threatened
- ❑ Yellow-billed Cuckoo—Candidate for listing.

The bald eagle uses nesting and roosting habitat located along rivers, reservoirs, and ponds in the RMPPA. The known bald eagle nest sites within the RMPPA occur primarily along the Little Snake, Yampa, and Fourmile Creek drainages. Numerous roost sites have been identified along these two rivers. Summer foraging areas are concentrated along the upper reaches of the Yampa River, even above Steamboat Springs, and throughout the Danforth Hills area. Overall winter range for this species extends broadly across the central portion of the RMPPA, extending to the east up the Yampa River and to the west up the Green River. A winter concentration area has been documented along the Yampa River above and below Craig, with winter foraging recorded especially in the Danforth Hills, east of Craig along the Yampa River, and on the slopes of the Williams Fork Mountains. Within the RMPPA, winter range for bald eagles is largely contiguous with shrublands, irrespective of community, and agricultural lands. Bald eagle nesting and roosting sites have been located in the midst of saltbush, agricultural areas, and pinyon-juniper woodlands. The key to suitable nesting and roosting areas is the presence of a stream that provides large trees to support nests or serve as perches, except in the case of pinyon-juniper woodlands, which provide these resources themselves. Winter foraging areas include these same habitats in specific locations in uplands that are likely determined by topography and prey availability in the uplands adjacent to the Yampa River. Winter concentration areas are in a reach of the Yampa River that flows through agricultural lands near Craig.

Mexican spotted owls typically occupy narrow canyons and river corridors on the Colorado Plateau. No known nesting or roosting areas have been documented in the RMPPA, although there has been an unconfirmed identification of an owl call as this species in the Dinosaur National Monument.

Yellow-billed Cuckoos occupy lowland riparian forests with tall trees, and are often associated with cottonwood bosques having an open understory. This species has one confirmed nesting observation within the RMPPA along the Yampa River near Hayden (Federal Register Vol. 66. No. 143 pg 38615)

and is also a documented breeder south of the RMPPA. Yellow-billed Cuckoos are also likely to be seasonal migrants in the RMPPA.

In addition to these three species, the following three species have recently been under federal consideration and are still listed by the Colorado BLM or the State of Colorado: peregrine falcon, mountain plover, and greater sage-grouse.

Peregrine falcon (delisted and still protected). Peregrine falcons use cliff and canyon habitats for breeding. Foraging areas include riparian zones and near shore environments where waterfowl and obligate riparian birds may be found. Populations within the RMPPA are stable and seasonal. Numerous nesting areas and potential nest sites are found along the Yampa River in Dinosaur National Monument and on Cold Spring Mountain. Additional nesting areas have been identified on Signal Butte, in Cross Mountain Canyon, and near the eastern edge of the RMPPA near Gore Mountain.

Mountain Plover (proposed threatened; proposal withdrawn September 2003). Mountain plovers typically breed in sparsely vegetated upland areas. The species is primarily found in upland areas between Vermillion Bluffs and the northwest corner of the RMPPA and is often associated with white-tailed prairie dog towns, as prairie dogs keep the plant cover sparse.

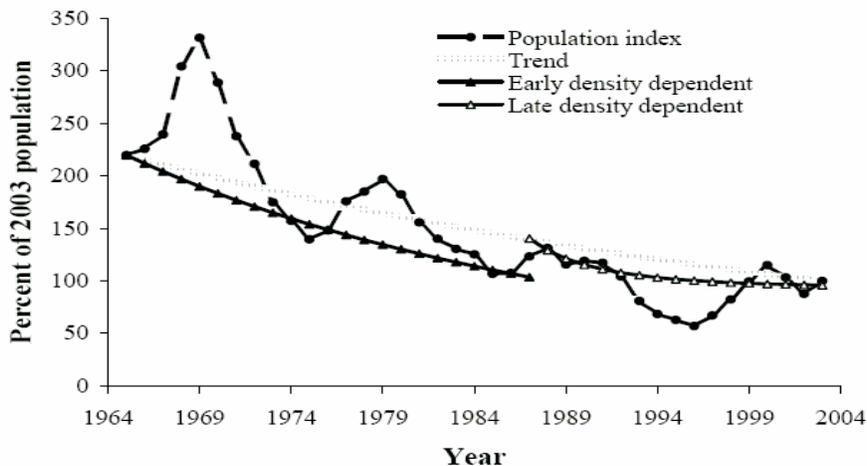
Greater Sage-Grouse (BLM sensitive). Greater sage-grouse occupy semidesert lowland to subalpine meadow sagebrush communities that are predominantly defined by big sagebrush, which covers broad expanses, especially across the central portion and northwest corner of the RMPPA. The RMPPA contains the largest greater sage-grouse population in the State of Colorado.

Greater Sage-Grouse Populations: Historically, sage-grouse inhabited much of the sagebrush-dominated ecosystems of North America. Populations of this species have declined in both abundance and extent throughout most of their historical range. Even after taking into account the strong cyclic behavior of sage-grouse population dynamics, populations have declined markedly relative to both presettlement anecdotal numbers (BLM 2004b), and the records kept in the last 30 years where the peak in the cycle of bird numbers has declined (BLM 2004a).

Rogers (1964) interviewed numerous homesteaders present in northwest Colorado in the early years of the 20th century and reported that sage-grouse numbered in the “thousands,” wagon loads of harvested birds were taken near Hayden, and thousands of birds were shot for the annual Sage Hen Days held in Craig in the early 1900s. In the early 20th century, the highest densities of sage-grouse occurred in Moffat, Routt, Rio Blanco, Garfield, and Grand Counties. Populations appear to have declined substantially across Colorado in the 1920s and 1930s, resulting in the first closure of the hunting season in 1937. Hunting was again allowed in 1953 after greater sage-grouse populations had recovered during the 1950s. Populations of the birds continued to increase into the 1960s, but were never so great as in the early part of the century (Rogers 1964).

Connelly et al. (2004) published a conservation assessment of greater sage-grouse and sagebrush habitats that is based on data from questionnaires completed by 11 States (California, Colorado, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming) and two provinces (Alberta and Saskatchewan). Generally, between 1965 and 2003 there was a 729 percent increase in the number of leks inventoried—a marked increase in monitoring effort, although not all survey methods provided compatible data. In addition, not all leks were active, with the largest number of inactive leks clustered in Colorado, Utah, and Washington. During this time period, 80 percent of the States (all but California and Colorado) showed population declines. Populations in the late 1960s and early 1970s were about two to three times greater than in 2003. The rangewide trends in population index are shown in Figure 3-1.

Figure 3-1. Rangewide Change in the Population Index for Greater Sage-Grouse in North America, 1965–2003 (Connelly et al. 2004)



Connelly et al. (2004) used data for Colorado from 1965 to 2003 that reflected information from 275 leks, although for 5-year periods within this timeframe averages of 44 to 171 leks were inventoried. The overall results indicated that lek size has decreased, but populations have increased in Colorado.⁵ Other findings for Colorado sage-grouse populations included the following:

- ❑ The proportion of active leks ranged from 41 to 96 percent.
- ❑ Population trends based on counts of male grouse at leks decreased over the assessment period, regardless of the parameter used, with a significant decline in males per lek (Figure 3-2).
- ❑ A decline in lek size was also reflected in the distribution of leks among size classes, with medium and large leks each comprising over 30 percent of the leks sampled from 1965 through 1979, but for the remainder of the period, the proportion of medium and especially small leks increased.
- ❑ Annual rates of population change standardized on 2003 populations were relatively stable to increasing (Figure 3-3). Sage-grouse populations increased at an overall rate of 1.0 percent per year from 1965 to 2003 at an average rate of 2.21 percent from 1965 to 1985 and fluctuated around a level similar to the 2003 population at an average rate of 4.3 percent from 1986 to 2003, and continued to fluctuate around the 2003 population level.
- ❑ Populations in the late 1960s and early 1970s were approximately 0.7 to 1.6 times the current populations (Figure 3-3) with relatively large population fluctuations.
- ❑ Although greater sage-grouse populations have definitely declined nationwide, the greater sage-grouse in Colorado have been generally increasing for about the last 17 years and breeding populations have not declined for the last 39 years; however, Braun (1995) reported a long-term decline in sage-grouse distribution and abundance. Similarly, Connelly and Braun (1997) indicated that sage-grouse breeding populations declined by 31 percent and production declined by 10 percent when they compared the long-term average of males/lek to the average obtained from the 1985 to 1994 data.

⁵ This discrepancy could result, in part, from the fact that data from Moffat County were collected using inconsistent methods and could not be used in the Connelly et al. analysis of changes in lek size.

Figure 3-2. Change in Lek Size for Sage-Grouse in Colorado, 1965–2003 (Connelly et al. 2004)

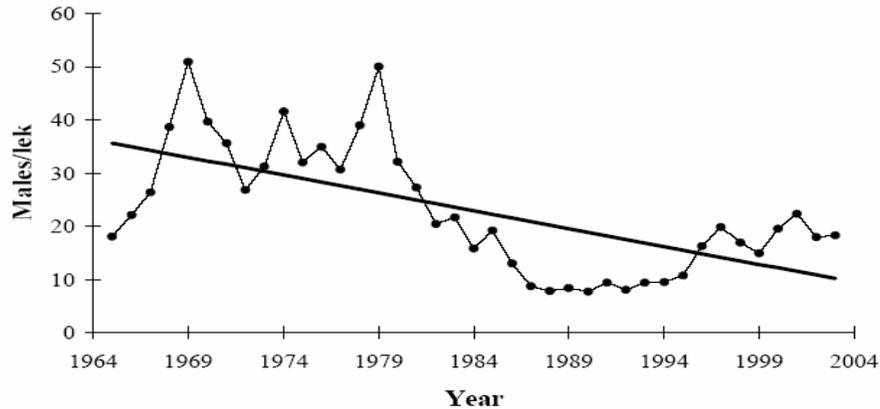
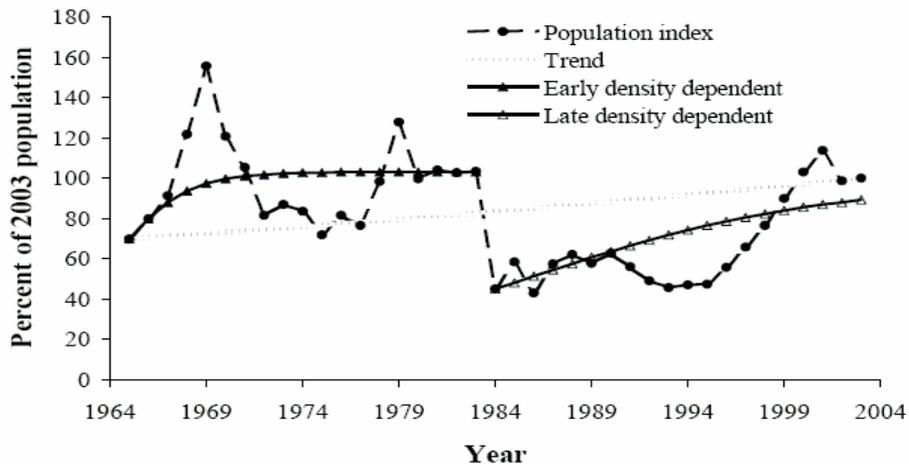


Figure 3-3. Change in the Population Index for Greater Sage-Grouse in Colorado, 1965-2003 (Connelly et al. 2004)



Data specific to Moffat and Routt Counties and to the RMPPA are provided by Rogers (1964), who described sage-grouse populations in Moffat County as having the largest population and the highest density of sage-grouse of any county in the State. The highest density of sage-grouse was localized in the Beaver Basin area of Cold Springs Mountain—the extreme northwest part of the county. Other areas in this county with a good population density were the western portion of Blue Mountain north of Artesia near the Utah line, the Two Bar Ranch on the Snake River, Lay Creek, Bluegravel Gulch, upper Timberlake drainage, Big Gulch drainage, upper Bighole Gulch, the head of Spring Creek, and the area around the town of Great Divide. The principal sage-grouse population in the southwest part of the county was on top of Blue Mountain within 10 miles of the Utah line.

In Routt County, there are four distinct sage-grouse groups: Two areas with fair population density (near the towns of Toponas and Hayden) and about equal numbers and range; one area in the upper Slater Creek and Snake River areas in the extreme northern part of Routt County with a light population in the summer months and a wintering area near the Wyoming line; and one area north of Steamboat Springs and west of Clark on Deep Creek with small range and numbers. The highest concentration of sage-grouse in the county was in the Twentymile area southeast of Hayden on the upper Sage and Fish Creek drainages. The Breeze Basin-Yampa River area west of Hayden near the Moffat County line was known

to contain a high density of sage-grouse area in 1947, but no sage-grouse were observed in this area in 1959 and 1960.

Today, within the RMPPA, essentially all of the land west of SH 13 (except the area on the south side of Cold Spring Mountain, and the lands closest to the Yampa and Green River drainages) is within the range of the greater sage-grouse. The central portion of this area—north, west, and southeast of Maybell—as well as a broad area along the northern boundary of the RMPPA from Middle Mountain near the northwest corner of Colorado to Baker Peak east of SH 13 provides winter range. A number of comments in the LHAs focus on greater sage-grouse populations and habitat. The following comments characterize the attention given to this species:

- ❑ **Cold Springs.** The large expanses of sagebrush steppe intermixed with wet meadows provide important sage-grouse nesting and brood rearing habitats. Sage-grouse numbers are up since the early 1990s, with lek counts remaining stable over the last 3 years; however, sage-grouse are only at 50 to 60 percent of their historic population numbers for the area.
- ❑ **Douglas Mountain.** Sagebrush grasslands and sagebrush mixed shrub habitat types have the potential to support greater sage-grouse within this landscape. There are no known grouse leks within the landscape; however, efforts to locate breeding sage-grouse in the landscape have been minimal.
- ❑ **Dry Creek.** The large expanses of sagebrush steppe intermixed with wet meadows provides important sage-grouse nesting and brood rearing habitats along Vermillion Creek, although there are no known sage-grouse leks within this watershed. Heavy historic grazing, especially in mesic areas at the higher elevations, has reduced the quality of brood rearing habitat essential for sage-grouse in the area.
- ❑ **Fourmile Creek.** The entire landscape is considered a sage-grouse production area, although the quality of sage-grouse brood rearing habitat has been reduced by heavy historic grazing, especially in mesic areas at the higher elevations. The large expanses of sagebrush steppe intermixed with wet meadows provide important sage-grouse nesting and brood rearing habitats along Timberlake Creek. Fourteen sage-grouse leks have been identified and brood rearing habitats have been documented.
- ❑ **Powderwash.** This is an important area for greater sage-grouse breeding, nesting and brood rearing, containing 10 known leks and about 2,400 acres of sage-grouse winter range.
- ❑ **Sandhills.** Available habitats provide winter range, nesting, and brood rearing for sage-grouse.
- ❑ **Sand Wash.** This is an import production area for sage-grouse nesting and winter range. The numerous historic leks on Seven Mile Ridge are no longer active.

Greater Sage-Grouse Habitat and Its Usage: Greater sage-grouse use areas are all located in shrublands. Sagebrush is the primary habitat used, and areas of sagebrush along streams where forbs and insects are abundant are used for brood rearing. Some production areas have also been identified in areas that have been mapped as saltbush and mountain shrub.

Several factors related to greater sage-grouse habitat and the way it is used by this species have been considered causes of the decline in greater sage-grouse distribution and abundance. These factors include habitat loss, alteration, and degradation (Braun 1995). Historically, sagebrush-dominated vegetation was one of the most widespread habitats in the country, and still covers much of the Great Basin and Wyoming Basin, and reaches into the Snake River Plain, Columbia Basin, the Colorado Plateau, Montana, southwestern Colorado, northern Arizona and New Mexico. Across this area, big sagebrush (*Artemisia tridentata*) predominates and has five known subspecies (West 1988; Kartesz 1994).

The sagebrush mosaic was historically subject to impacts from natural components of the environment, such as small and patchy fires, and periodic population explosions of jackrabbits, grasshoppers, and crickets. Big sagebrush does not resprout after a fire, but is replenished by wind-dispersed seed from adjacent unburned stands or seeds in the soil. Depending on the species and the size of a burn, sagebrush

can reestablish itself within five years of a burn, but a return to a full pre-burn community (density and cover of sagebrush) cover can take 15 to 30 years (Bunting 1984; Miller and Rose 1999).

Since settlement of the West began, the amount, distribution, and quality of sagebrush habitats and populations of the sage-grouse that depend on them have declined as a result of activities, such as large-scale conversions to cultivated croplands or pastures, altered fire frequencies resulting in conifer invasion at higher elevations, and annual grass invasion at lower elevations, livestock grazing, herbicide use, mineral and energy development, and recreational activities related to urban growth and increased human populations. As a result, the 155.5 million acres of sagebrush that existed historically were reduced to 119 million acres by 2004 (Connelly et al. 2004). Currently, sagebrush communities and greater sage-grouse are at risk from multiple sources across multiple scales (BLM 2004a). About 56 percent of the potential presettlement distribution of habitat is currently occupied by greater sage-grouse (Connelly et al. 2004).

Greater sage-grouse use different components of their sagebrush habitat for breeding, nesting, brood-rearing, and wintering (Table 3-15). Key habitat components include adequate canopy cover of tall grasses and medium height shrubs for nesting, abundant forbs and insects for brood rearing, and availability of herbaceous riparian species for late growing-season foraging (BLM 2004). Understory, height, density, cover, and patchiness of the sagebrush-dominated ecosystem are important to sage-grouse. Within the RMPPA, identified brood areas are in smaller drainages associated with the Vermillion Creek, Little Snake River, and Yampa River watersheds, where moist conditions in late spring and early summer produce the succulent forbs and insects on which broods feed. Map 3-19 shows these use areas, as well as the leks that have been identified within the RMPPA.

Production areas, traditionally mapped as a 2-mile buffer around leks and believed to contain 80 percent of the nests associated with grouse displaying at the lek have recently been expanded. It has been found that no more than 75 percent of greater sage-grouse nests are found within a 4-mile radius of a lek, making the previous production area size insufficient to protect most nests (B. Petch, personal communication 2004).

Table 3-15. Characteristics of Sagebrush Rangeland Needed For Productive Greater Sage-Grouse Habitat¹

		Breeding (April–June)		Brood-Rearing (June–August)		Winter ²	
		Height	Canopy	Height	Canopy	Height	Canopy
RANGE-WIDE DATA							
Mesic sites³	Sagebrush	15.7–31.5 in. (40–80 cm)	15–25%	15.7–31.5 in. (40–80 cm)	10–25%	9.8–13.8 in. (25–35 cm)	10–30%
	Grasses and forbs	>7.1 ⁴ in. (>18 cm)	>25% ⁵	Variable	>15%	N/A	N/A
Arid sites³	Sagebrush	11.8–31.5 in. (30–80 cm)	15–25%	15.7–31.5 in. (40–80 cm)	10–25%	9.8–13.8 in. (25–35 cm)	10–30%
	Grasses and forbs	>7.1 ^{4,6}	>15%	Variable	>15%	N/A	N/A
% Area⁷		>80		>40		>80	
MOFFAT COUNTY DATA							
Mesic sites³ (Danforth Hills)	Sagebrush (nest and brood sites)	31.1 in. (79 cm) avg. nest bush height	26% (nest sites)	22.9 in. (58 cm) height at brood sites	10.6% at brood sites	No winter data	No winter data
	Sagebrush (random sites)	22.9 in. (58 cm) avg. random sagebrush height	32% (random sites)	17.3 in. (44 cm) height at random sites	14% at random sites		
	Grasses and forbs (nest and brood sites)	5.9–7.1 in. (15–18 cm) avg. grass height at nests	3.7% grass 7.7% forbs 11.4% total canopy at nest sites	8.0 in. (20.3 cm) grass height, 4.4 in. (11.2 cm) forb height at brood sites	6.5% grass 8.0% forb 14.5% total canopy at brood sites		
	Grasses and forbs random sites)	7.3 in. (18.6 cm) avg. grass height at random sites	7.9% grass, 8.1% forbs, 16.0% total canopy at random sites	6.7 in. (17.1 cm) grass height, 3.2 in. (8.2 cm) forb height at random sites	5.9% grass, 3.8% forb, 9.7% total canopy at random sites		
Arid sites (Axial Basin)	Sagebrush	31.1 in. (79 cm) avg. nest bush height	26% at nest sites	As for mesic sites above	As for mesic sites above	No winter data	No winter data
	Sagebrush (random sites)	17.7 in. (45 cm) avg. random sagebrush height	23% at random sites				

		Breeding (April–June)		Brood-Rearing (June–August)		Winter ²	
		Height	Canopy	Height	Canopy	Height	Canopy
	Grasses and forbs (nest and brood sites)	5.9–7.1 in. (15-18 cm) avg. grass height at nests	3.7% grass 7.7% forbs 11.4% total canopy at nest sites				
	Grasses and forbs (random sites)	5.1 in. (13 cm) grass heights at random sites	5.0% grass 4.7% forbs 9.7% total canopy at random sites				

¹ Source: BLM 2004b. Rangeland data are from Connelly et al. (2000); Moffat County data are from Hausleitner (2003).

² Values for height and canopy coverage are for shrubs exposed above snow.

³ Mesic and arid sites should be defined on a local basis; annual precipitation, herbaceous understory, and soils should be considered (Tisdale and Hironaka 1981, Hironaka et al. 1983).

⁴ Measured as droop height; the highest naturally growing portion of the plant.

⁵ Coverage should exceed 15 percent for perennial grasses and 10 percent for forbs; values should be substantially greater if most sagebrush has a growth form that provides little lateral cover (Schroeder 1995).

⁶ Specific to nest sites.

⁷ Percentage of seasonal habitat needed with indicated conditions.

Greater Sage-Grouse Management: As a result of greater sage-grouse population changes, conservation efforts to protect greater sage-grouse populations began in the mid-1990s. Between May 1999 and December 2003, seven petitions for protection under the ESA were filed. Three of these petitions were for rangewide listing of the greater sage-grouse as threatened or endangered. A January 12, 2005, USFWS notice of a 12-month petition finding stated that listing was not warranted.

In parallel with the attention focused on the legal status of the greater sage-grouse, the National Sage-Grouse Habitat Conservation Strategy was developed by BLM because it manages about half of all remaining greater sage-grouse habitat in the nation and the management of this habitat is an extremely critical tool in halting the decline of the greater sage-grouse in the Western United States. This conservation strategy provides national sage-grouse habitat conservation guidance in BLM land use plans. The National Sage-Grouse Management Plan, released in November 2004, required each State Director to develop by April 2005 a process and schedule to update deficient land use plans to adequately address greater sage-grouse and sagebrush conservation needs. Issues and alternatives evaluated in the National Environmental Policy Act (NEPA) process for land use plan updates, amendments or revisions must analyze threats identified by the Western Association of Fish and Wildlife Agencies (BLM 2004).

In addition, a Northwest Colorado Greater Sage-Grouse Conservation Plan was prepared and was released in 2005. The plan establishes seven management zones and several subzones within which conservation planning, habitat management, and evaluation will be managed. These seven zones extend across the RMPPA, except in the higher elevations in the east and southeast, which are in Routt National Forest. Greater sage-grouse habitat on BLM lands in South Routt County are covered under the existing *Northern-Eagle and Southern Routt County Greater Sage-Grouse Conservation Plan*, which was finalized in September of 2004.

The *Northern-Eagle and Southern Routt County Greater Sage-Grouse Conservation Plan* and the Northwest Colorado Greater Sage-Grouse Conservation Plan identify potential conservation actions that might be implemented in order to maintain and enhance greater sage-grouse populations and habitat. BLM intends to cooperate with these sage-grouse working groups to conserve sage-grouse habitat.

Because of the varied nature of sage-grouse reproductive performance, habitat capability, and conservation threats among management zones, each zone will be evaluated and managed independently with a goal toward reaching and maintaining its own internal population goal and the broader population goal. Conservation strategies applied in each zone will focus on meeting the desired condition for greater sage-grouse habitat and population performance on a sufficient portion of the zone to meet population goals. Conservation activities may proceed at different rates, and in different directions in each management zone based on the needs of the zone, its priority in meeting overall goals, and the availability of resources. To be successful, greater sage-grouse conservation in each zone will require a mix of landscape-level analysis and application of conservation actions on a site-specific basis (Gunnison Sage Grouse Working Group [GSGWG] 2004).

Other Bird Species (BLM Sensitive). The following Special Status Bird Species are listed by the Colorado BLM or the State of Colorado, although they are not federally listed (Table 3-13): Columbian sharp-tailed grouse, American white pelican, ferruginous hawk, burrowing owl, sandhill crane, and long-billed curlew. The overall range of the Columbian sharp-tailed grouse is primarily in the lower elevations of the eastern half of the RMPPA. This range extends west to the Danforth Hills and south to the lowlands near Tonponas between the Flat Tops and the Gore Range. Winter range occupies the central portion of the overall range, and concentrations of known lek locations are scattered throughout winter range, with production areas where nesting and brood rearing occur defined as a 1.24-mile buffer around leks. The habitats supporting these use areas are sagebrush and mountain shrubs. In the Fourmile Creek Landscape, two Columbian sharp-tailed grouse leks have been identified on private land, and sharp-tailed

production areas have been identified on the Cull Reservoir, Upper Fourmile, and East Fortification Allotments. White pelicans do not breed in the RMPPA, but forage in a reach of the upper Yampa River that is south of Steamboat Springs. Ferruginous hawk sightings are particularly abundant north of Trincher Creek, in the Little Snake River headwaters north of Fortification, and in the uplands between Maybell, Craig, and Great Divide. CDOW GIS data on the burrowing owl are spotty, but there is appropriate habitat within the RMPPA for burrowing owls, which are likely to be co-located with white-tailed prairie dogs. Other key bird species in the RMPPA include the sandhill crane and long-billed curlew. Important and heavily used overall range for the sandhill crane occurs east of SH 13. This species, as well as the occasional whooping crane that could be within their flocks, might be transient farther west in the RMPPA. In addition, breeding pairs of sandhill cranes are beginning to be observed in wetland areas surrounded by sagebrush. This species has the potential to expand into additional wetland habitats on lands managed by BLM (B. Petch, personal communication 2004). Sandhill cranes have also been observed along Fourmile Creek. Potential habitat for long-billed curlews occurs in the irrigated hayfields found along some of the rivers within the RMPPA. Although data have not been recorded on this species, it is expected to occur in the RMPPA (B. Petch, personal communication 2004).

Mammals. The following three federally listed mammal species have been found or are likely to occur within the Little Snake RMPPA:

- ❑ Black-footed ferret—Endangered, experimental nonessential population
- ❑ Canada lynx—Threatened
- ❑ Gray wolf—Endangered.

Black-footed ferrets occur in shortgrass and midgrass prairie to semidesert shrublands and are typically associated with colonial mammals such as the white-tailed prairie dogs that occur within the RMPPA. Black-footed ferrets are believed to have occurred historically in the RMPPA. Currently within the RMPPA, there is a breeding facility for captive black-footed ferrets and conditioning pens used to ready captive ferrets for release. A viable relocation habitat exists in the Vermillion Creek area. At one time, this area was to be used as a ferret release site, but campestral (sylvatic) plague reduced the white-tailed prairie dog colonies to a level insufficient to support a ferret population; thus, free ranging black-footed ferrets do not presently occur in the RMPPA. Should it be determined that the ferrets could be reintroduced into the RMPPA on BLM-administered lands, no adverse impacts on other uses would occur by reintroduction of the ferrets.

Canada lynx typically use coniferous forests of uneven-aged stands with relatively open canopies and well-developed understories. Lynx have historically occurred in the RMPPA, but are now primarily restricted to higher elevations in the central portion of Colorado. Lynx reintroductions have occurred in the San Juan Mountains in southwestern Colorado, and these lynx or perhaps others have been known to move through the RMPPA as they disperse.

Gray wolves were historically spread across the North American continent, including Colorado and the RMPPA, in areas where prey density was sufficient, irrespective of habitat type. Gray wolves reintroduced in Yellowstone National Park provide the closest source of dispersing individuals. There is evidence that individuals from the Yellowstone population have moved through the RMPPA.

Several other Special Status Mammal Species are found within the RMPPA. These include the Townsend's big-eared bat, wolverine, river otter, and kit fox.⁶ The CDOW GIS data for many of these species are sketchy, and the LHAs do not mention them. Specific use areas for bats have been most intensively investigated in the vicinity of Dinosaur National Monument, where potential and active roost

⁶ Note that the genetic separation of kit foxes and swift foxes is still in question, but traditionally the name swift fox has been most often applied to individuals occupying the eastern plains.

areas, such as abandoned mines and caves have been trapped for bats. Although bats were trapped in these areas, no specific data are available on the Townsend's big-eared bat. Habitat occurs for the wolverine within the RMPPA, although the most recent sightings of this species in the area were about 15 years ago and were unconfirmed (B. Petch personal communication 2004). The overall range of the river otter is designated by CDOW as the Yampa River from just east of Cross Mountain and the Green River to the Colorado State line. There have also been reports of the occurrence of either the kit fox or the swift fox within the RMPPA, but the species was not confirmed and an attempt to trap an individual for taxonomic confirmation failed (B. Petch personal communication 2004).

3.1.7.2 Characterization

Primary indicators for Special Status Species are their population numbers, population viability, and habitat stability. For most of the Special Status Species, habitat loss and fragmentation have been and remain the primary cause of their imperiled status. Some of these species have also suffered from historic efforts to extirpate them, and some suffer competition or predation from species that have expanded their range or that have been introduced. By definition, the populations of all Special Status Species have suffered downward trends. Management efforts by BLM, USFWS, CDOW, and others have reversed the downward trend for some these populations, but none are near their historic levels and most remain at levels that are biologically insecure, regardless of their legal status. In addition to continued threats from habitat loss and fragmentation, variability in habitat condition is an ongoing factor in the distribution and density of these Special Status Species. For example, population viability for Special Status Plant, Fish, and Amphibian Species varies with hydrologic conditions. Soil conditions further influence the populations of plants. The recent drought has reduced the amount or quality of habitat in some areas, which further stresses populations of these species.

Because of the intense focus on the greater sage-grouse through the National Sage-Grouse Habitat Conservation Strategy and the Northwest Colorado Greater Sage-Grouse Conservation Plan, past data on this species have been collected and new data are being collected. The potential causes of population declines have been categorized as reduced habitat quality, habitat loss and fragmentation, predation, hunting, physical disturbance, disease and genetics. Information on their relative importance and mechanisms of action is still being collected and evaluated. Recent data on greater sage-grouse populations within the Northwest Colorado Management Zones (Map 3-20) are provided in Table 3-16.

Table 3-16. Greater Sage-Grouse Trends in Population and Lek Numbers Within the Northwest Colorado Management Zones¹

Zone No.	Count 1999	Count 2000	Count 2001	Count 2002	Count 2003
1	241 (12 leks)	165 (11 leks)	133 (7 leks)	117 (7 leks)	137 (6 leks)
2	54 (4 leks)	41 (4 leks)	18 (4 leks)	25 (3 leks)	37 (3 leks)
3a	222 (8 leks)	628 (13 leks)	503 (12 leks)	459 (13 leks)	433 (15 leks)
3b	282 (12 leks)	424 (19 leks)	744 (25 leks)	774 (24 leks)	650 (23 leks)
3c	13 (2 leks)	74 (3 leks)	109 (2 leks)	170 (4 leks)	118 (3 leks)
4a	45 (2 leks)	20 (2 leks)	143 (4 leks)	54 (2 leks)	64 (2 leks)
4b	62 (2 leks)	0 (0 leks)	37 (2 leks)	31 (2 leks)	41 (2 leks)
4c ²					
5	389 (21 leks)	451 (22 leks)	289 (19 leks)	226 (19 leks)	322 (17 leks)
6	479 (7 leks)	429 (9 leks)	349 (8 leks)	337 (8 leks)	321 (9 leks)

Zone No.	Count 1999	Count 2000	Count 2001	Count 2002	Count 2003
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¹ The management zones established by the Northwest Colorado Greater Sage-Grouse Conservation Plan are entirely within Moffat County and hence entirely within the Little Snake RMPPA.

² Data not available.

The future of most of the Special Status Species depends on the degree to which their habitat can be maximized and kept in good condition and to which their populations can be protected from competition and predation that exceed the levels with which these species evolved. Further, more complete information on the location of Special Status Species within the RMPPA and monitoring of these populations will facilitate timely and focused management responses to factors that affect them.

3.1.8 Wild Horses

Wild horse management within BLM-administered lands of the RMPPA follows the Wild Free-Roaming Horse and Burro Act of 1971 (Public Law 92-195) and 43 CFR 4700, Protection, Management and Control of Wild and Free-Roaming Horses and Burros. The Sand Wash Basin Herd Management Area (HMA) Plan was signed in May of 1982; however, the 1989 Little Snake RMP has been the principal planning document for management of wild horses in the RMPPA. Wild horses within the HMA are also managed to maintain or improve rangeland conditions and to comply with the *Standards for Public Land Health and Guidelines for Livestock Grazing Management* that became effective in 1997.

3.1.8.1 Current Conditions

One wild horse herd is managed on BLM-administered lands within the RMPPA, although wild horses from the Rawlins Field Office Planning Area drift into the RMPPA during the winter months. The Sand Wash wild horse herd resides in the fenced Sand Wash Herd HMA, which provides sufficient water, forage and habitat to maintain a self-sustaining wild horse population in balance with the other uses of the area. The Sand Wash HMA is about 45 miles west of Craig, Colorado, in the Sand Wash Basin (Map 3-21). The boundary of the HMA is fenced, except along SH 318, generally preventing wild horses from entering or leaving the HMA. There are no fences within the HMA, allowing horses to roam freely within the confines of the basin.

The Sand Wash HMA includes 154,940 acres of public land, 1,960 acres of private land, and 840 acres of State school section lands, for a total of 157,730 acres (BLM 1982). Sand Wash Basin is surrounded by ridges and mesas. Lookout Mountain on the northwest boundary is the highest point in the HMA at 8,120 feet, and the lowest point is where Sand Wash exits the HMA at an elevation of 5,800 feet. The Sand Wash Basin receives 7 to 12 inches of annual precipitation, and the climate is typical of the cold deserts of the Rocky Mountain Region, with warm summers and very cold winters. Vegetation types within the HMA include sagebrush/bunchgrass, saltbush, and pinyon-juniper woodlands. These vegetation types are described in detail in Section 3.1.5. Six livestock allotments, grazed by both cattle and sheep, occur within the HMA boundary, although there are no pasture or allotment fences. Monitoring within the HMA includes actual use and utilization estimates for livestock, wildlife, and wild horses.

Wild horse herds are typically characterized by color, genetics, and population size. The most common colors of the horse herd are grey and sorrel, although most colors and color patterns of horse can be found in the HMA, including buckskins, duns, and paints. There has been an increase in unique colors and paint horses since color data were originally collected in 1988. Genetic analysis indicates the highest similarity for the herd was to the Iberian derived Spanish breeds, followed by Gaited breeds, North American breeds and Arabian breeds.

The original population of horses within the HMA in 1971 was 65 head. The managed population range recommended in 1986 was changed to a maximum of 217 horses in 1995, and again in 2001 to a management range of 163 to 363 horses. The existing horse population has been managed to the most current of these numbers through horse gathers in 1989, 1995, 1998, and 2001. Before the gathers, the wild horse herd exceeded these population recommendations. The herd had a population high of 455 head in 1998. To maintain populations at a sustainable level, the herd was gathered five times between 1988 and 2001 using helicopters to drive the horses into traps, which resulted in the removal of 855 horses, to date, from the HMA. The current wild horse population on the HMA is estimated to be within the current management range. The mare/stud ratio is maintained at about 50/50, which enables them to sustain smaller bands of 10 to 15 head during the foaling period from March through May. In the fall and winter, band sizes increase to around 60 head (BLM 1982; BLM 2001; Dobrich 2002).

In spite of the ability of the Sand Wash herd to rapidly increase its population, there are factors that affect the herd's habitat, such as increasing recreation, wildlife winter range use, and livestock grazing. Within the last 10 years, late winter recreational OHV use has been increasing in the HMA, especially during the April and May foaling period, because the area typically has less snow and becomes accessible and hospitable earlier in the year than other areas in the RMPPA. The increase in numbers of elk in the Sand Wash Basin has increased competition for winter forage, and more recently for summer forage as well.

3.1.8.2 Characterization

The population of the Sand Wash wild horse herd is maintained at sustainable levels through gathers that occur about every four to five years. A number of factors currently affecting the Sand Wash horse herd habitat could be exacerbated, and habitat might be lost, degraded, or fragmented if the oil and gas leases within the HMA were activated. Existing leases cover about 98 percent of the HMA.

The population of the Sand Wash wild horse herd after foaling in 2005 is forecast to be 361 horses. This estimate is based on the horse population before the 2001 gather of 335 horses and removal of 168 horses, for an after-gather population of 167 horses (Dobrich 2002). The annual herd increase of about 22 percent from the recruitment of foals would result in the projected population of 361 horses (BLM 2001). A horse gather was planned in the Sand Wash HMA for the summer of 2005 to bring the wild horse population within the management population range of 163 to 363 horses for the next 4 to 5 years.

3.1.9 Wildland Fire Management

Fire is an inherent component of ecosystems and historically has had an important role in promoting plant succession and the development of plant community characteristics. Control of fires during the last century has changed plant communities and resulted in conditions that might sustain large-scale fires when natural ignition of vegetation occurs. BLM's management practices include the control of naturally occurring fires in some areas, the management of vegetation so that fires are controllable in areas where this activity is appropriate, and the use of fire to manage plant succession and community character in selected locations.

3.1.9.1 Current Conditions

Fires within the RMPPA are both naturally occurring and used as a management tool. Naturally occurring fires are widely distributed in terms of frequency and severity. Large acreage fires occurred in the area in the last half of the 19th century and the beginning of the 20th century. Historically, the area has displayed a moderate to high frequency of fires, averaging 251 fires and burning an average of 8,500 acres per year. During the 12-year period from 1993 to 2004, the RMPPA averaged 270 fires per year, burning 12,307 acres annually. The central and eastern portions of the RMPPA average 20 fires per year.

A majority of information contained in this section was adapted from the *2004 Northwest Colorado Fire Program Area Fire Management Plan* (BLM 2004).

Sources of Fire

The weather and fuel structure in the RMPPA provide an opportunity for ignitions from frequent summer storms. In the western portion of the RMPPA, lightning accounts for 88 percent of all starts and about one-half of the acres burned. In the eastern portion of the RMPPA, where BLM- and Forest Service-managed lands intermingle, about 40 percent of the fires are human-caused. Careless smoking, vehicle exhaust, escaped agricultural burning, and unattended campfires account for most the human-caused starts. Equipment use is also responsible for starting some fires.

Types of Vegetation Susceptible to Fire

The wide variety of vegetation across the RMPPA varies in its susceptibility to fire. The following generalizations on the susceptibility of specific plant cover types are based on research by Romme and others in western Colorado:

- ❑ Fire intervals in spruce/fir forests are variable, ranging from decades to hundreds of years, with the longer intervals being more typical. Because of the long fire return interval, wildland fire suppression activities in this vegetation type have not significantly changed the composition, structure, and function of these forests. In timbered areas within the RMPPA, the high elevation fir-spruce are exhibiting fuel accumulations, stocking levels, canopy closures, and insect activity that suggest they are nearing the time in their cycle when stand replacement events may occur.
- ❑ Historically, in ponderosa pine forests, low-intensity fire was relatively frequent, with natural fire return intervals of about 10 to 20 years. These fires played a major role in shaping the composition, structure and function of these forests and had a significant effect on the abundance and distribution of overstory and understory plant species. The periodic low-intensity ground fire naturally thinned the vegetation and kept understory species in check. Timber harvest, fire suppression, and livestock grazing activities have had a significant impact on the composition, structure, and function of these forests. The naturally cool, moist environment of these forests makes them relatively fire resistant; however, under very dry conditions, fire is usually of high intensity because of the naturally high density of trees and the high fuel loading found on the forest floor.
- ❑ Historically, in warm, dry mixed-conifer forest, median fire return intervals were about 20 to 30 years, and fire played a similar role to that described for the ponderosa pine forests. The current condition of many of the warm, dry mixed-conifer forests is also similar to that described for ponderosa pine forests, as past timber harvest, fire suppression, and livestock grazing activities have had similar effects. Timber harvest of old growth ponderosa pine and Douglas-fir has changed the abundance and distribution of these species, and has created opportunities for white fir to become more dominant.
- ❑ Current fire research on the aspen forests in the southwestern part of Colorado indicates historical mean fire intervals of 18 to 48 years. Other studies indicate that there is substantial uncertainty concerning fire intervals and fire intensities in aspen forests. The naturally cool, moist environment associated with these forests makes them relatively fire resistant; thus, most fires quickly subside. Under very dry conditions, high-intensity fires occur, particularly in stands with high amounts of ground fuels and a heavy conifer component.
- ❑ Infrequent, light surface fires characterize pinyon-juniper woodlands with fire return intervals greater than 25 years. Unpublished research of pinyon-juniper sites in Mesa Verde National Park, located in southwest Colorado, indicates that the fire return intervals for stand-replacing events are long and that when these events occur, the fires tend to be large and very intense.

- Fire history and effects in closed-canopy oak shrublands are speculative because fires rarely leave visible evidence (e.g., fire scars). Given that the area has an annual period of hot, dry weather, an abundance of ignition sources in these shrublands, and frequent fires in adjacent communities, it seems unlikely that fires were rare. Gamble oak and other brush species will sprout from root collars after a stand-replacing event.

Range of Potential Fire Behavior

Fires are typically categorized on the basis of period of occurrence, size class, regime, and condition class. The fire season for the RMPPA normally extends from late April to early November. The most critical fire conditions for the RMPPA begin as early as mid-June and can last until widespread fall moisture occurs.

Over the past decade, the large majority of wildfires in the RMPPA have covered less than 300 acres. From 1993 to 2004, 98.4 percent of the wildfires that occurred within the RMPPA were size class A (0.25 acres), B (0.25 to 10 acres), C (10 to 99 acres), and D (100 to 299 acres) incidents (Table 3-17). Only 1.6 percent of the wildfires were representative of the other three size classes: E (300 to 999 acres), F (1,000 to 4,000 acres), and G (5,000+ acres).

Table 3-17. Fire Occurrence (Size and Acreage), 1993–2004

Size Class	A	B	C	D	E	F	G
Number of fires	977	332	50	9	15	6	1
Number of acres	117	547	1,486	1,568	6,151	13,094	73,121

The five fire regimes (Table 3-18 and Map 3-22) reflect the frequency and severity of burns. Historically, the most prolific fire spread events have been wind-driven, especially in the brush plant cover types. Plume-dominated fires have occurred particularly during very dry years in the older stands of pinyon-juniper and the mixed conifer stands. Rates of fire spread through the canopies of sagebrush can exceed 3 miles per hour, while spread through mixed conifer and pinyon-juniper stands of 0.5 miles per hour are not uncommon. Years with better than average moisture tend to keep the light fuels (e.g., grasses) green, which helps to curtail fire spread. The incursion of annual grasses, like cheatgrass, are changing the fire environment. Light fuels available to burn through the height of the fire season are becoming more abundant by way of the species morphology. Much of the timbered lands of the RMPPA experience long return intervals between fire events. Burn severity in these communities tends to be moderate to severe resulting in stand replacement of the dominant species. Examples of these vegetation types are high elevation subalpine fir and spruce, lodgepole pine, mid to lower elevation lodgepole pine, and some pinyon-juniper stands in the western portion of the RMPPA. Examples of a more moderate to frequent return interval would be sagebrush/grasslands in the western portion of the RMPPA and the lower elevation shrub communities in the eastern portions.

Table 3-18. Fire Regimes Within the RMPPA

Fire Regime		Acres	Percent of the RMPPA
I	0–35 year frequency and low to mixed-severity surface fires most common	33,400	0.8

Fire Regime		Acres	Percent of the RMPPA
II	0–35 year frequency and high-severity stand replacement fires	0	0
III	35–100+ year frequency and mixed severity	18,300	0.4
IV	35–100+ year frequency and high-severity stand replacement fires	2,898,300	60
V	200+ year frequency and high-severity stand replacement fires	387,600	9
Unclassified		881,900	2

Table 3-19 shows condition classes defined in terms of the relative risk of losing one or more key components that define an ecological system based on the following five ecosystem attributes: disturbance regimes (e.g., patterns and frequency of insect, disease, fire), disturbance agents, smoke production, hydrologic function (e.g., sedimentation, streamflow), and vegetation attributes (e.g., composition, structure, and resilience to disturbance agents).

Table 3-19. Condition Class Definitions

Condition Class	Fire Regime Example Management Options
Condition class 1	Fire regimes are within a historical range and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within a historical range. Where appropriate, these areas can be maintained within the historical fire regime by treatments (e.g., fire use).
Condition class 2	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased), which results in moderate changes to one or more of the following: fire size, intensity, and severity and landscape patterns. Vegetation attributes have been moderately altered from their historical range. Where appropriate, these areas might need moderate levels of restoration treatments, such as fire use and hand or mechanical treatments, to be restored to the historical fire regime.
Condition class 3	Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals, which results in dramatic changes to one or more of the following: fire size, intensity, severity and landscape patterns. Vegetation attributes have been significantly altered from their historical range. Where appropriate, these areas might need high levels of restoration treatments, such as hand or mechanical treatments, before fire can be used to restore the historical fire regime.

3.1.9.2 Characterization

The fuel structure in the RMPPA is gradually changing because of management practices and the incursion of non-native annual grasses, primarily cheatgrass (*Bromus tectorum*). In addition, in the central and eastern portions of the RMPPA, the fire environment is changing because of the Routt/Great Divide blowdown within the Routt National Forest, which has resulted in a spruce bark beetle epidemic in adjacent areas. In areas where fuels are continuous, fires spread readily and rapidly during the height of the average fire season. Much of this area is grouped typically in fire regimes 2 and 3 (sagebrush), but many of the pinyon-juniper stands have much older stand characteristics, which often have heavier fuel accumulations and burn with stand replacement fire behavior. Many areas exist where sparse fuels and other natural barriers limit fire spread. Most are dry sites where the vegetation is of a moderate to old age

class distribution. Cheatgrass has significantly increased from historically inhabiting scattered pockets to becoming a dominant fine fuel component intermixed with sagebrush and pinyon-juniper stands. Areas of large blocks of infestation include Brown's Park and Greystone. Cheatgrass has recently been found at higher elevations on the Routt National Forest.

The moderate- to long-return fire interval, fire exclusion, other management practices, and increased human use and incursion into these areas have rendered many of the forested areas in peril of large severe wildland fires. These forests have achieved a level of vegetation stocking and dead and down fuel loads to exacerbate large fire spread through the dry seasons of the year. Recent insect and wind episodes have increased fuel loadings in localized areas to critical levels.

The hazard component across the RMPPA varies from very low to very high. Mature stands of oak brush inhabit much of the steeper slopes above 6,500 feet. Decadent stands of continuous bitterbrush/sagebrush are common to the Great Divide. Insect-killed Douglas-fir also contributes to high hazard areas.

High-risk, high-hazard, and high-value areas include Steamboat Springs and Meeker interface, Douglas Mountain, Greystone, Elk River, Steamboat Lake, Stagecoach/Morrison Creek and Catamount. Areas of high hazard and high value with low to moderate risk include the Upper White River, Breeze Basin, Wilderness Ranch, and Great Divide timber stands designated for management purposes, and motorized trail corridors.

3.1.10 Cultural and Heritage Resources

Cultural resources are recognized as fragile, irreplaceable resources with potential public and scientific uses representing an important and integral part of the nation's heritage. Cultural resources are contained in a definite location of human activity, occupation, or use identifiable through field inventories (e.g., surveys), historical documentation, or oral evidence (BLM-M-8110). Archaeological resources, a subset of cultural resources, include any material remains of human life or activities that are at least 100 years old and are of archaeological interest as further defined at 43 CFR 7.3. The term "cultural resource" also includes historic or architectural sites, structures, or places with important public and scientific uses that are 50 years or more old and could include definite locations (e.g., sites or places) of traditional cultural or religious importance to specified social and cultural groups (see Glossary: Traditional Cultural Property). Cultural resources are concrete, material places and things that are located, classified, ranked, and managed through the system of identifying, protecting, and utilizing for public benefit.

3.1.10.1 Current Conditions

The ROI for cultural resources covers the RMPPA. A variety of cultural resource site types attributed to a range of culturally distinct chronological periods ranging from over 10,000 years ago to the present have been discovered in the RMPPA, and there is a potential for additional resources to be found. Archaeological investigations have occurred as early as 1922 (La Point 1987), but it was not until the 1970s that regular investigations began taking place. As of September 2005 about 1,805,789 acres have been intensively inventoried in the RMPPA (McDonald and Metcalf 2006). Historically, inventories have been implemented to support site-specific surface disturbing projects, such as mineral and energy development, to comply with the requirements of Section 106 of the National Historic Preservation Act and other cultural resource preservation laws. In addition, academic institutions have performed some research excavations, although such scientific investigations have been limited. Implemented in this manner, previous cultural resource inventories do not comprise a statistically valid sample as they have not resulted in the investigation of the variety of environmental and ecological ranges present in the RMPPA. As a result, known cultural resource sites do not fully represent the cultural resources present.

A total of 5,622 cultural resource sites have been identified as of September 2005, the earliest of which dates to around 9000 B.C. Cultural resources are classified into site types based on similar physical or cultural characteristics. At the broadest level, cultural resource sites are categorized as either prehistoric or historic types. Prehistoric sites can be associated with one or more of the four following cultural traditions: Paleo-Indian, Archaic, Formative (Fremont or Ancestral Puebloan), and Protohistoric. There are about 4,246 prehistoric sites in the RMPPA, with sites from each cultural tradition. Some of the prehistoric site types include the following: lithic scatter, campsite, quarry, kill site, rock shelter, rock art, burial, tipi ring, wickiup, granary, and rock walls. Historic sites are cultural resources with a period of significance following A.D. 1860. and are organized either chronologically or functionally. There are about 1,217 identified historic sites in the RMPPA. In addition, there are 154 sites that contain both prehistoric and historic artifacts. Table 3-20 displays the cultural chronology represented in the RMPPA. Further information onsite types in the RMPPA is provided in the *Regional Class I Overview of Cultural Resources for the BLM Little Snake RMP* (McDonald and Metcalf 2006).

Table 3-20. Cultural Time Periods Represented in the Little Snake RMPPA

Cultural Time Period	Timeframe	Known Sites ¹	Characteristics
Paleo-Indian	Before 6400 B.C.	30	Big-game subsistence patterns. There are no dated sites from this period, although projectile points from this period have been recovered. Paleo-Indian sites are significant because of scarcity.
Archaic	6400 B.C.–A.D. 0	230	Nomadic lifestyle with small game hunting, seed, and nut-gathering subsistence patterns. Projectile points and camps have been found and further discoveries are possible. Archaic sites are scientifically important because of the differences between Colorado Plateau/Great Basin Archaic cultures and Northwestern Plains Archaic cultures in the RMPPA.
Formative	A.D. 0–A.D. 1350	192	Increased use of bow and arrow, ceramics, rock art, and farming with associated sedentary lifestyle and population growth. As a result, more permanent settlements and associated cultural resources remain from these cultures. Scientific uncertainty still remains concerning their origin and disappearance. Identification of additional sites would be scientifically beneficial.
Protohistoric	A.D. 1350–A.D. 1880	45	Nomadic lifestyle with hunting-gathering traditions while retaining use of ceramics and small unnotched or side-notched projectile points. Later traits also include equestrian rock art motifs, European trade goods, wickiups, and a possible increase in the use of obsidian. Identification of additional sites would benefit further research.
Historic	After ca. 1860	1,360	Euro-American settlement patterns associated with agriculture, homesteading, limited ranching and hay farming, minerals development, and transportation.

¹ Numbers reflect sites with specific dates to a defined time period. There are 3,663 sites that have not been dated.

Sources: BLM 2003, La Point 1987, McDonald and Metcalf 2006, Miller 2002, Spath 1999, and Tipps 1988.

Prehistoric or historic cultural resource sites, structures, or objects listed in or eligible for listing in the National Register of Historic Places (NRHP) are managed as directed by 36 CFR 800, Protection of

Historic and Cultural Properties. In addition, those sites where data are insufficient to make an eligibility determination are treated as though they were eligible until supporting information shows otherwise. Of the known sites within the RMPPA in 1986, very few have been formally determined for the NRHP. Thirty sites are listed on the NRHP, and nearly 11 percent of recorded sites (612 sites) are eligible for the NRHP. Of the sites not listed on or eligible for the NRHP, 17 percent (n=961) of known sites need additional data to make an NRHP determination, nearly 67percent are not eligible (n=3,791), and about 5 percent have not been evaluated (n=285).

In compliance with the American Indian Religious Freedom Act of 1978, National Historic Preservation Act of 1966, Archaeological Resources Protection Act of 1979, Native American Graves Protection and Repatriation Act of 1990, as well as other Executive and Secretarial Orders, BLM has initiated consultation with Native American tribes. This consultation could assist BLM with identifying and designing management for significant religious or cultural locations or properties (traditional cultural properties), understanding tribal concerns, identifying public land places, resources, uses, and values that are important to the tribes or tribal members (including traditional values and traditional use areas), identifying land management procedures that conflict with Native Americans' religious observances. On October 14, 2004, BLM sent letters to the Shoshone Tribal Council, Ute Mountain Tribal Council, Uintah and Ouray Tribal Council, and Southern Ute Indian tribe to initiate consultation. BLM received a negative response from the Southern Ute Indian tribe, and there has been no response from the other tribes. To date, Native American entities have not identified traditional use areas or traditional cultural properties in the planning area. BLM will continue to consult with the tribes, as directed by BLM Manual 8120, Tribal Consultation Under Cultural Resources, and BLM Handbook 8120, General Procedural Guidance for Native American Consultation.

3.1.10.2 Characterization

Indicators of cultural resources include the presence and condition of cultural sites, landscapes, or places of traditional use. The trend and forecast of cultural resources in the RMPPA varies considerably as a result of the diversity of terrain, geomorphology, access, visibility, and past and current land use patterns. Adherence to Section 106 of the NHPA and the BLM policy of avoiding cultural resources provides for the continued identification and preservation of cultural resource sites; however, the absence of research-based inventories has led to an understanding of the RMPPA's cultural resources based only on where undertakings have previously occurred, rather than where sites are likely to occur.

Cultural resource site sensitivity was modeled based on cultural resource data from past inventories, mostly associated with Section 106 compliance actions. Modeling sensitivity is a way to provide guidance on site densities and distributions when working with sample data, such as cultural resources data. The model (current cultural sensitivity) was developed after analyzing relationships between existing cultural resource site data, cultural resource inventories, vegetation, and soil classifications through a GIS database. Through use of a computer-tested model, it was found that prehistoric resources were most accurately depicted in the model through an intersection of vegetation and soils data (Map 3-23), while historic resources were predicted by soils data (Map 3-24).

Because it is based on information from existing inventories and excavations, the model represents BLM's current understanding of cultural resource distribution in selected areas of the LSFO. Table 3-21 notes current cultural sensitivity acres for both prehistoric and historic cultural resource sites. The resulting acres are a quantitative accounting of where known sites fall within the rankings of high, medium, or low sensitivity.

Table 3-21. Current Cultural Sensitivity in the Little Snake RMPPA

Cultural Period	High Site Sensitivity		Medium Site Sensitivity		Low Site Sensitivity	
	Acres	%	Acres	%	Acres	%
Prehistoric	402,270	30	806,440	60	142,200	10
Historic	449,480	33	445,850	33	455,630	34

Source: Little Snake RMP Class I Inventory, BLM 2006.

It is important to note the limitations of this model. It does not necessarily identify the actual distribution of cultural resources in the LSFO nor can it predict the location of any particular cultural resource site. Rather, it predicts where cultural resources are likely to occur based on known variables. The model is based only on industry and BLM-driven inventory and excavation projects and not from an understanding of cultural resource site distribution. Consequently, the difference between a highly sensitive zone and a low sensitive zone only relates to the amount of cultural resource Section 106 Class III survey work that has been undertaken over the last 30 years in selected areas of LSFO. Further, because an area is in a low sensitive zone it does not imply that the area does not have cultural resources, nor that BLM does not have to comply with the Section 106 process. In addition, a cultural resource site identified in a low sensitive zone is not unimportant. On the contrary, a find in such an area could be more important, as it could provide information where there is limited cultural resource information. Further, the model cannot distinguish whether sites in a highly sensitive zone would be eligible for the National Register. The model was generalized to fit the field office-wide scale. Pockets of higher sensitivity could occur within larger areas mapped as low sensitivity, and the reverse—pockets of low sensitivity within areas mapped as high sensitivity—could also occur.

Because recorded sites are manifested by discovery of exposed artifacts, features, and structures, they are easily disturbed by natural elements, such as wind and water erosion, natural deterioration and decay, animal and human intrusion, and development and maintenance activities. Because of the limited site monitoring and associated stabilization activities, site conditions in the RMPPA are considered to be declining. Indications of active vandalism or collecting (e.g., unauthorized digging and pot hunting) have been observed in limited instances in the past, which is illegal under the Archaeological Resources Protection Act. Archaeological and historic sites are known to be deteriorating from a variety of causes. Collectively, these agents have adversely affected many known cultural resources.

3.1.11 Paleontological Resources

Paleontological resources constitute a fragile and nonrenewable scientific record of the history of life on earth. It is BLM policy to manage paleontological resources for scientific, educational, and recreational values, and to protect or mitigate these resources from adverse impacts. To accomplish this goal, paleontological resources must be professionally identified and evaluated, and paleontological data must be considered as early as possible in the decisionmaking process. Paleontological resources will be managed according to the BLM 8270 Handbook and BLM Manual for the Management of Paleontological Resources.

3.1.11.1 Current Conditions

The ROI for paleontological resources covers the RMPPA. Paleontological resources are integrally associated with the geologic rock units (e.g., formations) in which they are located. If extensive excavation on a certain formation in one geographic area leads to discovery of significant paleontological resources, there is a potential that excavations throughout the extent of the formation could also produce

fossil material. The geographic extent of the RMPPA contains 128 named formations at the surface, 78 of which are known to be fossiliferous (Armstrong & Wolney 1989); however, these formations have differing potentials to contain significant fossils. Other areas may also contain fossils, but have not been examined and evaluated (Armstrong & Wolney 1989). The potential for paleontological resources is currently noted through the use of the following three class definitions (depicted in Table 3-22 and Map 3-25):

- ❑ **Class I.** Areas that are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. Consideration of paleontological resources will be necessary if the LSFO review of available information indicates that such fossils are present in the area.
- ❑ **Class II.** Areas with exposures of geological units or settings that have high potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. The presence of geologic units from which such fossils have been recovered elsewhere could require further assessment of these same units where they are exposed in the area of consideration.
- ❑ **Class III.** Areas that are very unlikely to produce vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils based on their surficial geology, igneous or metamorphic rocks, extremely young alluvium, colluvium, or aeolian deposits or the presence of deep soils; however, if possible, it should be noted at what depth bedrock could be expected to determine if fossiliferous deposits may be uncovered during surface disturbing activities.

Table 3-22. Paleontological Resource Potential Classification Acreage

Class	Acres Within BLM-Administered Lands	Percent of Total Acres
I	503,600	37.3
II	838,000	62.1
III	8,000	0.6

Paleontological localities are areas of known paleontological resources with defined boundaries, usually associated with excavation and data recovery efforts. Although a comprehensive paleontological inventory has not been carried out for the RMPPA, government, academic, and private industry personnel have studied paleontological resources in various contexts, but principally in relation to surface disturbing development activities. At least 40 groups and institutions from the 1850s to the present have collected fossils in the RMPPA (Armstrong & Wolney 1989). During that period, over 1,000 paleontological localities have been documented. Fossils recovered from these localities represent a diverse array of plants, invertebrates, and vertebrates; however, no paleontological localities have been identified on BLM-administered land within the RMPPA over the past 6 years during development-related surface disturbance. Scientific activity has occurred during the past 6 years and there are currently active paleontological use permits issued for the BLM-administered land within the RMPPA.

3.1.11.2 Characterization

Paleontological resources are indicated by both the presence of and potential for these resources. The current trend of paleontological resource use permits and scientific activity would likely continue or increase slightly in the future. Clearances and monitoring of surface disturbing activities are anticipated to be the primary means of identifying paleontological localities.

3.1.12 Special Management Designations

3.1.12.1 Wilderness Study Areas

Wilderness study areas contain wilderness characteristics and are managed to preserve those values until Congress either designates them as wildernesses or releases them for other uses. This principle applies to the seven WSAs in the RMPPA. A discussion of the current resource values and uses found in each WSA, established in 1980 under the authority of Section 603(c) of Federal Land Policy and Management Act (FLPMA), can be found in the Colorado BLM Statewide Wilderness Study Report.

In 1964, Congress passed the Wilderness Act, which established a national system of lands for the purpose of preserving a representative sample of ecosystems in a natural condition for the benefit of future generations. Until 1976, most of lands considered for, and designated as wilderness were managed by the National Park Service and Forest Service. With the passage of FLPMA in 1976, Congress directed BLM to inventory, study, and recommend which public lands under its administration should be designated wilderness. Through this process, two areas in the RMPPA (Cross Mountain WSA and Diamond Breaks WSA) were recommended for wilderness designation. The West Cold Springs, Ant Hills, Chew Winter Camp, Peterson Draw, and Vale of Tears WSAs were not recommended for wilderness designation.

Current Conditions

In 1980, BLM completed the wilderness inventory of BLM-administered lands within the RMPPA, finding eight areas that possess wilderness characteristics. Following completion of the inventory in 1980, BLM designated eight WSAs; however, Tepee Draw WSA was dropped from further wilderness recommendation and removed from wilderness study in the 1989 Little Snake ROD. The remaining seven WSAs are shown on Map 3-26. The seven WSAs are listed in Table 3-23 as follows:

Table 3-23. Wilderness Study Areas in the Little Snake RMPPA

Proposal Name	Area (acres)*	Recommend for Wilderness?
Cross Mountain	14,273	Yes
Diamond Breaks	31,807	Yes
West Cold Springs	14,661	No
Ant Hills	4,226	No
Chew Winter Camp	1,216	No
Peterson Draw	5,022	No
Vale of Tears	7,044	No
Total	78,249	

Source: BLM 1991

These WSAs, established under the authority of Section 603(c) of FLPMA, are being managed to preserve their wilderness values according to the interim management policy, and will continue to be managed in that manner until Congress either designates them as wilderness or releases them for other uses. Should any of these WSAs be released from wilderness consideration by Congress, and subsequently released from management under the interim management policy, subsequent planning documents will prescribe how these lands will be managed. Within the RMPPA boundary area, there is a

designated wilderness area, called the Thunder Basin National Grassland. It is a 91,000-acre portion of the Mt. Zirkel Wilderness, managed by the Hahn's Peak/Bears Ears Ranger District of the Medicine Bow-Routt National Forests.

Management of WSAs is similar to but generally less restrictive than management of designated wildernesses. Examples of some of the activities that are allowed in WSAs include hunting, fishing, camping, hiking and horseback riding, livestock grazing, and travel with motorized vehicles on existing routes. Activities that would impair wilderness suitability are prohibited in WSAs.

There are six primary provisions of FLPMA with regard to interim management of WSAs:

- ❑ WSAs must be managed so as not to impair their suitability for preservation as wilderness.
- ❑ Activities that are permitted in WSAs must be temporary uses that create no new surface disturbance, and do not involve permanent placement of structures.
- ❑ Grazing, mining, and mineral leasing uses that existed on October 21, 1976, may continue in the same manner and degree as of that date, even if this would impair wilderness suitability of the WSAs.
- ❑ WSAs may not be closed to appropriation under the mining laws to preserve their wilderness characteristics.
- ❑ Valid existing rights must be recognized.
- ❑ WSAs must be managed to prevent unnecessary or undue degradation.

Only Congress can designate the WSAs established under Section 603 of FLPMA as wilderness or release them for other uses. The status of the existing WSAs will not change as a result of the LSFO resource management planning process and revision of the RMP. A discussion of the current resource values and uses in each WSA can be found in the *Colorado BLM Wilderness Study Report*, Volume One, Pages 1 to 168, Craig District Study Areas (BLM 1991). The following is a brief description of each WSA.

Cross Mountain. The Cross Mountain WSA is located in Moffat County about 15 miles west of Maybell, Colorado. Two sections of undeveloped Colorado State lands adjoin the WSA on the eastern edge and northwest corner. The WSA is bordered on the south by undeveloped BLM land, on the north and east by undeveloped private and State lands and county and BLM system roads, and on the west by undeveloped private land and county and BLM system roads. Cross Mountain is an oblong, flat-topped land mass rising over 2,200 feet above the floodplain of the Yampa and Little Snake Rivers. The Yampa River has cut a 1,000-foot gorge through the mountain, which provides spectacular geologic features representing about 1 billion years of geologic history. Erosion of the east and west flanks of the mountain has exposed colorful, rocky rims, side canyons, and rock outcrops. Vegetation consists of pinyon-juniper woodlands with sagebrush communities scattered throughout the area. Pockets of aspen and mountain brush are found on the east flank of the mountain, and a relic stand of ponderosa pine set in red sandstone slick rock adds to the interest of the area. The plant Ownbey's thistle (*Cirsium ownbeyi*) is a candidate for federal listing and the area is also habitat for two rare endemic plants—Yampa beardtongue and Watson's pricklygalea.

The area is habitat to a diversity of wildlife including threatened and endangered species. Elk, mule deer, pronghorn, coyote, mountain lion, fox, and occasional black bear inhabit the mountain. The Yampa River provides habitat for the endangered pikeminnow, bonytail chub, humpback chub, and razorback sucker. Peregrine falcon and bald eagles inhabit the WSA, as do many other species of mammals, birds, amphibians, reptiles, and fish.

Diamond Breaks. The Diamond Breaks WSA is located in Moffat County, Colorado, and Daggett County, Utah, about 65 miles northwest of Maybell, Colorado. The WSA is bordered on the north by the

Browns Park National Wildlife Refuge and on the west by Dinosaur National Monument. The area consists of the Diamond Mountains, part of the eastern extension of the Uinta Range. A dominant feature of the WSA is a series of northeast-southwest trending mountain peaks with ridges, steep draws, and canyons draining north and south to southwest. This series of colorful, rugged, red sandstone ridges provide a dramatic and scenic background as viewed from Browns Park and along the Green River.

The Diamond Breaks WSA contains a diverse mixture of vegetation including sagebrush, pinyon-juniper woodlands, aspen, mountain brush, Douglas-fir, limber pine, and ponderosa pine. It also maintains a diversity of wildlife including elk, mule deer, black bear, mountain lion, coyote, and other mammals and reptiles. A large portion of the WSA provides winter range for deer and elk. Golden eagle and other birds of prey nest within the WSA because of the availability of good cliff and woodland nesting habitat.

West Cold Springs. West Cold Springs WSA is located in Moffat County, Colorado, and Daggett County, Utah, about 65 miles northwest of Maybell, Colorado. The WSA consists primarily of the western portion of the rugged, south-facing slopes of Cold Spring Mountain. The area is characterized by deep draws and canyons that have been cut through the O-Wi-Yu-Kuts Plateau, forming a series of plateaus and ridges along the northern margins of Browns Park. The WSA appears to be in a transition zone between the Wyoming Basin Province ecoregion to the north, and Rocky Mountain Forest Province ecoregion to the south. Diverse vegetation communities cover the area, consisting of sagebrush steppe and saltbrush/greasewood in the low elevations, dense pinyon-juniper woodlands that dominate the area, and large old growth mountain mahogany and oak scrub communities mixed with limber pine, lodgepole pine, Douglas-fir, and aspen. Dense riparian vegetation is found in Beaver Creek Canyon and Spitze Draw.

The area is habitat to a diverse wildlife species including elk, deer, antelope, bighorn sheep, mountain lion, coyote, beaver, raptors, and numerous other birds, mammals, reptiles, and amphibians. The area is managed as part of the Colorado Division of Wildlife's Cold Spring Quality Elk Management Area. Beaver Creek is a class II high priority fishery resource with documented past occurrence and probable current occurrence of State or federal threatened species. Yellowstone cutthroat trout, brook trout, and brown trout are presently found in Beaver Creek. The aquatic and riparian habitat was documented to be in above average condition in the *1991 BLM Wilderness Study Report* (BLM 1991).

Ant Hills. The Ant Hills WSA is located in Moffat County about 50 miles west of Maybell, Colorado. The WSA is bordered on the west and south by Dinosaur National Monument, on the north by a road, and on the east by undeveloped BLM-administered lands in Big Joe Draw with the Chew Winter Camp WSA in the southeast corner. The area is remote and consists of hills and valleys on the southern slopes of Douglas Mountain. The Ant Hills consist of several hills rising 400 to 500 feet above the draws in the southeastern part of the WSA. The area is an extension of the landforms and drainages found in Dinosaur National Monument, and the WSA is dependent on the Monument for outstanding wilderness values. Vegetation consists mainly of pinyon-juniper woodlands, sagebrush, and native grass communities.

Chew Winter Camp. The Chew Winter Camp WSA is located in Moffat County about 50 miles west of Maybell, Colorado. The WSA is bordered on the south by Dinosaur National Monument, on the north by a primitive way on undeveloped BLM land, on the east by the Peterson Draw WSA, and on the west by the Ant Hills WSA. The area is remote and consists of ridgetops and portions of intervening drainages on the southern slopes of Douglas Mountain. The area is an extension of the landforms and drainages found in Dinosaur National Monument and is dependent on the Monument for outstanding wilderness values. Vegetation consists mainly of pinyon-juniper woodlands, sagebrush, and native grass communities.

Peterson Draw. The Peterson Draw WSA is located in Moffat County about 45 miles west of Maybell, Colorado. The WSA is bordered on the south by Dinosaur National Monument, on the north by a road

and private land surrounding the abandoned K-T mine, on the east by a primitive jeep trail on undeveloped BLM-administered lands in Bower Draw, and on the west by the Chew Winter Camp WSA and a primitive jeep trail. The area consists of rocky ridges, peaks, and gently rolling hills. The area is an extension of the landforms and drainages found in Dinosaur National Monument and is dependent on the Monument for outstanding wilderness values. Vegetation consists mainly of ponderosa pine forest along the northern boundary, pinyon-juniper woodlands, sagebrush, and native grass communities.

Vale of Tears. The Vale of Tears WSA is located in Moffat County about 25 miles west of Maybell, Colorado. The WSA is bordered on the south by Dinosaur National Monument, on the north by undeveloped private land and a dirt road through BLM land, and on the east and west by a primitive way through undeveloped BLM land. The area is remote and is located on the southern slopes of the southwestern end of Douglas Mountain within 0.5 miles of the Yampa River in Dinosaur National Monument. The Vale of Tears drainage in the southern part of the WSA has the appearance of colorful badlands with banded multicolored soil. The rugged Sawmill Canyon cuts through the eastern part of the WSA. The remainder of the area consists of ridges, peaks, and draws that promote the ruggedness of the area. The WSA is an extension of the landforms found in Dinosaur National Monument. Vegetation consists of dense pinyon-juniper woodlands with sagebrush and saltbrush/greasewood communities at lower elevations. The area provides habitat for mule deer, elk, birds of prey and numerous other birds, mammals, and reptiles.

Characterization

During the interim period between the inventory that identifies suitable and eligible areas appropriate for wilderness designation and the actual congressional designation of a wilderness (which can be many years), designated WSAs require special management practices to preserve the wilderness characteristics that make an area appropriate for designation.

Current management of the seven WSAs listed above will continue. Increased use of these areas will continue, which could require additional restrictions to be determined through this planning process to preserve the wilderness characteristics of each area. According to WSA monitoring reports since 1999, there was no major impairment to either the Cross Mountain or Diamond Breaks WSAs. Minimal vehicle traffic and fire suppression activities were noted. Based on this information, current management is successfully protecting the wilderness characteristics found within these two WSAs as well as non-recommended WSAs. The seven designated WSAs in the RMPPA will continue to be managed to preserve the wilderness characteristics.

3.1.12.2 Lands with Wilderness Characteristics

In 1996, the State of Utah, the Utah School Institutional Trust Land Administration, and the Utah Association of Counties (collectively Plaintiffs) filed suit challenging BLM's authority to reinventory lands for possible wilderness study area designation in Utah. A settlement to this suit, as amended, was reached in April 2003 between the Department of the Interior and the plaintiffs. Consistent with BLM policies for the identification, management and protection of multiple uses, terms of the settlement are being applied Bureau-wide. This settlement states that any land use plans completed after April 14, 2003, will not designate any new WSAs, nor manage any additional lands under the Section 603 non-impairment standard.

Areas with wilderness characteristics can be identified by BLM as a part of managing the public lands or through external nominations by the public. Both methods require the same type of review to determine whether the area has wilderness characteristics. Information provided by the public concerning resources and other values are considered along with all other resource information in the planning process. New

information may be considered in the NEPA process as appropriate. BLM continues to manage public lands according to existing land use plans, while new information (e.g., in the form of new resource assessments, wilderness inventory areas or citizens proposals) is being considered in a land use planning effort.

Current Conditions

In 1994, Colorado conservationists presented to BLM the *Conservationists' Wilderness Proposal for BLM Lands* that compiled numerous citizen wilderness inventories and the area-by-area justification for the statewide Citizens' Wilderness Proposal (CWP). The 1994 CWP included seven areas within the Little Snake RMPPA—Cold Spring Mountain, Cross Mountain, Diamond Breaks, Dinosaur Adjacent (which includes six units, also referred to as Dinosaur Wilderness Additions), Pinyon Ridge, Vermillion Basin and Yampa River. In 2001, based on new citizen inventories, the CWP was expanded to include new areas believed to be eligible for wilderness protection around the State, including additional acreage added to the existing CWP areas in the Little Snake RMPPA (Map 3-27). Table 3-24 identifies the seven proposed wilderness areas and acreages within the Little Snake RMPPA.

Table 3-24. Non-Wilderness Study Area Lands Proposed for Wilderness by the Public

Proposal Name	Area (acres)¹
Cold Springs Mountain	54,010
Cross Mountain	18,030
Diamond Breaks	42,960
Dinosaur Adjacent (includes 6 units)	57,200
Pinyon Ridge	20,850
Vermillion Basin	86,570
Yampa River	12,410
Total	292,030

¹ Acreage figures are approximate and reflect only those portions of the CWP that fall within the Little Snake RMPPA.

In November 1995, the Colorado BLM issued BLM Instruction Memorandum CO-96-010 requesting that field managers review certain CWP areas to determine if further analysis is needed for wilderness values. In December 1995, the BLM LSFO indicated that portions of Vermillion could warrant additional wilderness evaluation. In May and June 1997, respectively, Colorado BLM released policy to address CWP areas and hold discretionary irreversible or ir retrievable actions in temporary abeyance until wilderness issues raised by the Colorado Environmental Coalition could be resolved through the BLM planning process (IM CO-97-044), and released the Colorado Wilderness Review Procedures policy (IM-CO-97-051) to be used in conjunction with IM-CO-97-044. Pursuant to these policies, BLM began a multistep process of reviewing six CWP areas on Colorado's western slope. The LSFO inventoried Vermillion Basin and Yampa River CWP areas. The White River Field Office inventoried Pinyon Ridge, which lies within the boundaries of both field offices.

BLM found most of the three CWP areas in the RMPPA to be roadless but concluded that only Vermillion Basin warranted additional review. Specifically, BLM concluded that Yampa River was eligible for wilderness consideration, but was already protected well enough in the interim by its special recreation management area (SRMA) designation. In a contested decision, the White River Field Office found that Pinyon Ridge was roadless, but it failed to meet other criteria for wilderness.

In a letter to the BLM dated January 10, 2001, Moffat County disputed the results of the Vermillion Basin Wilderness Characteristics inventory. In the letter, Moffat County listed ways and manmade structures that were not included in the 2000 BLM Wilderness Characteristics Inventory. A detailed map of these ways and structures was included with the letter. Moffat County claimed that because several roads bisect the area into less than 5,000-acre pieces of land, the area does not meet wilderness criteria. In addition, Moffat County urged BLM to “acknowledge the subjective evolution and biases which concluded the inventory area contained significant naturalness and solitude or primitive and unconfined types of recreation opportunities.” Finally, the letter requested that BLM offer Moffat County the opportunity to participate in the process with regards to multiple use issues, grazing management, and mineral exploration issues that would arise if future consideration was given to the wilderness designation of the area.

In June 2001, the LSFO released its final wilderness characteristics inventory for the Vermillion Basin, concluding that 77,067 acres out of 81,028 inventoried roadless acres in the Vermillion Basin area have wilderness characteristics, and stating that this finding warranted a land use plan amendment. BLM has suspended oil and gas leasing decisions within the Vermillion Basin pending an RMP review of the existing uses and values. Most of the Vermillion Basin is currently designated as open to OHV use.

In October 2003, the Colorado BLM State Office issued CO-IM No. 2004-012 that provided guidance to all Colorado BLM Field Offices to bring Colorado BLM into compliance with implementation of Washington Office IM No. 2003-275 (*Consideration of Wilderness Characteristics in Land Use Plans*) and IM No. 2003-274 (*Bureau of Land Management Implementation of the Settlement of Utah v. Norton Regarding Wilderness Study*). This policy addresses three main issues: (1) rescission of CO-IMs 2002-07, 2001-06, 1999-13, 1998-17, and 1997-44 regarding CWP, (2) notification of interested parties in accordance with the public involvement requirements of NEPA (40 CFR 1506.6), and (3) reviewing new information. When implementing land use plans, BLM must, as with any new information, determine if BLM wilderness inventories or public wilderness proposals contain significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or impacts that have not previously been analyzed. Because every land use plan and supporting NEPA document is different, this determination will need to be made on a case-by-case basis. New information or changed circumstances alone, or the failure to consider a factor or matter of insignificant consequence is not a sufficient basis to require additional NEPA consideration before implementing a previously approved decision. If the new information shows that the action will affect the quality of the human environment in a significant manner, or to a significant extent not already considered, then a supplemental NEPA document would be prepared (40 CFR 1502.9).

In November 2004 and January 2005, during this planning process, the Colorado Wilderness Network resubmitted information to BLM on the seven CWP units within the RMPPA. In accordance with BLM policy, an ID team of BLM specialists was needed to evaluate each public proposal for wilderness to determine (1) if it is new and critically different from information considered before wilderness inventories were conducted by BLM, and (2) whether there is a reasonable probability that the areas (or significant portions thereof) could have wilderness characteristics. From that evaluation, BLM will determine which areas have wilderness characteristics. Non-WSA lands evaluated by BLM and found likely to have wilderness characteristics (e.g., those non-WSA lands that have been inventoried by BLM and determined to possess wilderness characteristics) are managed according to the management prescriptions of existing land use plans.

In June 2005, BLM specialists conducted a preliminary assessment of areas likely to have wilderness characteristics in the LSFO. The assessment was based on criteria for minimum size of 5,000 acres, naturalness, outstanding opportunities for solitude and primitive/unconfined recreation, and supplemental values (ecological, geological, or other features of scientific, educational, scenic, or historical values).

Public comments were received from local and State agencies, conservation groups, and private interests disputing the initial determination completed by BLM in May 2005. The comments focused on differences from the original wilderness inventoried in 1991, noting presence of developments (such as pipelines, reservoirs and developed springs, tanks, trails, and fences) and presence or condition of vehicle routes. In August 2005, BLM specialists reviewed the comments and new data to make final assessments about the likeliness of wilderness characteristics. The results are presented in Table 3-25.

Table 3-25. Areas Likely to Have Wilderness Characteristics

Area Name	Size	Meets Overall Criteria for Wilderness Characteristics (size, naturalness, and outstanding opportunities)	Supplemental Values
Cold Springs Mountain (area outside existing WSA)	>5,000 acres	Yes	Fish and Wildlife Resources (cutthroat trout, elk). Cultural Resources (potentially regionally significant rock art and other cultural values). Other Resources (portions of Limestone Ridge and Irish Canyon ACECs, visual resource values, Sensitive Plants and plant communities)
Cross Mountain (areas outside existing WSA)	<5,000 contiguous acres	No, size criterion is not met	N/A
Diamond Breaks (area outside WSA)	>5,000 acres if Utah portion included	No, naturalness criterion is not met	N/A
Dinosaur Adjacent (areas outside existing WSAs)—Wild Mountain	>5,000 acres if Utah portion included	Yes	No
Dinosaur Adjacent (areas outside existing WSAs)—Chew Winter Camp North	>5,000 acres	Yes	No
Dinosaur Adjacent (areas outside existing WSAs)—Tepee Draw	>5,000 acres	Yes	Visual resources (high-quality view sheds)
Dinosaur Adjacent (areas outside existing WSAs)—Vale of Tears North	>5,000 acres	Yes	Visual resources (high-quality view sheds)
Yampa River (areas outside SRMA only)	<5,000 contiguous acres	No, size criterion is not met	N/A
Pinyon Ridge (LSFO-managed portion only)	<5,000 contiguous acres	No, size criterion is not met	N/A

3.1.12.3 Areas of Critical Environmental Concern

An ACEC is defined in the FLPMA (Public Law 94-579, Section 103(a)) as an area within the 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 and safety from natural hazards. BLM prepared regulations for implementing the ACEC provisions of FLPMA. These regulations are found at 43 CFR 1610.7-2(b).

There are currently four ACECs within BLM-administered lands of the RMPPA, totaling 20,910 acres (Map 3-28). The size of each area and the values it is designed to protect are listed in Table 3-26. The values for which these four ACECs were designated are still present and require continued management attention.

Current Conditions

Table 3-26. Areas of Critical Environmental Concern

ACEC	Area (acres)	Values
Limestone Ridge (also designated as a Research Natural Area [RNA])	1,400	Remnant (relict) vegetation, Sensitive Plant Species, and scenic quality. RNA for high value elk winter range and important elk concentration area.
Irish Canyon	11,910	Remnant (relict) vegetation, Sensitive Plant Species, geological, cultural, and scenic quality
Lookout Mountain	6,950	Remnant (relict) vegetation, Sensitive Plant Species, and scenic quality
Cross Mountain Canyon	650	Sensitive Plant Species, threatened and endangered species, and scenic quality

Characterization

Restrictions that arise from an ACEC designation are determined at the time the designation is made and are designed to protect the values or serve the purposes for which the designation was made. In addition, ACECs are protected by the provisions of 43 CFR 3809.1-4(b)(3), which requires an approved plan of operations for activities (except casual use) under the mining laws. The Environmental Impact Statement (EIS) for the revised RMP will identify a reasonable range of alternatives that will include current management for these areas.

Increased use and surface disturbing activities (particularly OHV use) pose a threat to the relevant and important values in the Limestone Ridge ACEC/RNA, Irish Canyon ACEC, and Lookout Mountain ACEC. Recreation use in the Irish Canyon ACEC has resulted in damage to rock art sites, and the potential for mineral entry in the Lookout Mountain area could further threaten the ACEC values.

Current ACECs will be reevaluated as part of the RMP revision process. This process will determine whether the relevant and important values of each ACEC are still present and require continued special management attention, threats of irreparable damage to these values have been identified, and whether current management is sufficient to protect these values. Goals, standards, and objectives for each area will be identified, as well as general management practices and uses, including necessary constraints and mitigation measures (see BLM Manual 1613). This management direction should be adequate to minimize the need for subsequent ACEC management plans.

In addition to the reevaluation of existing ACECs, public and internal proposals to designate additional ACECs will be evaluated through the RMP revision process. Information on relevance and importance is actively sought during planning to aid the evaluation of potential ACEC areas. Evidence of relevance and importance may be derived from the judgment of qualified specialists or non-BLM sources, such as State historic or natural heritage programs (BLM Manual 1613.21B). Rare plants, animals, and communities are tracked by the Colorado Natural Heritage Program (CNHP) to monitor which are thriving, and which are rare or declining to target conservation towards those species and habitats in greatest need. Unless included on federal, State, or agency species lists, protections for rare plants and plant communities are discretionary; however, the information compiled by natural heritage programs can be useful in guiding natural resource management decisions, such as potential ACEC designations. All natural heritage programs track and rank rare species and habitats using the same scientific criteria, overseen by NatureServe. The classification scheme is a standardized ranking system that allows the natural heritage programs to target the most at-risk species and ecosystems for inventory, protection, research, and management. Species and ecosystems are ranked on the global (G), national (N), and subnational/State/province (S) levels. The basic ranks used to classify species and ecosystems are—

- **G/N/S 1.** Critically imperiled—Typically 5 or fewer occurrences, or fewer than 1,000 remaining individuals.
- **G/N/S 2.** Imperiled—Typically 6 to 20 occurrences, or between 1,000 and 3,000 remaining individuals.
- **G/N/S 3.** Vulnerable to extirpation—Typically 21 to 100 occurrences, or between 3,000 and 10,000 remaining individuals.
- **G/N/S 4.** Apparently secure—Usually more than 100 occurrences and more than 10,000 individuals.
- **G/N/S 5.** Demonstrably widespread, abundant, and secure—Typically more than 100 occurrences and more than 10,000 individuals.

BLM 6840 Manual requires that the State Directors designate BLM Sensitive Species and periodically review and update their listing. In coordination with State agencies that are responsible for fisheries, wildlife, and botanical resources, and State Natural Heritage programs, provisions for the conservation of those Special Status Species must be ensured. The objectives from approved recovery plans and conservation agreements should be incorporated in land use plans and subsequent activity and interdisciplinary level plans.

Heritage program lists of rare plants and plant communities are available from the Colorado Natural Heritage Program (<http://www.cnhp.colostate.edu/>).

Current ACECs Within the Little Snake Field Office

Limestone Ridge ACEC

Limestone Ridge was designated as a Natural Area by the Colorado Natural Areas Program in 1990. Sites qualify as Colorado Natural Areas when they contain at least one unique or high-quality feature of statewide significance: native plant communities, geologic formations or processes, paleontological localities, or habitat for rare plants or animals. Limestone Ridge supports a cross section of Great Basin vegetation types in excellent condition, including three high-quality native plant communities which are now rare in Colorado: curlleaf mountain mahogany woodlands, pinyon-juniper woodlands with native bunchgrass understory, and limestone barrens communities. The limestone barrens contain cushion plants that are more typical of alpine environments, here occurring at lower elevations on rocky barrens of limestone substrate. The regional endemic *Penstemon yampaensis* (Yampa beardtongue) is also found here. The ridge itself crowns the eastern end of Cold Spring Mountain, a large, relatively flat-topped

ridge which is an erosional remnant of the northeast limb of the Uinta anticline. The Mississippian limestone capping the ridge is more than 300 million years old (Colorado State Parks).

In addition to the *Penstemon yampaensis* (Yampa beardtongue) occurrence in Limestone Ridge ACEC, there are 22 other occurrences of this plant throughout the RMPPA. In addition to the two occurrences of *Cercocarpus ledifolius/Pseudoroegneria spicata* (mixed mountain shrublands) communities that occur in Limestone Ridge ACEC, there are two other occurrences in the RMPPA. In addition to the two occurrences of *Pseudoroegneria spicata phase Arenaria hookeri* (Western Slope grasslands) communities in Limestone Ridge, there is one other occurrence in the RMPPA. Besides the two occurrences of *Pinus edulis/Pseudoroegneria spicata* (Xeric Western Slope pinyon-juniper woodlands) communities in Limestone Ridge, there are four other such communities in the planning area. In addition to the one *Artemisia nova/Pseudoroegneria spicata* (Western Slope sagebrush shrublands) community in Limestone Ridge, there are nine other occurrences in the area managed by the LSFO.

Irish Canyon ACEC

Irish Canyon was designated as a Natural Area by the Colorado Natural Areas Program in 1990. Irish Canyon is an example of a beheaded stream valley; the stream in Irish Canyon was pirated by Vermillion Creek in early Pleistocene time, leaving a 1000-foot deep dry gorge. The canyon supports populations of several plant species of special concern: *Penstemon yampaensis* (Yampa beardtongue), *Parthenium ligulatum* (ligulate feverfew), *Cryptantha caespitosa* (tufted cryptanth), and *Eriogonum tumulosum* (woodside buckwheat). High-quality examples of northwestern Colorado plant communities are found on the floor and canyon walls, and Irish Lakes represent one of the few natural playa lakes in this part of the State. Rock art and other archaeological sites abound in the canyon (Colorado State Parks).

In addition to the two occurrences of *Penstemon yampaensis* (Yampa beardtongue) in Irish Canyon, there are 21 other such occurrences in the RMPPA. Besides the two occurrences of *Cryptantha caespitosa* (tufted cryptanth) in Irish Canyon, there are eight other occurrences in the planning area. In addition to the two occurrences of *Eriogonum tumulosum* (woodside buckwheat) in Irish Canyon, there are four other occurrences of this plant in the Field Office. In addition to the two occurrences of *Parthenium ligulatum* (ligulate feverfew) in Irish Canyon, there are four other occurrences in the RMPPA. The occurrence of *Trifolium andinum* (mountain clover) in Irish Canyon is the only such occurrence in the RMPPA. In addition to the one occurrence of *Cercocarpus ledifolius/Pseudoroegneria spicata* (mixed mountain shrublands) in Irish Canyon, there are three other occurrences of this plant community in the RMPPA. Besides the two occurrences of *Artemisia nova/Pseudoroegneria spicata* (Western Slope sagebrush shrublands) in Irish Canyon, there are eight other occurrences in the planning area. In addition to the two occurrences of *Pinus edulis/Cercocarpus ledifolius* (Mesic Western Slope pinyon-juniper woodlands) in Irish Canyon, there are two other communities in the Field Office. In addition to the two occurrences of *Pinus edulis/Pseudoroegneria spicata* (Xeric Western Slope pinyon-juniper woodlands) in Irish Canyon, there are four other occurrences in the RMPPA.

Lookout Mountain ACEC

Irish Canyon was designated as a Natural Area by the Colorado Natural Areas Program in 1990. Lookout Mountain is an excellent example of an isolated, flat-topped erosional remnant of a once-extensive Tertiary alluvial plain. Some 26 million years ago, much of Colorado was a relatively flat plain, the surface of which is preserved in these types of remnants. The mountain is capped by the Bishop Conglomerate, made up of flood and mudflow deposits derived from the Uinta Mountains to the northwest. The site contains high-quality cold desert shrublands and pinyon-juniper woodlands. Populations of three plant species of special concern are also found in the alluvial gravels that cap the mountain: *Astragalus detritalis* (debris milkvetch), *Cryptantha caespitosa* (tufted cryptanth), and

Townsendia strigosa (strigose Easter-daisy). The site provides a panoramic vista of much of northwestern Colorado, as well as of the colorful badlands formed of Green River and Wasatch shales at Vermillion Bluffs (Colorado State Parks).

In addition to the occurrence of *Cryptantha cespitosa* (tufted cryptanth) on Lookout Mountain, there are seven other such occurrences in the RMPPA. The only occurrence of *Townsendia strigosa* (strigose easter-daisy) is on Lookout Mountain. All three occurrences of *Astragalus detritalis* (debris milkvetch) in the planning area are on Lookout Mountain. There is one other occurrence of *Artemisia tridentata* ssp. *wyomingensis*/*Pseudoroegneria spicata* (Xeric sagebrush shrublands) besides the one community on Lookout Mountain. In addition to the one occurrence of *Pinus edulis*/*Pseudoroegneria spicata* (Xeric Western Slope pinyon-juniper woodlands) on Lookout Mountain, there are five more of these plant communities within the RMPPA. Besides the one *Atriplex confertifolia*/*Pseudoroegneria spicata* (cold desert shrublands) occurrence on Lookout Mountain, there are 10 other occurrences in the planning area.

Cross Mountain Canyon ACEC

Cross Mountain Canyon ACEC lies completely within the Cross Mountain Canyon WSA. The 1989 Little Snake RMP did not specify how WSAs were to be managed if released by Congress. Therefore, the ACEC was designated as an extra layer of protection for the canyon if WSA protections were removed.

Cross Mountain Canyon was designated as a Natural Area by the Colorado Natural Areas Program in 1990. Cross Mountain Canyon is a classic example of an exhumed horst cut by a superimposed stream. This block of ancient sedimentary rock was folded, broken, and uplifted during the formation of the Uintah Mountains in the early Tertiary period. These mountains were eventually worn down and buried in their own debris, then were again uncovered or exhumed by erosion as a new round of uplift began about 10 million years ago. In the meantime, the Yampa river had established its modern course, and as the land rose, the river cut a deep canyon and exposed the structure of the mountain. Vertical cliffs of Mississippian Madison Limestone rise to over 200 feet high in the canyon, which is bounded on the west by a well-exposed fault zone. Two rare plant species: *Penstemon yampaensis* (Yampa beardtongue) and *Cirsium ownbeyi* (Ownbey thistle) and four endangered fish species occur in the canyon of the Yampa at this site. Peregrine falcons may nest on the cliffs (Colorado State Parks).

In addition the one occurrence of *Penstemon yampaensis* (Yampa beardtongue) in Cross Mountain Canyon, there are 22 other such occurrences in the RMPPA. The only occurrence of *Cirsium ownbeyi* (Ownbey thistle) in the planning area is within Cross Mountain Canyon.

3.1.12.4 Wild and Scenic Rivers

The National Wild and Scenic Rivers System (NWSRS) was created by the Wild and Scenic Rivers Act of 1968. The purpose of the act was to preserve in their free-flowing condition, selected rivers of the nation, which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. Rivers are evaluated based on the presence of outstandingly remarkable values (ORV), which include scenic, fish, recreation, wildlife, geologic, historic, cultural, or ecological values. A river must have one or more ORVs to be eligible for inclusion in the NWSRS. Each value must be directly river-related (i.e., occurring within 0.25 miles of the river's high watermark), exhibit rare and unique or exemplary values within the geographic region, and be determined to be regionally or nationally significant.

Current Conditions

The Nationwide Wild and Scenic Rivers Inventory lists the Yampa River between the Williams Fork River and Dinosaur National Monument as potentially eligible for designation. Currently, there are no river segments within the RMPPA that have been through the Wild and Scenic River (WSR) review process. The 1989 Little Snake RMP did not include a Wild and Scenic River study, which was the subject of protest by the Colorado Environmental Coalition. BLM committed to conduct the Wild and Scenic River study in response to this protest. BLM resource specialists conducted a technical analysis in 1991, in which 181 stream segments in the RMPPA were inventoried and analyzed for potential eligibility. Seven stream segments on the Yampa River and one stream segment on the Little Snake River were found to be potentially eligible. Tentative Wild and Scenic classifications were identified with input from a River Advisory Group consisting of special public interest groups and the general public.

The LSFO planned to proceed with the final part of the Wild and Scenic River study—the suitability analysis and report preparation. Funding was requested for completion of the study, but was not made available until the current RMP revision was initiated. Interim protection on BLM lands for the potentially eligible portions of the Yampa and Little Snake Rivers identified in the previous study was provided in the 1989 Little Snake RMP (“no adverse effects on outstandingly remarkable values or modification of free-flowing characteristics”) (BLM 1989).

BLM policy now requires Wild and Scenic River studies as part of the RMP process. An ID team met in February 2005 to review previous Wild and Scenic River study information, and to update available information on rivers in the LSFO area. To determine eligibility, BLM inventoried all potentially eligible rivers, which included all rivers nominated by the public or included in the Nationwide Rivers Inventory. All rivers within the planning area were mapped and reviewed by the ID team to identify any additional rivers that could possess values that might make them potentially eligible for inclusion in the NWSRS. As part of the current review, BLM also reviewed the preliminary eligibility and classification findings from the 1991 preliminary Wild and Scenic River study. The conclusions of the 1991 study were found to be largely sufficient to include in an eligibility report; however, LSFO staff visited several segments within the RMPPA to determine if ORVs were present. Based on this review of potentially eligible rivers or river segments, the ID team established preliminary Wild and Scenic River eligibility determinations for Beaver Creek (1 segment), Vermillion Creek (1 segment) and the Yampa River (3 segments) river segments. These river segments have been tentatively classified as either Wild, Scenic, or Recreational (Table 3-27; Map 3-29).

Table 3-27. Tentatively Eligible Wild and Scenic River Segments and Classification

Segment	Size	Classification	Values
Beaver Creek segment 1: State land boundary in T.11N, R.103W, Section 10 to the Utah Border	5.0 miles (4.2 miles BLM, 0.8 miles State Land Board [SLB])	Wild	Fish population (Colorado River Cutthroat Trout)
Lower Vermillion Creek segment 1: BLM boundary in T.9N, R.101W, Section 2 to Bluehill Road/Sparks Fault	3.9 miles (2.9 miles BLM, 1.0 miles SLB)	Scenic	Cultural (petroglyphs), geology (canyon formation)
Yampa River segment 1: Williams Fork area to Milk Creek area	9.7 miles (4.3 miles BLM, 5.4 miles private)	Recreational	Fish population (pikeminnow) and recreation (boating)

Segment	Size	Classification	Values
Yampa River segment 2: Milk Creek area to Duffy Tunnel area	15.9 miles (15.9 miles BLM)	Scenic	Fish population (pikeminnow) and recreation (boating)
Yampa River segment 3: East side of Cross Mountain Canyon to West side of Cross Mountain Canyon	3.3 miles (3.3 miles BLM)	Wild	Fish population (pikeminnow), recreation (boating), geologic (rare sediments, lithology and stratification), and scenic (canyon views)

A *Draft Wild and Scenic Rivers Eligibility Report* was completed in May 2005 and was subject to a public comment period. The final report is included as Appendix D. The Final Eligibility Determination of Wild and Scenic Rivers for the BLM LSFO is the basis for the suitability determination, which occurs through the RMP/EIS process. Final determination and recommendation of rivers suitable for inclusion in the NWSRS will be identified as a management action in the *Little Snake Resource Management Plan and Record of Decision* (1989). Rivers identified as suitable will then be managed to protect identified ORVs until Congress either approves or rejects the recommendation for their inclusion in the NWSRS. Only Congress can designate a Wild and Scenic River. Decisions in the RMP simply identify segments that are suitable for inclusion in the system, and provides for management to preserve the values that made them eligible.

Characterization

Section 5(d) of the Wild and Scenic Rivers Act directs federal agencies to consider the potential for national wild, scenic, and recreational river areas in land use planning documents. A Wild and Scenic River review will be conducted as part of the RMP revision process. The analysis will inventory all stream segments in the RMPPA that meet the following criteria to determine if there are ORVs that would make the river segment eligible for further consideration as a Wild and Scenic River segment: (1) contain regular and predictable flows (in normal water years), (2) are free-flowing, (3) are derived from naturally occurring circumstances, and (4) are not ephemeral. The EIS for the revised RMP will include a reasonable range of alternatives that identify which eligible river segments should be recommended as suitable for inclusion into the NWSRS. During the suitability process, consideration was given to the amount of private land involved, and associated or incompatible with uses.

River-based activities are a major component of the recreation program and offer a unique recreation opportunity in the RMPPA. There is an increasing risk of eliminating these recreation opportunities because of development along waterways within the RMPPA. Determining the eligibility and suitability of potential Wild and Scenic River segments is critical in protecting the ORVs of certain streams and rivers within the RMPPA.

3.1.13 Visual Resources

Visual resource management (VRM) provides a mechanism for protecting the visual setting of the RMPPA, while allowing for other uses. Protecting the visual resources within the RMPPA is important because the area’s scenery is valued by users and can be negatively affected by some resource uses. Human-caused changes to the geologic and biotic features of the landscape can also add to or detract from the scenic value of the area. FLPMA requires that the public lands be managed in a way that will protect the quality of scenic values. Levels of management vary by area, resource, and use.

3.1.13.1 Current Conditions

Although the RMPPA is still largely undeveloped, range improvements and oil and gas developments in the past 15 years have changed much of the scenery. About 226 wells have been constructed on BLM-administered lands in the last 20 years. Most oil and gas developments have occurred in more concentrated areas where the potential for economically recoverable mineral resources is high. Nine major right-of-way (ROW) corridors exist within the RMPPA (page 32–33 of the 1989 Little Snake ROD). Range improvements, such as fencing and water developments, have occurred across the RMPPA. Highway 40 extends east-west through the towns of Steamboat Springs, Hayden, Maybell and Craig, and Highway 13 extends north-south through the town of Hamilton. Several communication sites exist on mountain tops in the RMPPA. There are currently no wind, solar, geothermal, or biomass facilities on BLM-administered lands within the RMPPA.

The landscape consists of open rolling hills and desert in the lower elevations of the western portion of the RMPPA, while forested mountainous landscapes characterize the higher elevations to the east. Based on recent field observations and the 1979 Visual Resource Inventory, the landscapes vary greatly within the RMPPA and are described physiographically. The landscape types consist of mountains, ridges, narrow valleys, canyons, mesas, rolling hills, broad valleys, river valleys, basins, reservoirs, and badlands. The following are brief narrative descriptions of the general landscape types that make up the visual resources of the RMPPA:

- ❑ Moderate to steeply sloping land at higher elevation levels generally characterizes the mountains within the RMPPA. High alpine ridges, broken talus slopes, and smooth undulating slopes are all common to the mountainous terrain. North-facing slopes tend to be densely forested with mixed alpine conifers and aspen, while south-facing slopes support somewhat less dense stands of conifers and aspen with pinyon-juniper on the dryer aspects.
- ❑ Ridges, narrow valleys, and rolling hills of intermediate elevation are located above the valley floors and below the mountains. Ridges and narrow valleys are characterized by moderate to steeply sloping land that crests in sharply angular ridgelines. Significant rock outcrops could be present along many of the slopes. Between these ridges are numerous steep-walled valleys that have been formed by intermittent streams that drain the area from west to east. Conifers and aspen are confined to northern aspects and higher elevations. Sagebrush, grasslands, and scrub oak are commonly found on lower slopes and southern aspects.
- ❑ The upland rolling hill environments situated at the base of the mountainous areas have a variety of vegetation types and patterns. Random patterns of aspen, mixed conifers, and grasslands are typical along the hillsides, while the small valley bottoms between these hills contain small water features in the form of ponds and intermittent streams. Vegetation is diverse within these wetter valley floors. The lowland rolling hills are dominated by grass and sagebrush or pinyon-juniper, depending on slight elevational differences, and differ from the upland rolling hills because the vegetation throughout is uniform. Because of the low profile of this vegetative cover, views are generally more expansive within the lowland rolling hill landscapes.
- ❑ Several canyons in the RMPPA are characterized by nearly vertical, precipitous walls exhibiting a variety of geological formations. Flowing rivers or streams generally bisect the canyon floors and are visually dominant elements within the canyons. Vegetation is mostly made up of coniferous species, which vary in density with the steepness of the canyon walls.
- ❑ Broad valleys of wide, open expanses of relatively flat to gently sloping lands are commonly used for agricultural activities, which also make use of the many small streams draining this landscape. Vegetation is diverse along the immediate stream corridors offering interesting patterns, textures, and colors to the area. Outside the direct influence of the stream corridor, vegetation consists primarily of grass and sagebrush. Basin landscapes are similar to broad valleys, but are much larger in scale and

comprise an entire watershed. Basins have moderate to gentle slopes, no outstanding landform features, and vegetation primarily consisting of grass and sagebrush.

- ❑ Major rivers, such as the Yampa River, are dominant scenic resources within the RMPPA. Land associated with a major river corridor is referred to as a “river valley” and contains a great diversity of vegetation as a result of the dominant water feature. Agricultural activities are common, taking advantage of the water supply and flat valley floor.
- ❑ Major water bodies in the form of reservoirs or ponds are commonly used for recreation or agricultural activities. These water bodies offer a variety of visual experiences and uses, especially if they are dominant water features.
- ❑ Mesas are extensive flat land areas that have been formed by streams. Typically, these mesas are independent of other mesas, separated by stream corridors. Dominant vegetation consists of grass and sagebrush with scattered stands of pinyon-juniper associations.
- ❑ Badland formations are characteristically areas where sandstone, claystone, mudstone, and shale have been exposed through erosion. Diverse colors and topography are characteristic of these areas and significantly contrast with the surrounding landscapes. Limited, if any, vegetation exists within these areas, which highlights the intense colors and contrast between this and adjacent landforms.

The BLM’s VRM system is a planning tool that helps ensure actions taken on the public lands today will benefit the visual qualities associated with the landscapes described above, while protecting these visual resources for adjacent communities in the future. The current visual resource inventory (VRI), developed in 1979 for the RMPPA, is incomplete and outdated. Because the VRI incorrectly reflects the WSA classification, it does not help protect the visual integrity of these areas. The VRI is currently being used as a mitigation tool after activities have been approved, rather than a tool in the planning and management of visual resources. The VRI is an insufficient guide for decisionmaking and does not protect the visual resources or prevent impacts on the landscape.

3.1.13.2 Characterization

BLM-administered lands are placed into one of four visual resource inventory classes, which represent the relative value of the visual resources. Classes I and II areas are the most valued, Class III represents a moderate value, and Class IV areas are of least value. The inventory classes provide the basis for considering visual values in the RMP process. Once the inventory classes are assigned to specific areas, each will serve as an indicator for visual quality and a baseline measurement for scenic values. This is a method of evaluating a proposed activity’s visual contrast with the existing landscape characteristics.

Visual quality as a factor in land use decisionmaking prevents environmental degradation and maintains important resource values. Public perception of and concern for visual resources is critical in land use planning. The visual characteristics of the RMPPA is valuable to a spectrum of users and sightseeing travelers. Designation and management of VRM classes allows BLM to control surface disturbing uses in a manner consistent with natural features and existing uses throughout the RMPPA.

VRM classes are assigned to areas based on the combination of scenic quality, visual sensitivity, and distance zones. VRM classes I through IV range from completely natural landscapes to landscapes containing extensive human modification. Visual values are considered throughout the planning process, and the area’s visual resources are assigned to management classes with the following established objectives:

- ❑ **Class I Objective.** To preserve the existing characteristics of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention.
- ❑ **Class II Objective.** To retain the existing characteristics of the landscape. The level of change to the characteristic landscape should be low.

- ❑ **Class III Objective.** To partially retain the existing characteristics of the landscape. The level of change to the characteristic landscape should be moderate.
- ❑ **Class IV Objective.** To provide for management activities that require major modification of the existing characteristics of the landscape. The level of change to the characteristic landscape can be high.
- ❑ **Rehabilitation Areas Objective.** Areas in need of rehabilitation should be flagged during the inventory process. The level of rehabilitation will be determined through the RMP process by assigning the VRM class approved for that particular area.

Management of VRM in WSAs could differ from management direction included in the 1989 Little Snake RMP. The BLM's VRM manual stipulates that Class I covers special areas in which the management situation requires a natural environment essentially unaltered by man. This definition addresses WSAs.

The trend for impacts on visual resources within the RMPPA is increasing because the VRM is outdated and incomplete, and as a result of increased use of RMPPA resources. The BLM planning regulations require the development of VRM objectives. For example, the visual classification of the WSAs within the RMPPA will be appropriately designated to reflect their scenic values; thus, management will adapt to protect these areas with quality visual characteristics. Management changes could also occur where areas of high-quality scenic value intersect an area with a high demand for OHV use. These areas would have to be managed appropriately to balance both recreation and visual resource protection. Because changes in resource conditions could occur in the RMPPA, and visitors could have developed increased sensitivity to visual contrasts and landscape changes, the entire RMPPA is in need of a contiguous set of VRM assessments and designations.

VRM assessment and management will be evaluated during the RMP revision process to ensure compliance with current VRM guidelines established by BLM, and to better manage the visual resources within BLM-administered lands of the RMPPA.

3.1.14 Geology

The RMPPA is located in the northwest corner of Colorado within a diverse geological setting. These geologic features affect the surface topographic features, soils, and hydrologic system. In addition, this geological variability (structural and stratigraphic) forms an ideal situation for the accumulation of fluid and nonfluid mineral resources. Exposed rocks in the RMPPA are mostly sedimentary, but few metamorphic and igneous rocks are present in the eastern part of the RMPPA. Distribution of fluid and nonfluid minerals resources in the RMPPA is controlled by the geological characteristic, conditions, and trends of these features, which will influence the planning issues and the management actions for the area.

3.1.14.1 Current Conditions

The main tectonic and geographic features in the RMPPA (shown in Figure 3-13; Tweto 1979) include the Uinta Mountains, Sand Wash Basin, Axial Basin Uplift, Piceance Basin, Douglas Creek Arch, White River Plateau, and Grand Hogback Monocline. The Park Range forms the extreme eastern boundary of the RMPPA. The elevation ranges from 14,000 feet in the Sawatch Range to 4,400 feet where the Colorado River flows out of the northwest portion of Colorado. Figure 3-14 shows the generalized geologic stratigraphic columnar section in the RMPPA.

Geologically, the area is defined by the Southern and Middle Rocky Mountains, Wyoming Basin, and the Colorado Plateau provinces (Figure 3-15; Fenneman and Johnson 1946). The Axial Basin Uplift in Moffat County connects the Southern Rocky Mountains with the Uinta Mountains (Middle Rocky

Mountains Province). The Piceance Basin, which occupies a small area of southern Moffat County and northern Rio Blanco County in the RMPPA, is within the Colorado Plateau Province. The Sand Wash Basin is the dominant geological feature in the RMPPA and is the southern most extension of the Greater Green River Basin of the southwestern Wyoming Basin. Rocks of Precambrian to the Cenozoic with a diverse lithology and complex structural patterns are present in the RMPPA. Cambrian through Tertiary age rocks are about 30,000 feet thick, of which 11,000 feet is clastic sediments of Cretaceous age rocks. Table 3-28 lists the geologic eras and periods represented in the RMPPA by era.

Table 3-28. Geologic Time Scale in the Little Snake Resource Management Plan Planning Area

Geologic Era	Geologic Period	Time Period (millions of years ago)	Geologic Activity and Importance
Precambrian		545–4500	During the Precambrian era, the Cordilleran miogeosynclinal belt extended into the northwestern portion of Colorado where a maximum of 20,000 feet of sediments were deposited in the trough in Utah and northwest corner of Colorado.
Paleozoic	Cambrian	490–545	A shallow shelf was covering much of northwest Colorado
	Ordovician	443–490	
	Silurian	417–443	Experts continue to debate whether northwestern Colorado was a land area or a shallow epicontinental sea (Chronic and Ferris 1961) during this period.
	Devonian	354–417	Pre-Devonian episodes of uplift and erosion preceded the deposition of the early Devonian sediments. Pre-Devonian erosional cycles have removed the Middle and Upper Ordovician Rocks. The late Devonian period is characterized by a second phase of advancement of the sea from the west and deposition of carbonate sediment in a shallow marine environment.
	Mississippian	323–354	This period is represented by a continuous carbonate deposition over a wide area that has been subject to early Devonian erosion. During the middle to early late Mississippian time, the sea withdrew from the area and extensive erosion and weathering occurred; however, the late Mississippian period is marked by an advancement of sea and extensive deposition of Mississippian sediment in northwest Colorado.
	Pennsylvanian	290–323	The early Pennsylvanian period is known for extensive tectonic activities in the area. The Front Range and Uncompahgre Plateau positive areas were providing the clastic debris to the area, especially to the Colorado trough; however, early Pennsylvanian limestone and dark shale sedimentation followed by evaporites and red clastic sediments.
	Permian	251–290	During the late Pennsylvanian and early Permian time, red clastic, conglomerates, and sandstone were deposited in the area. Limestone deposits are also known to have been deposited during the Permian time. Upper Pennsylvanian-Permian Weber Sandstone is a major hydrocarbon producing formation in the RMPPA.

Geologic Era	Geologic Period	Time Period (millions of years ago)	Geologic Activity and Importance
Mesozoic	Triassic	206–251	The Uncompahgre Plateau and Front Range remained positive during the early to middle Triassic. Red beds of early Triassic sediments indicate widespread continuous sedimentation in the area; however, middle Triassic sediments are absent, and the upper Triassic sediments rest unconformably over the early Triassic sediments in the area. The Lower Triassic Moenkopi and Shinarump Formations are also major hydrocarbon producers in the RMPPA.
	Jurassic	144–206	The widespread late Triassic sedimentation continued into the early Jurassic period. Early to middle Jurassic sediments are of eolian and alluvial nature until the late Jurassic period where marine embayment extended into northwest Colorado from the north. Entrada and Morrison Formations (lenticular sandstone) of the middle and Upper Jurassic age are the major oil producer in the area.
	Cretaceous	65–144	During the late Jurassic and early Cretaceous period, the entire area was covered by continental sediments. Lower Cretaceous Dakota sandstone is the primary natural gas producer in the RMPPA. The late Cretaceous is marked by a retreat of sea to the east and north. The area was covered by deltaic sediments. Cretaceous rocks are the thickest known sedimentary unit in the RMPPA. Middle Cretaceous fracture shales of Mowry and Mancos formations are known to have produced high API gravity oil in northwest Colorado; however, Upper Cretaceous Mesa Verde, Lewis, and Lance formations are the main natural gas objectives of exploration in the RMPPA, especially in the Sand Wash Basin. In addition, the Upper Cretaceous Mesa Verde formation is the main coal producer in the RMPPA.
Cenozoic	Tertiary	1.8–65	Laramide orogenic activity created the present structural feature of the northwest portion of the Colorado during the Tertiary period. In general, nonmarine sediments dominated the areas in northwest Colorado. Paleocene and Lower Eocene Fort Union and Wasatch formations are also shallow natural gas producers in northern Moffat County within the Sand Wash Basin Areas. The Tertiary period Browns Park Formation is the major source of uranium in the area. The Eocene epoch Green River Formation in the Piceance Basin portion of the Little Snake RMPPA contains high gravity oil that is classified as an oil shale. Times of intense structural deformation in the area occurred during the Eocene and post-Eocene epoch during the Tertiary period.
	Quaternary	Present–1.8	Igneous intrusions and lava flow covered portions of the RMPPA, especially in the areas of the eastern Sand Wash Basin and Elk Mountain during the Tertiary and Quaternary periods.

Source: Fenneman 1931; Chronic and Ferris 1961; Haun 1962; and Irwin 1986.

The trend of regional structural features in the RMPPA is northwest-southeast; however, major, large-scale features have north-south orientations that intersect the regional structures and form a very complex pattern. These complex structural patterns are favorable locations as hydrocarbon traps in the RMPPA.

An array of minerals resources is produced as a result of geologic activity in each geologic era and period. Triassic (Shinarump and Moenkopi formations), Cretaceous (Mancos, Dakota, Lance, Lewis, and Mesa Verde formations), and Lower Tertiary (Green River, Wasatch, and Fort Union formations) age rocks provide the best sources of oil and gas production in the eastern part of the Sand Wash Basin. Upper Cretaceous (Mesa Verde, Lewis, and Lance formations), Lower Tertiary (Fort Union and Wasatch Formation), and Upper Jurassic (Entrada, Curtis, and Morrison formations) age rocks provide the best sources of oil and gas production in the western part of the Sand Wash Basin. Oil and gas resources in the Piceance Basin are primarily from Cretaceous and Jurassic age rocks with minor amounts of Triassic and Mississippian and Pennsylvanian rocks. Coal in the RMPPA occurs mainly in Upper Cretaceous age rocks (Williams Fork and Iles formations) and to a lesser degree from Cenozoic age rocks (Wasatch and Fort Union formations). The Sand Wash Basin has extensive coal resources in Upper Cretaceous age rocks (Williams Fork Formation and Lance Formation) and the Lower Tertiary age rocks (Fort Union Formation). Oil shale deposits occur within Middle Eocene age rocks of the Tertiary period (Green River Formation). Uranium is found in Miocene age rocks of Tertiary period (Browns Park Formation)

3.1.14.2 Characterization

The geological setting and present topographic features in the RMPPA were formed as part of large-scale, regional geological activities that took place several million years ago. To understand the local geology of the RMPPA, regional geological activities were used to characterize the local structure and stratigraphy of the area. Related, well-known geological activities from the surrounding States, specifically Wyoming and Utah, were used in analyzing the local geology of the area. The major geological features of the RMPPA would not change unless more regional-scale activities occurred in the area.

Human, resource, or land use activities in the RMPPA are not expected to affect the general geology and structural features; however, resource development activities, such as road construction, drilling location pads, pipeline construction, and production facilities (e.g., compressor stations) will cause minor disturbances and alternation to the land surface, but will not cause major changes to the topographic characteristic of the RMPPA. The discharge of produced water from drilling activities could also alter the flow rates of this system. See Appendix B, Produced Water, for a complete analysis of produced water content and effects. None of the above factors would change the local or regional geological characteristics of the area.

3.2 CURRENT RESOURCE USE CONDITIONS AND TRENDS

Resource uses involve activities that use the natural, biological, and cultural components of the RMPPA. Resource uses in the RMPPA include energy and minerals, livestock grazing management, recreation, forest products, lands and realty, and transportation and access.

3.2.1 Energy and Minerals

Energy and minerals are discussed in three separate subsections to describe fluid and nonfluid minerals:

- **Leasable minerals** include oil and gas, coal, geothermal resources, oil shale, phosphate, helium, trona, and sulfate. Leasable minerals are governed by the Mineral Leasing Act of 1920, as amended, which authorized specific minerals to be disposed of through a leasing system.
- **Locatable minerals** include stratabound gold, copper-gold deposits, diamonds, gems, semiprecious stones, limestone, zeolite, uranium, bentonite, gypsum, and titaniferous magnetite. Locatable minerals can be located and claimed under the Mining Act of 1872.

- **Mineral materials** include sand and gravel, limestone aggregate, building stone, moss rock, cinders (clinker), clay, decorative rock, and petrified wood. Mineral materials are sold or permitted under the Mineral Materials Sale Act of 1947.

3.2.1.1 Leasable Minerals

Leasable minerals discussed in this subsection include conventional oil and gas, coalbed methane (CBM), coal, oil shale, and renewable energy resources. Leasable minerals are governed by the Mineral Leasing Act of 1920, as amended, which authorized specific minerals to be disposed of through a leasing system. Existing mineral leases for oil, gas, and coal are shown on Maps 3-30 and 3-31. Oil and gas occurrence potential is shown on Map 3-32. State Land Board mineral and surface ownership and leases is shown on Map 3-33.

Oil And Gas

The Energy Policy and Conservation Act Amendments (EPCA) of 2000 (Public Law 106-469) directed the Department of the Interior (DOI) to conduct an inventory of oil and natural gas resources beneath federal lands. The act also directed DOI to identify the extent and nature of any restrictions to their development. Executive Order 13212 (May 18, 2001) stated that "...agencies shall expedite their review of permits and take other action as necessary to accelerate the completion of [energy-related projects] while maintaining safety, public health, and environmental protections. The agencies shall take such actions to the extent permitted by law and regulation, and where appropriate." As a result, the DOI, USDA, and the Department of Energy (DOE) released a report, *Scientific Inventory of Onshore Federal Lands' Oil and Gas Resources and Reserves and the Extent and Nature of Restrictions or Impediments to their Development* (referred to as the "EPCA inventory") in January 2003. Based on the EPCA inventory, BLM designated seven EPCA Focus Areas to concentrate BLM efforts and resources to meet the President's National Energy Policy. BLM is integrating the results of the EPCA inventory into RMPs and reasonably foreseeable development (RFD) scenarios.

Current Conditions

Two of the seven EPCA Focus Areas are partially found within the RMPPA—the Greater Green River Basin (Sand Wash Basin within the LSFO) and the Uinta-Piceance Basin (Piceance Basin within the LSFO). The Greater Green River Basin, which extends from Wyoming into most of Moffat and Routt Counties (known as Sand Wash Basin in Colorado), has the greatest potential for oil and gas resource development with a cumulative sedimentary rock thickness of more than 20,000 feet. There are 62 oil and gas fields in the RMPPA. Production from the eastern part of the Sand Wash Basin in Routt County is shallow and small, and historically produces more oil than gas. Production from the western part of the Sand Wash Basin in Moffat County is much deeper and produces more gas than oil; however, with recent technological advancement, additional resources have been identified in deeper formations in the RMPPA. A portion of the Piceance Basin, which occupies a small area of the southern part of Moffat County, has the second largest potential for oil and gas resource development in the RMPPA; however, the reserve in the RMPPA has been reported as mostly unconventional resources.

As of July 2005, about 60 percent of BLM-administered surface, and more than 60 percent of federal mineral estate within the RMPPA is leased. There are currently 1,171 oil and gas leases administered by BLM within the RMPPA. During the past 20 years, 594 wells have been drilled in the RMPPA, of which 226 are on BLM-administered lands. On average, 30 wells have been drilled annually over the last 20 years. Most of this has been infill drilling within known oil and gas fields. About 30 percent of the 881 producing wells are oil producers, and about 70 percent are gas producers (BLM 2005).

Based on historical oil and gas development and production activities, leasing, and economic factors, about 3,031 wells are anticipated to be drilled over the next 20 years within the LSFO. About 96 percent of the projected 3,031 wells will be drilled in areas of high oil and gas occurrence potential (Map 3-32) (BLM 2005). Of the 3,031 wells that are projected, about 54 percent will be gas wells (both conventional and CBM), 20 percent oil wells, 20 percent dry holes, and 6 percent other types of wells (e.g., injection wells).

The baseline for projecting the number of oil and gas wells over 20 years is based on all potentially productive areas being open for leasing under the standard lease terms and conditions, except those areas designated as closed to leasing by law, regulation, or executive order; however, not all potentially productive areas are open for leasing, subject to standard lease, terms, and conditions (Map 3-33). Map 3-34 and Table 3-29 show oil and gas leasing categories found within the RMPPA.

Table 3-29. Oil and Gas Leasing Categories in the Little Snake Resource Management Plan Planning Area

Oil and Gas Leasing	Acres
Open to leasing, subject to standard terms and conditions	549,800
Seasonal Restrictions	1,162,040
CSU	116,210
No Surface Occupancy (NSO)	192,190
Closed to leasing	78,190

Based on the EPCA inventory oil and gas leasing categories, Map 3-35 and Table 3-30 show the current distribution of the RMPPA by category and cumulative timing limitations. The cumulative timing limitations are divided into the following four groups: less than 3 months (less than 1 percent of the BLM-administered mineral estate), 3 to 6 months (17 percent of the BLM-administered mineral estate), 6 to 9 months (42 percent of the BLM-administered mineral estate), and greater than 9 months (2 percent of the BLM-administered mineral estate).

Table 3-30. Percent of Little Snake Resource Management Plan Planning Area by EPCA Oil and Gas Leasing Category

Oil and Gas Leasing	Acres	Percent of BLM Administered Mineral Estate*
Open to leasing, subject to standard terms and conditions	549,800	29
Less than 3 months	13,240	1
3 to 6 months	317,230	17
6 to 9 months	802,600	42
Greater than 9 months	28,970	2
CSU	116,210	6
NSO	192,190	10
Closed to leasing	78,190	4

*Percentages do not add up to 100 percent due to overlapping timing limitations.

Using the estimated number of oil and gas reserves in the Western United States in the EPCA inventory, estimates were generated for barrels of oil and cubic feet of gas in the RMPPA for the leasing categories (Table 3-31). Based on information from the EPCA report, up to 61,497,000 barrels of oil, and 2,021,383 million cubic feet of gas would be available for leasing subject to standard terms and conditions. Up to 68,000 barrels of oil and up to 273 million cubic feet of gas would be in areas closed to oil and gas leasing, and up to 2,583,000 barrels of oil, and up to 62,550 million cubic feet of gas would be in nonrecoverable NSO areas.

Table 3-31. Proven Reserves and Undiscovered Technically Recoverable Resources

Alternative A	Acres	Total Liquids ^{1,2} (Thousands of Barrels)	Total Natural Gas ^{3,2} (Millions of cubic feet)
Open to leasing, subject to standard terms and conditions	549,800	61,497	2,021,383
Seasonal Restrictions	1,162,040	216,771	7,560,670
CSU	116,210	15,456	544,095
NSO	192,190	19,418	470,294
Recoverable NSO ⁴	163,630	16,835	407,744
Nonrecoverable NSO ⁵	28,560	2,583	62,550
Closed to leasing	78,190	68	273

¹Comprising oil, natural gas liquids (NGL), and liquids associated with natural gas reservoirs.

³Comprising associated dissolved and nonassociated natural gas.

²Estimate based on data from EPCA inventory, January 2003.

⁴Recoverable NSO is the area within the 0.25-mile internal buffer of an NSO area.

⁵Nonrecoverable NSO is the area beyond the 0.25-mile internal buffer of an NSO area.

Characterization

The indicators for oil and gas development include presence of proven oil and gas reserves (conventional and unconventional) within and adjacent to the RMPPA, similar geological settings, and geophysical activities related to searching for and identifying new or additional resources. About 3,031 additional oil and gas wells are projected over the next 20 years (BLM 2005). Large-scale geophysical activities have increased, specifically in the western portion of Moffat County. As of November 2004, two notices of intent (NOI) to conduct geophysical surveys (3-D seismic) in Moffat County have been approved by the LSFO. It is expected that about 40 large-scale 3-D seismic surveys will be conducted in the next 20 years within BLM-administered lands in the RMPPA; therefore, it is reasonable to expect that existing production areas could be expanded, and new reservoirs could be discovered.

For each well developed, an estimated amount of acreage would be disturbed. Average disturbances are 4 acres per drill pad, 12 acres per well pad for necessary roads, and about 0.24 acre per well pad for central facilities. Future gross surface disturbance from drilling and production activities is estimated to be 49,216 acres over 20 years. Future long-term surface disturbance is estimated to be 23,030 acres over 20 years. In addition to surface disturbance from drilling and production activities, 8,000 acres would be disturbed from seismic activities before reclamation; however, disturbances from seismic activities are temporary and BLM requires 100 percent reclamation on completion of the seismic survey; therefore, after reclamation, there would be no surface disturbance from seismic activities (BLM 2005).

Coalbed Methane

Coalbed methane is methane gas that can be extracted from coal seams. As a relatively new and major source of onshore natural gas in the United States, CBM production is very different from conventional oil and gas resources. Water permeates the coalbed and the pressure causes the methane to be absorbed into the grain surfaces of the coal. To produce CBM, the water must first be removed, which causes a pressure reduction that allows methane to be desorbed from the coal and flow to the well bore. Since most CBM is associated with coals at shallow depth, exploration, well drilling and completion, and production costs are considerably lower than for conventional deep gas production.

Current Conditions

Large quantities of CBM are available from coalbeds that underlie public lands in the RMPPA; however, there are currently no commercially producing CBM wells. Based on the U.S. Geological Survey report (Brownfield et al. 2004), there are three main potential CBM areas in the Little Snake RMPPA—eastern Sand Wash Basin, Lower White River, and Danforth Hill (Figure 3-16).

The eastern Sand Wash Basin area includes the Yampa Coal Field in the southeast corner of Moffat County and western portion of Routt County. Sand Wash Basin is the southern extension of the Greater Green River Basin of Wyoming, which has had proven CBM production fields for several years. Sand Wash Basin also has extensive coal resources in the Upper Cretaceous Williams Fork Formation, the Lance Formation, and the Lower Tertiary Fort Union Formation. These coals have gas content of less than 200 to 540 cubic feet per short ton (Kaiser and others 1993). It is estimated that the Sand Wash Basin has at least 101 trillion cubic feet of gas reserves at depths of less than 6,000 feet.

The Lower White River area is in the northern part of Rio Blanco County and south central part of Moffat County, and is within the Piceance Basin. The Piceance Basin is also one of the most prolific oil and gas basins in Colorado and has several productive CBM fields in operation. The producing CBM fields closest to the RMPPA are White River Dome and Pinyon Ridge, which are in the Lower White River area. The White River Dome field produces an average of 3,080 million cubic feet per day of gas and about 96 barrels of water per day (Johnson and Flores 1998) from the Williams Fork Formation (Upper Cretaceous age). The average well depth in this field is about 5,400 to 6,400 feet. The Pinyon Ridge Field also produces gas from the Williams Fork Formation at an average depth of 1,300 feet. The Danforth Hill area is in the southeastern portion of Moffat County and northern Rio Blanco County.

Seven CBM exploration or pilot projects (Meridian Oil and Marsh Drilling Company in 1989 and 1990; Cockrell Oil Corporation in the early 1990s; Phillips Petroleum in 2000, Yates Petroleum in 2002, and currently Patina Oil and Gas/CDX, Tipperary Oil and Gas Corporation and KLT Gas Inc.) have either been completed or continue to be explored and developed. The Iles, Williams Fork, and Fort Union formations are the formations of interest. Four of the projects are in Moffat County and three are in Routt County. Most of the wells drilled in these projects are fee wells. Reportedly, all of the projects have encountered large volumes of produced water with varying amounts of total dissolved solids. Much of the water is fresh enough for permitted surface discharge. For a complete analysis of produced water content and effects, see Appendix B, Produced Water.

Characterization

The indicators for CBM include geological information, coalbed thickness, depth of coal burial, wide geographical distribution, available pipelines, and proven production from the same formation in surrounding areas (Greater Green River Basin and Piceance Basin). Based on current data, it is likely that several CBM resource development projects will occur in the next 20 years. Based on current conditions,

it is anticipated that the well spacing would be 80 acres during the dewatering stage and 160 acres during production phase; however, the spacing requirements might change as additional data become available to evaluate the appropriate spacing requirement to capture the maximum efficiency in gas production.

There are currently no specific requirements established for CBM production within BLM-administered lands of the RMPPA. The surface disturbance associated with CBM development is combined with the surface disturbance from conventional oil and gas activities identified above.

Coal

Coal is classified by rank in accordance with standard specifications of the American Society for Testing and Materials (ASTM) D-388. There are four basic types of coal of economic value—anthracite, bituminous, subbituminous, and lignite. These four categories of coals vary according to hardness, density, heat value, and luster. Anthracite has the highest heat value and is the hardest of all four categories. Lignite, on the other hand, is less dense and has low heat value. Coal impurities such as sulfur, ash, moisture, and volatile contents are also important to its value. Colorado coal has the second highest quality (low impurity content) in the nation. Most of the Colorado coals are bituminous and subbituminous.

Current Conditions

Of the 12 active coal mines in Colorado, four are within the RMPPA (Table 3-32). Moffat and Routt Counties are the two leading coal-producing counties in the State, accounting for an annual production of about 16.50 million tons (2003 production Colorado Geological Survey's report). Coal in the RMPPA occurs mainly in the Upper Cretaceous Williams Fork and Iles formations and to a lesser degree in the Wasatch and Fort Union formations (Cenozoic age). The Green River Coal Region, which occupies most of Moffat County and the western portion of Routt County, is the largest coal-producing region in the RMPPA. Coal is also produced from the Danforth Hills and Lower White River areas within the Uinta Coal Region of the RMPPA. Most of the coals in the RMPPA are high-volatile bituminous to subbituminous (Trapper and Colowyo Mines) in rank and vary in bed thickness from 3 to 20 feet. The coal from the Green River Coal Region contains an average of 9.7 percent moisture, 36.4 percent volatiles, 9.0 percent ash, and 0.6 percent sulfur. BTU values range from 9,850 (Moffat County, Yampa Field) to 12,581 (Routt County, Yampa Field).

Table 3-32. Active Coal Mines in the Little Snake Resource Management Plan Planning Area¹

Mine name	County	Coal Field	Formation	Mine Type	Annual Production
Colowyo	Moffat	Danforth Hills	Williams Fork	Surface	4,988,615
Trapper	Moffat	Yampa	Williams Fork	Surface	1,854,061
Twentymile	Routt	Yampa	Williams Fork	Longwall underground	8,127,386
Seneca II-W, Yoast	Routt	Yampa	Williams Fork	Surface	⁽²⁾

¹ Inactive coal leases are inspected annually to assure their inactive status. BLM conducts quarterly inspection of active mines in the RMPPA to verify production.

² Data not available.

As of November 2004, there were 88 coal leases in the RMPPA (Map 3-31), of which 16 are contained entirely on privately owned lands. Accordingly, there is one inactive subsurface mine where the permit has been suspended (because of expiration), and there are two mines that are in the reclamation process

(Edna and Seneca #1). One lease by application (LBA) was filed in May 2004 by Peabody Energy Engineering Company for additional coal development in Routt County (Twentymile Mine, COC-67514). Presently, Peabody's LBA is in the review stage of lease approval. According to the LSFO, one new coal mine is expected to open in the near future; however, because of economic factors and reduction in coal thickness at the surface, two of the surface mines could change the nature of their operations and start producing coal using underground mining techniques.

Characterization

The indicators for coal resources include geological information (outcrop, maps, sedimentary depositional system, core samples, and geophysical log signature). The indicators show that there are significant coal reserves within the RMPPA. Routt and Moffat Counties account for more than 30 percent of the total coal produced in the State. According to the *Geological Assessment of Coal Resources and Coalbed Methane Potential of Northwest Colorado Report* (U.S. Geological Survey 2004), the following future coal potential development projections have been proposed for the RMPPA:

The Danforth Hills, Lower White River, and Yampa coal fields contain about 56 billion short tons of coal in beds greater than 1.2 feet thick and less than 3,000 feet of overburden (Figure 3-17).

There is a high potential for mining operations in the Lower White River Coal Field, and coal could be produced from two coal zones of Mesa Verde group formations. The Danforth Hills coal field has a very high potential for coal resources for surface coal development. Coal in this field is produced from Fairfield Coal Group of the Williams Fork Formation. The Yampa coal field is the most important coal producing area in Colorado. Future development potential is very high and expansion is expected to be underground using longwall technology. Coal from this field is produced from four coal zones of the Williams Fork formations.

The coal suitability analysis prepared for the 1989 Little Snake RMP was reviewed for adequacy as part of the RMP revision effort. Results of this review are detailed in Appendix C, Coal Suitability Review. Exploratory drilling or any other data gathering efforts to obtain additional information for resource management and economic analyses for the RMPPA may be considered on a case-by-case basis.

Oil Shale

Oil shale is one of the unconventional hydrocarbon resources in the U.S. where most of the resources are located in Western States, especially in Utah, Wyoming, and Colorado (Piceance Basin, Uinta Basin, and Sand Wash Basin). According to the DOE report, the total oil shale reserve in the U.S. is about 2 trillion barrels of oil. Of this total reserve, about 1 trillion barrels of oil is contained in the Green River Formation in Colorado, but only a small fraction of this reserve is in the RMPPA. About 78 percent of the surface acreage and 82 percent of the shale oil in place is administered by BLM. The most important factors in the economic evaluation and development of this resource include the deposit's grade (percent oil content per ton), impurities, such as sulfur, nitrogen and hydrogen contents, access to water supply, access to infrastructure, such as refinery, quality of oil (API gravity), oil price and recovery technology, the loss of liquids during processing, and environmental regulatory requirements (surface and ground water quality, reclamation, air quality, and ecological and health effect). In general, oil shale deposits are classified as low grade where recovery is about 15 gallons of oil per ton of shale, and classified as high grade where shale is at least 10 feet thick, and there is potential for recovery of 25 or more gallons of oil per ton of sediments.

Current Conditions

Oil shale deposits occur within the Green River Formation of the Middle Eocene sediments covering about 2,600 square miles of northwest Colorado (Burgh 1962). In the RMPPA, low-grade oil shale deposits are known in the Gray Hills of south-central Moffat and north-central Rio Blanco Counties and in sediments of the Sand Wash Basin in Moffat and Routt Counties. High-grade oil shale deposits are present in Piceance Creek Basin in northern Rio Blanco County and the south-central portion of Moffat County. Based on LSFO records, no oil shale development applications have been filed to date.

In the Little Snake RMPPA, oil shale occurs in the Laney Shale Member of the Green River Formation. The Laney Shale Member crops out over a large area in Moffat County in T.8N to 12N, R.96W to 100W. There are several zones of oil shale 50 to 100 feet thick in the Little Snake River area. Samples of the weathered oil shale yield 0.3 to 16.6 gallons of oil per ton of shale rock. Production of oil shale is unlikely at the present time because of the lower grade of the oil shale, the present extraction technologies, and interest in richer oil shale deposits to the south in the Piceance Basin, and to the west in the Uinta Basin. These oil shale deposits are considered richer deposits because of a much higher yield of gallons of oil per ton of shale rock.

The Oil Shale Withdrawals were revoked in two separate orders. The Oil Shale Classification Order No. 10 by USGS IN 1981 classified those lands that USGS felt had oil shale potential. The revocation was for most of the withdrawal on lands that did not meet USGS requirements by PLO 6387 published May 24, 1983, and effective June 21, 1983. Later, it was determined that because oil shale was leasable, the entire withdrawal could be revoked and oil shale managed by BLM without the withdrawal. This PLO 7516, published March 15, 2002, and effective April 15, 2002, revoked all the Oil Shale Withdrawals. The withdrawn lands in Moffat County were opened in 1983. A detailed legal description of the Oil Shale withdrawal area in the Little Snake RMPPA can be found in the 1981 USGS Oil Shale Classification Order No. 10, or in the PLO 6387 published in 1983.

Characterization

The indicators for oil shale include past and current oil shale development, pending or authorized applications, and development in neighboring areas with similar geography. It is estimated that about 1.5 trillion barrels of oil from oil shale deposits could be recovered from northwest Colorado (Burgh 1962); however, development of oil shale has been limited because of oil price, recovery technology, access to refineries, transportation infrastructure, process water requirements, access to land (public and private), and environmental regulatory requirements (air, surface and ground water, land reclamation and restoration, and ecological and health effect) (Bunger et al. 2004).

Renewable Energy Resources

Renewable energy resources include wind, solar, biomass, hydropower, and geothermal. Because the potential for development of biomass, hydropower, and geothermal resources are minimal in the RMPPA, these resources are not discussed in detailed in this plan; however, wind energy has a moderate chance of being considered in the RMPPA, and is therefore discussed in detail.

In recent years, DOI in conjunction with DOE, USDA, and the Department of Defense (DOD) has developed an interim policy to comply with the requirement for wind energy regarding NEPA compliance. This policy development is in response to the NEPA requirements and the nation's energy independence from foreign fossil fuel energy supply. The renewable energy resources potential in the RMPPA were not evaluated in the 1989 Little Snake RMP/EIS.

Wind and solar resource production is permitted through ROWs through the BLM lands and realty program, whereas geothermal resources are considered leasable. Renewable energy resources are discussed in the following sections.

Current Conditions

Wind and solar energy are the primary potential sources for renewable electricity generation within the RMPPA; however, interest in developing renewable energy resources in the RMPPA has not occurred to date.

Wind Energy. There are currently no wind energy producing facilities and no pending applications for wind facilities within the RMPPA. Based on the *U.S. Department of the Interior Draft Programmatic EIS on Wind Energy Development on BLM-Administered Lands in the Western United States* (DOI 2004), the northwest corner of the RMPPA has a wind energy potential of medium to high (Map 3-36). According to the *Wind Energy Resource Atlas of the United States* (Pacific Northwest Laboratory 1986), the RMPPA is within wind power classes 6 and 7 (on a scale that ranges from 1 to 7). In addition, Brower and Company (1995) indicated that the RMPPA is predominantly in a wind power density class of 200 to 300 wind per square meter (which is marginal); however, isolated locations are also present with a wind power density of 300 to 400 wind per square meter (which is a fair rating).

Solar Energy. There are currently no commercial solar energy producing facilities, and no pending applications for solar facilities within the RMPPA; however, with over 300 days of sunshine per year, Colorado is one of the prime locations for solar energy development. Data from the National Renewable Energy Laboratory (2002) indicate that most of the RMPPA is within 5.6 to 6.5 kilowatt hours per square meter per day (kwh/m^2 per day) solar isolation annual average range (ranges from 3.5 to 7.0). Northeastern Moffat County and all of Routt County are within 4.1 to 4.5 (kwh/m^2)/day.

Biomass. There are no biomass production facilities and no pending applications for biomass production within the RMPPA. There are many ways to use organic matter to directly generate power and heat, process it into fuels, or convert it to organically derived chemicals and other materials. Biomass sources are quite varied and include agricultural food and feed crops, crop waste and residue, wood waste and residues, animal waste, and municipal wastes. Based on the data published by USDA (1996 and 2002) and EPA (2001), the potential for biomass renewable energy resource development in the RMPPA is very low and ranges between 50,000 to 775,000 million British thermal units (the range is from 50,000 to 11,200,000 mmBtu).

Hydropower. There are no hydropower facilities or pending applications for the RMPPA. In 1998 DOE indicated that hydropower resource development throughout the country has reduced drastically because of the environmental attributes and legal and institutional constraints. The potential for hydropower generation in the RMPPA is very low.

Geothermal. BLM has statutory authority for leasing geothermal mineral rights under the Geothermal Steam Act of 1970 (P.L. 91-581; 30 U.S.C. §§ 1001-1027, December 24, 1970, as amended 1977, 1988, and 1993). Geothermal energy is a source of energy resource that uses the natural heat, steam, or hot waters of the Earth's interior supply. In particular, steam and hot water have been used to generate electricity since the early 1970s in the U.S. (California). In other places, geothermal energy is used as a direct source of heat in buildings and swimming pools. There are no geothermal facilities or pending applications for the RMPPA. Geothermal energy resources have been used in Colorado since the early 1900s (Coe 1978). In the RMPPA, geothermal development has been limited to only six known locations in Moffat County (Juniper and Craig) and Routt County (Steamboat, Brand's Ranch, and Hot Sulphur Springs) to heat swimming pools or baths (Coe 1978); however, based on geological history, market

demand, proximity to the population density, ease of access, environmental constraints, and development cost, the RMPPA does not have geothermal resources that can contribute significantly to the energy supply. In addition, the recent data published by the Southern Methodist University Geothermal Laboratory (2001) also indicate that the RMPPA has a low geothermal resource potential for commercial development and it is unlikely that it will support an economically viable geothermal powerplant. No known geothermal resource areas (KGRA) are known in the RMPPA.

Characterization

The indicators for renewable energy include the existence of current renewable energy facilities, pending or authorized applications, and renewable energy development in neighboring areas with similar geography. There are no renewable energy facilities in the RMPPA; however, the LSFO could potentially receive ROW applications for wind and solar energy facilities initiated under the new national policies for both wind and solar energy development on BLM-administered lands. Isolated locations within the RMPPA could be suitable for wind power development provided that suitable topographic locations, access to the power grid, and transmission line ROWs could be developed economically.

The RMPPA could be suitable for solar power development provided that accessibility to suitable topographic locations, cost reduction in installation and distribution of electricity, access to the power grid and transmission lines ROWs, and technological advancement in more efficient systems are obtainable.

3.2.1.2 Locatable Minerals

Locatable minerals (metallic and nonmetallic) are those that can be located and claimed under the Mining Act of 1872. Placer gold, limestone, zeolite, and uranium are further discussed in this subsection.

Current Conditions

Placer Gold. According to the *Colorado Geological Survey Mineral and Mineral Fuel Activity Report* (2003), there are no active metal and industrial minerals mines or prospects in the RMPPA. Based on BLM records, there were two small, low potential gold mines or prospects (Joker Mine operated by M&M II Ltd., and Blue Jet Mine that was operated by Orvie Zimmerman) in the eastern part of the RMPPA, which are now in reclamation. The production data for these mines/prospects are not available. Placer gold was also purported to be found in the eastern part of the RMPPA near the town of Steamboat Springs, at Hahn's Peak on Forest Service lands. These deposits were the result of the erosion of quartz veins related to Tertiary intrusion rocks in the area.

Limestone. A small limestone quarry, operated by Moffat Limestone Company, is present on Juniper Mountain in the RMPPA that supplies scrubbing materials to the powerplants. The waste materials from the quarry are reportedly used as road base. The amount of production from the 2004 quarry activity is 27,000 tons of mineral grade limestone and 19,000 tons of nonmineral grade limestone. According to LSFO records, the operator of this quarry has a mining claim on the land.

Zeolite. An exploration mining notice for Zeolite in the Sand Wash Basin of Moffat County was filed in 2003. Zeolite is a hydrous aluminum silicate that is generally used for molecular filtration and as an ion-exchange agent. The project was reclaimed and no new proposals are pending or anticipated at this time.

Uranium. There are currently no uranium mining activities in the RMPPA; however, the Maybell-Lay-Juniper Springs region in central part of Moffat County and the Fish Creek District in the east central part of Routt County (near the town of Steamboat Springs) were once uranium-producing regions in the RMPPA. The Maybell-Lay-Juniper Springs region was the largest producer, and the source of the

uranium was believed to be the tuffaceous beds in the Brown Park Formation. Mining activity in this region started in 1953 and continued until 1982. About 5,300,000 pounds of uranium oxide was produced.

Characterization

The indicators for locatable minerals are based on the geological information, required conditions for development of metallic minerals, economic values regarding percent ore recovery per ton of host materials and the percent of ore in the host rocks, market demand, and the nature of these commodities. Preliminary analysis of these indicators illustrate that it is unlikely that any significant metallic (gold or other metallic minerals) mining activities will be present in the RMPPA over the next 20 years. It is anticipated that current trends for nonmetallic minerals (e.g., limestone and zeolite) would continue over the next 20 years.

Based on the recent DOE study (*National Uranium Resource Evaluation (NURE)*, Goodknight 1983), there is a possibility that the Maybell region could contain at least 200 million pounds of uranium oxide in intermediate-grade resources. If a large increase in the price and market demand occurs, uranium interest in the Maybell region could be renewed in the next 20 years.

3.2.1.3 Mineral Materials

Mineral materials include sand and gravel and construction materials that are sold or permitted under the Mineral Materials Sale Act of 1947. The mineral materials program on BLM-administered lands within the RMPPA centers mainly around the use of sand and gravel for concrete aggregate, road base and coverings, construction fill, and rock for aggregate, riprap, and decorative purposes (flagstone and moss rock). Other mineral materials, such as silica sand and decorative stone, are also produced in Colorado but not in the RMPPA. Mineral materials are sold at a fair market value or made available through free use permits to governmental agencies. Local government agencies and nonprofit organizations may obtain these materials free of cost for community purposes. County and State road construction divisions are the significant users of gravel and sand resources.

Current Conditions

Presently, the RMPPA includes the following mineral materials activities: eight active community gravel pits (under free use permit), mostly in Moffat County; a general stone quarry at Breeze Mountain (flagstone, bulk stone); and several common use areas for moss rock. Mineral material disposal regulations allow limited quantities (up to 25 pounds with a yearly limit of 250 pounds) of petrified wood collection for noncommercial purposes under the terms and conditions consistent with the preservation of significant deposits as a public recreational resource (40 CFR 3620). In this case, petrified wood is classified as a salable mineral and paleontological resource, which could be subject to additional resource protection as specified in the RMP. Based on BLM records, sporadic petrified wood areas possibly exist in the RMPPA; however, no permits have been issued and no requests for collection have been submitted to date.

Characterization

Indicators of mineral material development are based on geological units that have high potential for mineral materials and access. In areas of high potential for sand and gravel, which are located near major roadways (along Highway 40 between Craig and Steamboat Springs and along Highway 2 south of the Steamboat Springs) and along the Little Snake River, it is considered likely that mineral materials (sand

and gravel) could be developed over the next 20 years. Other areas not easily accessible through major roadways are unlikely to be developed.

3.2.2 Livestock Grazing Management

About 98 percent (1,282,590 acres) of the BLM-administered lands within the RMPPA are allocated to livestock grazing allotments, which are managed in accordance with the 1989 Little Snake RMP. Allotments are an outgrowth of the grazing districts and permitting system established to manage livestock grazing in these districts by the 1934 Taylor Grazing Act. Unallotted acreage includes small isolated parcels not included within existing allotment boundaries and areas withdrawn specifically for other uses. About 36,052 acres in the central portion of the RMPPA were acquired through the Bankhead-Jones Farm Tenant Act. These tracts are known as land utilization lands, and were originally patented under the agricultural homestead laws.

Sustainable livestock grazing and desired rangeland condition requires the collective management of forage, water, soil and livestock by BLM and the livestock owners and operators. An interdisciplinary approach ensures effective management of the multiple resource values and uses included in the RMPPA. The livestock that graze on lands within the RMPPA are primarily cattle, but also include sheep and some domestic horses. The relative numbers of these grazing livestock have varied in response to their economic value as a commodity (cattle and sheep) and their use in ranching operations (horses).

3.2.2.1 Current Conditions

The *Standards for Public Land Health and Guidelines for Livestock Grazing Management*, effective in 1997, establish appropriate conditions for soils, riparian systems, upland vegetation, wildlife habitat, threatened and endangered species, and water quality. These standards not only pertain to impacts associated with livestock grazing, but also to other rangeland impacts from activities, such as recreation, development activities, wildlife grazing, and wild horse management.

There are 348 allotments in the RMPPA (Map 3-37) that are made up of BLM-administered land and land managed by other federal agencies, the State of Colorado, and private entities. These allotments are used by 197 permittees. The allotments are used for grazing cattle (59 percent of the allotments), sheep and horses (17 percent of the allotments), or sheep exclusively (12 percent of the allotments), with the other 12 percent of the allotments grazed by some combination of these species. Additional information on the allotments is provided in Appendix L, Livestock Grazing Allotments. Section 3 permits provide grazing authority for 162 allotments, while the remainder of the allotments (186) are managed as Section 15 leases. Section 3 allotments are those that are within a grazing district, as provided in the Taylor Grazing Act and are most common in the western portion of the RMPPA. Section 15 allotments are those that are outside a grazing district and are mostly located in the eastern portion of the RMPPA. Section 15 allotments total 118,130 acres of the federal surface.

The 1986 Draft RMP reported 166,259 permitted AUMs. Agreements between BLM and individual permittees lowered the permitted AUMs to 165,275 by 1990 (BLM 1996; BLM 1990). Total permitted numbers change frequently because of conversions of the class of livestock and changes in allotment or livestock management. With this caveat, the best estimate of current permitted use (Appendix L) indicates that the total AUMs provided on the lands managed by BLM, other federal agencies, the State of Colorado, and private entities are 141,242, 8,243, 145,025, and 724,210, respectively, with 13,841 AUMs in suspension. There is one unpermitted allotment, which is used as a common "reserve" allotment for permittees to use when their permitted allotment has insufficient forage for livestock grazing as a result of occurrences, such as a wildfire or vegetation treatments.

Billed use is the number of AUMs used by livestock in a given year, which could be less than the number of permitted AUMs. Maintaining accurate records on billed use allows permittees and BLM to make comparisons between utilization data and vegetation trend data to guide livestock management adjustments. Use has fluctuated over the last 10 years from a high in 2001 of just over 92,000 AUMs to a low in 1994 of less than 59,000 AUMs (Table 3-33). These changes are a result of many factors, including precipitation levels, forage production, and market and social factors.

Table 3-33. Livestock Billed Use in Animal Unit Months for the Little Snake Field Office, from 1994 to 2003, Craig, Colorado¹

Year	Cattle Sec 3	Sheep Sec 3	Cattle Sec 15	Sheep Sec 15	Horse Sec 3	Horse Sec 15	Total Sec 3	Total Sec 15	Total AUMs
1994	25,269	16,629	10,840	4,653	970	518	42,868	16,011	58,879
1995	32,580	18,307	10,459	5,596	1,814	506	52,701	16,561	69,262
1996	36,623	24,612	11,761	4,843	1,614	583	62,849	17,187	80,036
1997	34,817	27,243	11,095	5,052	1,548	603	63,608	16,750	80,358
1998	37,345	27,068	11,648	5,042	1,152	603	65,565	17,293	82,858
1999	39,826	35,815	11,532	4,792	2,279	558	77,920	16,882	94,802
2000	36,552	26,873	13,468	4,764	1,745	553	65,170	18,785	83,955
2001	40,301	31,837	12,805	4,804	1,804	463	73,942	18,072	92,014
2002	39,331	19,351	13,255	4,790	1,425	488	60,107	18,533	78,640
2003	33,120	15,684	13,659	4,960	920	483	49,724	19,102	68,826

¹All billed use numbers are in AUMs that are based on billed use.

3.2.2.2 Characterization

Trends in livestock grazing reflect changes in livestock species, changes in permittees and their perspectives, and changes in permitted use or season of use. Since the early 1970s, sheep producers in the area have been converting production to cattle, or have sold to permittees wanting to run cattle on their allotments, which has caused a conversion of sheep grazing to cattle grazing on much of the RMPPA. Absentee ownership of many of the allotments has increased, as well as the number of permittees that do not rely on livestock grazing for their primary source of income. Changes in the types of permittees that run livestock on the RMPPA have led to diversification of perspectives. Some permittees value the wildlife resources and habitat on their grazing allotments more than livestock grazing; however, the increasing elk population is creating conflicts with other grazing animals in areas where they concentrate in the late fall, winter, and spring. The LHAs have identified areas that have been adversely affected by wildlife. Increased pressure on forage and water by overabundant wildlife is resulting in a downward trend of riparian and upland forage.

Changes in permitted use or season of use could be a result of livestock conversions and the differences in seasonal use patterns for different species, or changes in rangeland condition. Variations in the condition of the land are in response to climatic factors and wildlife, livestock, and recreational use. If rangeland condition deteriorates, BLM has the ability to reduce the number of permitted AUMs, manage plant communities that provide forage and browse through vegetation treatments, change the season of use, require deferment and pasture rotations, and install range improvements, such as fences, water pipelines, spring developments, and reservoirs. These range improvements often enable more intensive grazing systems and encourage better livestock distribution and grazing utilization. BLM's traditional goal in

managing livestock grazing is to provide sustainable habitat for livestock and other animals, which is likely to remain as the primary focus of BLM's management of livestock.

3.2.3 Recreation

3.2.3.1 Recreation Use

Current Conditions

General recreation use includes a variety of activities in the RMPPA, such as boating and river-based recreation, hiking and equestrian recreation, hunting and wildlife-based recreation, and OHV use on and off roads and trails. In some areas, concentrated recreation use is beginning to create resource impacts and increased user conflicts.

In the RMP process, SRMAs are divided into recreation management zones (RMZ), which are recreation use areas with distinct settings or unique recreational opportunities. The BLM will direct recreation funding to provide for infrastructure and staffing to support the recreation opportunities for each SRMA (BLM 2005). Areas that are not designated as SRMAs are by default extensive recreation management areas (ERMA), for which minimal capital investments are to be made. Under the current RMP, the Little Yampa Canyon/Juniper Mountain LYC SRMA is the only designated SRMA on BLM-administered land within the RMPPA.

OHV use is one of the fastest growing recreation opportunities in the RMPPA. Because of its relationship to transportation and access issues, discussion on the subject of OHV use can be found in Section 3.2.6 of this document. OHV use has potential to conflict with other recreation uses, such as hiking, biking and equestrian use, which use many of the same roads and trails. In addition, many recreation experiences require quiet and solitude, such as a backcountry experience or wildlife viewing. OHV use in the same area can frighten away wildlife and create noise across great distances, which diminishes the backcountry experience.

Hunting is another major recreation use in the RMPPA. Hunting-related revenue is a major part of the economic base in northwest Colorado, which is a highly sought after destination for big game hunters. The number of hunters recreating in the RMPPA has remained constant over the recent past. User conflicts have occurred between hunters and hikers, particularly in the Cedar Mountain area. CDOW has determined that 40 percent of the big game license revenue taken in by the State of Colorado is from Moffat and Rio Blanco Counties (B. Petch personal communication 2005)

There are limited fishing and waterfowl hunting opportunities in the RMPPA. Fishing for Northern Pike has become popular on the upper segment of the Yampa River. Other wildlife-related recreation opportunities include wildlife viewing and wild horse observation. Although wildlife-based recreation activity levels are relatively constant, there is a potential for increase (particularly viewing of wintering elk). Wildlife and bird watching tours are also common in the RMPPA, as eagles and other raptors can be viewed along Highway 13. In the spring, antler gathering is popular in Sand Wash and the western portions of the RMPPA near big game wintering areas, such as Douglas Mountain, Diamond Breaks and Cold Springs.

The Yampa River provides recreation opportunities such as canoeing, kayaking, rafting, and jet boating; however, the season is short, generally from mid-May when spring runoff begins until late June when irrigation demands begin to substantially reduce flow levels. The river level drops enough that some sections become impassable by boat. A portion of the Yampa River is managed by BLM as a SRMA (also see Section 3.2.3.4). As of January 1999, under a cooperative agreement with BLM, the Colorado

Department of Parks and Recreation (State Parks) has become the primary manager of the Yampa River public land access sites. The purpose of the agreement is to implement the consistent river management component of the Yampa River System Legacy Project. The Legacy Project is supported by participating local, State, and national organizations, and by a major grant from Great Outdoors Colorado. State Parks provides day-to-day management, facilities, signing, maintenance, and regulation enforcement. A user fee is charged at developed river access sites. State Parks and BLM cooperatively enforce all applicable laws and regulations on public lands within the Yampa River corridor. State Parks issues all Yampa River permits for commercial guides and outfitters.

Upstream of the Yampa River (on non-federal land), Elkhead reservoir also provides water-based recreation opportunities. This reservoir will be closed and expanded over the next few years by the City of Craig Water Conservation District, which could increase use and recognition of river recreation opportunities on the Yampa River. The closing of the reservoir may result in a shift in recreation use patterns on the river to more motorized use from local boat and jet ski owners, which will create an increase in user conflicts.

Because of the large number of historic and user-created roads and trails in the RMPPA, there has not been a strong need to develop a designated and managed trail system. Only two managed trail systems exist within the RMPPA. The Yampa Valley Trail contains both motorized and non-motorized trail segments, and use of these segments is generally low because much of the trail system exists in nonspectacular landscapes. Most use of this trail occurs in the Little Yampa Canyon SRMA, along Juniper Mountain, and in the western part of the RMPPA across the southern part of Cross Mountain Canyon. The other managed trail is the Cedar Mountain Trail, which is a non-motorized trail. This trail receives high use due to its close proximity to the City of Craig.

Hiking and other trail-based recreation in the RMPPA do not occur at significant levels. Mountain bike use has increased since the last RMP planning effort, but actual use is still low, occurring mostly in the spring and summer. There is a potential for mountain biking opportunities to increase because of overflow from the Steamboat Springs area, which occurs mainly in the earlier part of the season because of snow pack in the Steamboat Springs area. Equestrian use in the RMPPA on and off existing roads, routes and trails, mainly by local horse enthusiasts, is popular and has remained constant. Motorized recreation occurs on many of the same trails as non-motorized use and affects other uses chiefly by diminishing opportunities for solitude. Nevertheless, there are good opportunities for solitude and remoteness in the RMPPA, especially in Brown's Park and near Dinosaur National Monument on the western side of the RMPPA. The WSAs in the RMPPA do not attract considerable recreational use.

Non-motorized recreation opportunities, especially hunting, exist in the Fly Creek and Serviceberry areas, which are both in the northern part of the RMPPA. Planning for these areas occurred in the mid-1990s and temporary travel restrictions were implemented that closed these areas to motorized vehicle use until final travel management decisions were made in the revision of the RMP. Comments from hunters in these areas indicate the non-motorized restrictions create a high-quality hunting experience. Every season, BLM receives complaints about motorized vehicle incursions into these areas.

BLM attempts to account for the amounts of different types of annual recreation use through the Recreation Management Information System (RMIS). RMIS measures recreation participation in 65 types of recreation activities; however, the data sources for most of these activities depend entirely upon observations and professional judgment, and hence, have no supportable sources or statistical basis; therefore, most of the RMIS data is unreliable and will not be used in this RMP. The activities that have supportable data sources are hunting licenses issued by CDOW, river permit and camping fees at river campgrounds managed by State Parks, and actual use figures reported by BLM permitted outfitters and guides. Hunting license data shows steady and high use trends over the past 10 years. River use has also

been fairly consistent and heavy, with decreases in use during years of low river flows as a result of drought. Permitted outfitter and guide use has also remained strong and consistent for the past 5 years.

Although not statistically measured, OHV use within the RMPPA is increasing. The increase in this use for the past 15 years is obvious to long-time users of the RMPPA. The LSFO has received an increase in complaints regarding OHV use in the form of written letters, phone calls, and in-person communication. These complaints primarily concern resource and wildlife impacts, conflicts with non-motorized users, conflicts with other OHV users and irresponsible OHV use, motorized use in non-motorized areas, conflicts with grazing management activities, failure to close gates, vandalism to fences, and degradation of hunting experiences caused by OHV use by other hunters, which drives big game out of public land areas. The on-the-ground imprint of OHV use is also obvious to long-time users of the RMPPA, with the proliferation of many user-created routes in the past 15 years, and the conversion of single-track game and motorcycle trails to wider two-track trails. More discussion regarding OHV use can be found in Section 3.2.6.

Antler gathering is another use that is increasing and creating increased user conflicts. Antlers that are shed by big game in their winter and spring ranges across most of the western RMPPA are of monetary value. The LSFO does not currently have any restrictions on the collection and sale of antlers. Many people who participate in this activity use OHVs to cover more ground than can be done on foot or by horseback. The LSFO has received reports of groups of people who grid areas to increase their success in finding antlers and some reports of people staking out their areas and threatening other lawful users of the RMPPA to keep out of these areas.

Characterization

Indicators to measure trends in recreation include visitor use levels, user conflicts levels, impacts on resources, and compliance with commercial authorization.

Concentrated camping use is increasing across the RMPPA during the fall hunting seasons and in the spring and summer because of OHV use. This increase in camping and associated impacts is especially obvious in Sand Wash, the Duffy Mountain area, and BLM-administered lands along the elk and deer seasonal migration routes. The impacts include soil compaction and vegetation loss at campsites, rock fire rings, user created routes, littering, and vandalism of signs. As OHV use continues to increase, potential conflicts with users will increase and impacts on wildlife, archeological resources, wild horses, and soil and vegetation resources will increase. The need for OHV management tools and active OHV management is becoming increasingly obvious.

Overall recreation use is likely to increase, especially motorized- and river-based recreation. Some recreation users are advocating more trail development in the RMPPA, particularly a trail system from Flat Tops to the Yampa Valley corridor. There is an opportunity for interpretive recreation at cultural sites to educate visitors on cultural resource values and heritage resources, such as rock art, caves, and other sites.

3.2.3.2 Recreation Opportunity Spectrum

Current Conditions

The recreation opportunity spectrum (ROS) is a system of inventorying and classifying the range of recreational experiences, opportunities, and settings available on public lands. BLM primarily manages five of the six ROS classes: primitive, semiprimitive nonmotorized, semiprimitive motorized, roaded natural, and rural. The urban ROS classification does not typically require BLM management

restrictions. Rural ROS classes also require very few BLM restrictions. The primitive, semiprimitive, and roaded natural classifications are designed to provide certain types of recreation settings and might require use restrictions to meet management objectives.

Although ROS inventories were designated in the 1989 Little Snake RMP, there was no management actions to comply with the objectives; hence, the shift towards a more developed ROS condition in the RMPPA in the past 15 years. Some of the more primitive settings, such as the WSAs, have retained much of their original ROS setting, but unmanaged OHV use in some of these areas has the potential to shift the characteristics of these areas to more developed settings.

Characterization

As predicted in the 1989 Little Snake RMP, the trend over the last decade has been for ROS conditions to shift from more primitive to more developed, semiprimitive settings and to more developed rural settings. This shift occurs as local populations and developments increase with the result that the demand for primitive settings exceeds availability.

BLM recreation policy now requires that a benefits-based recreation planning system be used in RMP revisions that identifies and manages for particular recreation opportunities. This system requires the designation of three different intensity scales of SRMAs, and funding for recreation developments will be focused on these SRMAs. Funding for recreation developments in ERMAs will be discouraged, except for route and destination signing. ROS objectives can still be set through RMP revisions, which will provide an additional management tool to meet recreation goals and assess impacts on recreation resources.

3.2.3.3 Extensive Recreation Management Areas

Current Conditions

ERMAs are areas where recreation is nonspecialized, dispersed, and does not require intensive management. Recreation might not be the primary management objective in these areas, and recreational activities in the areas are subject to few restrictions. Most BLM-administered lands within the RMPPA are managed as ERMAs.

On BLM-administered lands within the RMPPA, there are currently only two developed campgrounds—Rocky Reservoir and Irish Canyon. These campgrounds are free sites with few facilities and limited services because of their small size, remoteness, and low use. In addition, there are picnic sites at the Irish Canyon interpretive site and at Cedar Mountain Recreation Area and a boat ramp near the upper part of Little Yampa Canyon.

Other areas of concentrated recreation use have been identified as being in need of increased management. Facility development, such as all-terrain vehicle (ATV) unloading ramps, horse corrals, hardened sites, and sanitation facilities, has been considered for focused, developed recreation management in some key areas. Possible areas include—

- Emerald Mountain
- South Sand Wash
- Cedar Mountain
- Wild Mountain
- Duffy Mountain.

Sand Wash in particular has been identified as one of the key motorized recreation opportunities in the RMPPA. An assessment was recently conducted to outline the recreation use history, explain the existing and emerging conflicts, impacts, and issues, display existing route, resource data, and existing management direction, and to recommend a planning and development approach to the Sand Wash area for future recreation use (BLM 2004).

Characterization

Recreation activity of any kind could indicate the need for ERMA designation and management. As areas of concentrated recreation use continue to increase in size, number, and use levels, increased focus on providing facilities in these areas will be required to protect natural resources and maintain the recreational experience. The management needs of some areas of concentrated recreation use could go beyond the scope of the ERMA, in which case, these areas could be considered for SRMA designation.

3.2.3.4 Special Recreation Management Areas

Current Conditions

SRMAs are distinct, identified areas created for use by the public, specifically managed for recreational activities. Identified SRMAs often have a single, unique recreation activity, a demand for the recreation opportunity, and a distinctive natural setting (BLM 2005).

The Little Yampa Canyon/Juniper Mountain is the only identified SRMA on BLM-administered land within the RMPPA (Map 3-28). This area was identified as a SRMA in the 1989 Little Snake ROD. The ROD states that the SRMA (19,290 acres) “will be administered to provide unrestricted flatwater river floatboating opportunities in the region” (BLM 1989). It describes management actions that are needed and explains that all concerns for this area will be addressed in a recreation area management plan (RAMP). Subsequently, the LSFO completed the *Little Yampa Canyon RAMP in 1996* (BLM 1996).

Characterization

A specific, unique recreational opportunity must be recognized, among other factors, when a SRMA is identified (BLM 2005). Management of the Little Yampa Canyon/Juniper Mountain SRMA continues to be monitored and can be revised as necessary. Other areas within the RMPPA are beginning to receive increased levels of recreation.

Other areas of important recreation use could become desirable for SRMA identification. Possible areas include—

- ❑ **Emerald Mountain.** If the area is acquired through the proposed land exchange, recreation opportunities could include environmental education, watchable wildlife (big game and birds), muscle-powered day use (hiking, biking, and Nordic skiing), big game hunting, and OHV recreation.
- ❑ **Sand Wash Basin.** Opportunities include developed recreation facilities, a managed OHV road and trail system, and onsite interpretation for watchable wildlife and wild horses.
- ❑ **Great Divide and Axial Basin.** Recreation opportunities include big game hunting and watchable wildlife (big game).
- ❑ **Vermillion Basin.** Opportunities could include solitude and primitive/unconfined recreation, scenic views, watchable wildlife (big game and birds), archeology, OHV use, and mountain biking.

3.2.3.5 Special Recreation Permits

Current Conditions

As authorized by 43 CFR 2932, there are four types of uses for which special recreation permits (SRP) are required—commercial use, competitive events, organized groups, and recreation use in special areas. BLM can issue SRPs for noncommercial use in certain special areas including rivers and backcountry and camping areas.

Most SRPs issued by the LSFO are related to hunter outfitting and guiding. The number of SRPs issued on BLM-administered land is market-driven as opposed to being limited by BLM. Very few permanent camps are authorized on BLM-administered lands, as most camps are on private lands. Currently, there are no commercially guided OHV-related SRPs issued by the LSFO, despite high OHV use. In addition, no river-related SRPs are issued by BLM because the Yampa River permit system is handled through State parks.

Characterization

The number and type of SRPs issued and requested are used as indicators of the level of this type of use. There has been minimal change in the demand for SRPs on BLM-administered land within the RMPPA over the past planning period. It is unlikely the demand for SRPs in the RMPPA will change over the upcoming planning period. If demand for SRPs were to increase, the issue of limiting SRPs might need to be addressed.

3.2.4 Forestry

3.2.4.1 Current Conditions

There are currently 6,330 acres of commercial forestland and 37,600 acres of woodlands available for forest product removal. Fuelwood is the greatest use of forest products within the RMPPA. Individuals cutting firewood for personal use represents the greatest demand on the woodland resource. Historically, pinyon pine has been the preferred species for fuelwood in the RMPPA. More recently, juniper is increasingly used for fuelwood.

Harvesting trees for posts is another use of forest products. Posts are generally found on the more productive pinyon-juniper sites where the soils are deep and well-drained. Many of these areas are difficult to access. Seasonal Christmas tree harvesting by local residents is also a common use of the forest resources; however, the RMPPA contains only a limited quantity of good quality Christmas trees. The double-needle pinyon local to this area does not have the growth characteristics of the single-needle pinyon, which is a popular Christmas tree.

There are also uses of forest products that do not include harvesting. These uses include hunting, wildlife viewing, hiking, sightseeing, and camping. Such activities are becoming increasingly important uses of woodlands.

3.2.4.2 Characterization

Lands on the Diamond Peak, Middle Mountains, and Douglas Mountain are considered suitable for timber harvest, and such uses might occur in the future.

3.2.5 Lands and Realty

The goals of the lands and realty program are to manage the public lands to support the goals and objectives of other resource programs, provide for uses of public lands in accordance with regulations and compatibility with other resources, and improve management of the public lands through land tenure adjustments. The lands and realty program is a support program to all other resources to help ensure that BLM-administered lands are managed to benefit the public. The following sections describe the current conditions and characterization of lands and realty within the RMPPA.

3.2.5.1 Current Conditions

The ROI for lands and realty encompasses the RMPPA. Of over 4.2 million acres in the RMPPA, about 1.3 million acres (32 percent) is BLM-administered public surface ownership concentrated primarily in the western half of the RMPPA (Map 1-2). The eastern half of the RMPPA primarily consists of small parcels of BLM-administered public surface ownership interspersed with private and State-owned lands. About 41 percent is privately owned and 6 percent administered by the State of Colorado (Table 3-34). About 1.1 million acres (56 percent) of the private and State lands are underlain by federally owned minerals. BLM public lands are used for a wide variety of purposes, and conflict among competing uses is common.

Table 3-34. Surface Land Ownership in Little Snake RMPPA

Ownership	Acres
BLM public surface	1,349,400
Private	1,742,500
State of Colorado	251,700
Other federal	878,100
Total	4,221,700

Major focus areas for the lands and realty program include land tenure adjustments, mineral estate, ROWs, and communication sites, which are further discussed below. Wind and solar renewable resource production is permitted by ROWs through the lands and realty program. All renewable energy resources are discussed in Section 3.2.1.

Land Tenure Adjustments

BLM land tenure adjustments are used to consolidate, where possible, BLM-administered surface and subsurface estate. The following actions are considered:

- ❑ **Disposal.** Public lands have potential for disposal when they are isolated or difficult to manage. Disposal actions are usually in response to public request, such as community expansion. Disposals result in a title transfer, wherein the lands leave the public domain. All disposal actions are coordinated with adjoining landowners, local governments, and current land users.
- ❑ **Sale.** Public land sales are managed under the disposal criteria set forth in Section 203 of the FLPMA. Public lands determined suitable for sale are offered on the initiative of BLM. The lands are not sold at less than fair market value. Lands suitable for sale must be identified in the RMP. Any lands to be disposed of by sale that are not identified in the current RMP require a plan amendment before a sale can occur.

- ❑ **Acquisition.** Acquisition of lands can be pursued to facilitate various resource management objectives. Acquisitions, including easements, can be completed through exchange, Land and Water Conservation Fund (LWCF) purchases, or donations or receipts from the Federal Land Transaction Facilitations Act sales or exchanges.
- ❑ **Exchange.** Land exchanges are initiated in direct response to public demand or by BLM to improve management of the public lands. Lands need to be formally determined as suitable for exchange. In addition, lands considered for acquisition would be those lands that meet specific land management goals identified in the RMP. Nonfederal lands are considered for acquisition through exchange of suitable public land, on a case-by-case basis, where the exchange is in the public interest and where acquisition of the nonfederal lands will contain higher resource or public values than the public lands being exchanged.
- ❑ **Withdrawal.** Withdrawals are used to preserve sensitive environmental values, protect major federal investments in facilities, support national security, and provide for public health and safety. Withdrawal segregates a portion of public lands and suspends certain operations of the public land laws, such as mining claims. Certain stock driveways are also withdrawn. Federal policy now restricts all withdrawals to the minimum time and acreage required to serve the public interest, maximize the use of withdrawn lands consistent with their primary purpose, and eliminate all withdrawals that are no longer needed.

Many of the BLM-administered parcels in Routt County and eastern Moffat County are difficult to manage either because the parcels are landlocked, small and isolated, or do not offer values that serve BLM's mandate. In these situations, it is more desirable for BLM to offer parcels for sale or exchange with the intent of consolidating lands in areas of the RMPPA where land ownership is more condensed. In all land tenure adjustments, keeping the surface and mineral estate intact on both the lands disposed of and acquired would benefit the future owners and their use of the land. Of about 59,900 acres of BLM-administered lands in Routt County, 41,523 acres (269 parcels) were identified by the LSFO in the 1989 Little Snake RMP as having potential for sale or exchange. Some lands in Moffat County might also be considered for sale, exchange or Recreation and Public Purposes Act adjustments, leases, or withdrawals.

In Routt County, about 15,621 acres of BLM-administered lands (129 parcels) have been tentatively identified for sale, the proceeds from which will be used to purchase the 6,350-acre State Land Board Emerald Mountain parcel in Steamboat Springs. A separate NEPA analysis of the transaction has been initiated, and will be acknowledged, but not analyzed as part of the RMP revision process.

Mineral Estate

About 60 percent of the BLM-administered surface and 80 percent of the federal mineral estate within the RMPPA are leased. The BLM administers the leasing of the mineral estate underlying Forest Service and Bureau of Reclamation (BOR) withdrawn lands, although mineral management decisions on these lands are coordinated with the appropriate surface agency. Much of the private lands had the mineral estate (either all of the minerals or portions of the minerals) reserved to the U.S. Government at the time they were patented. In these cases, the mineral estate is administered by BLM, although those respective agencies and private landowners administer the surface estate.

Rights-of-Way

Rights-of-way across BLM-administered land within the Little Snake RMPPA are primarily for pipelines, roads, and electrical and telephone lines. The LSFO processes about 35 to 50 ROW applications per year. Thirty-five ROW applications were processed in 2004. In addition to minor linear and nonlinear ROWs, there are nine major ROW corridors defined within BLM-administered land of the RMPPA and eleven

other potential major ROW corridors, as designated in the 1989 Little Snake RMP (see page 32–33 of 1989 Little Snake ROD).

Corridors are established to accommodate preferred routes for transportation and transmission facilities. To the extent possible, linear ROWs, such as roads and pipelines, are routed where there would be least impacts on environmental resources, taking into account point of origin, point of destination, and purpose and need of the project. Although established corridors exist, this does not preclude the location of transportation and transmission facilities in other areas, if environmental analysis indicates that the facilities are compatible with other resource values and objectives. Further identification of corridors might not necessarily mandate that transportation and transmission facilities would be located there if they are not compatible with other resource uses, values, and objectives in and near the corridors or if the corridors are saturated (Map 3-38). ROWs are issued with surface reclamation stipulations and other mitigation measures. Restrictions and mitigation measures could be modified on a case-by-case basis, depending on impacts on resources. Areas closed to mineral leasing, having an NSO restriction, or otherwise identified as unsuitable for surface disturbance or occupancy are generally avoidance or exclusion areas for ROWs.

Revised Statute (RS) 2477 ROWs are discussed in Section 3.2.6, Transportation and Access.

Communication Sites

Several sites within the RMPPA host communication equipment for various public and private tenants, such as phone companies, local utilities, and local, State and federal agencies. There are three communication sites on BLM-administered land within the RMPPA (Table 3-35).

Table 3-35. Communication Sites Within the Little Snake RMPPA

Site	Acres	Tenant(s)/Customer(s)	Status
Magnetic Mountain	3.03	Steamboat Amateur Radio	Authorized
		Public Service Company	Authorized
		Tri-State	Authorized
		Eagle Communications	Authorized
		CO Division of Telecom	Authorized
		Hutton's Radio Communication	Authorized
Juniper Mountain	11.44	Moffat County Communication	Authorized
		USDA Animal and Plant Health Inspection Service	Authorized
		Yampa Valley Electric	Authorized
		BLM Craig district Office	Authorized
		Union Telephone Co.	Authorized
		CO Division of Commerce	Authorized
		Steamboat Springs Amateur Radio	Authorized
Cedar Mountain	12.59	Public Broadcasting Co., Inc.	Authorized
		Wild West Radio, Inc.	Authorized
		Union Telephone Co.	Authorized
		Public Service Company	Authorized
		Verizon Wireless	Authorized

Site	Acres	Tenant(s)/Customer(s)	Status
		CO State Patrol	Authorized
		Tri-State	Authorized
		Rocky Mountain Natural Gas Co.	Authorized
		DOE Western Area Power Administration Rocky Mountain Region	Authorized
		CO Christian University	Authorized
		CAP	Authorized
		Pearson Communication Ltd.	Authorized
		Moffat County Communication	Authorized
		Eagle Communications	Authorized

3.2.5.2 Characterization

BLM is moving toward the consolidation of BLM-administered lands to benefit the public. To achieve this goal, candidates for land tenure adjustment through disposal, sale, exchange, or acquisition include parcels that are difficult to manage or that do not have public access, relatively small parcels adjacent to other federal or State-managed lands, parcels that would increase conservation of natural resources, and parcels that increase access to or use of public lands. The current RMP is limited in its ability to allow for some actions, such as land sales. Improved or expanded language in the RMP that gives the Field Office Manager more authority to approve land tenure adjustment actions would help the LSFO achieve its objectives for this program.

BLM also anticipates an increasing need to consider the sale or exchange of mineral rights, particularly for split-estate lands, in order to simplify land management and mineral leasing throughout the RMPPA. BLM has seen a steady annual increase in mineral leases over the past several years and since the last RMP decision document, but the 1989 Little Snake RMP does not contain language for the sale or exchange of mineral rights. Conflicts between minerals development (e.g., oil/gas, coalbed methane, coal, solar energy, and wind energy) and the related transportation network, and other land and resource uses and values in the RMPPA also need to be considered, particularly in areas of varied ownership patterns. Some of the conflicts noted include disruptive activities and human presence in fisheries, big game crucial habitat (crucial winter range and birthing areas), and other important wildlife species habitats (e.g., greater sage-grouse, mountain plovers, black-footed ferret, and raptors). Conflicts with recreation values forage uses, air quality, sensitive vegetation types, and sensitive watersheds were also noted. Avoidance and exclusions for these resources could be considered.

ROW applications across BLM-administered lands have increased in the RMPPA. The demand for utility corridors, access to communication sites and additional roads within the RMPPA will likely continue to increase. Established ROW corridors should be evaluated and considered for adjustment or elimination. The potential for additional ROW corridors should also be considered.

Demand for communication site applications, for both existing and new sites on BLM-administered lands within the RMPPA, is increasing. Communication site applications are now granted through lease rather than ROW. The LSFO expects the increasing demand for communication sites to continue. The revised RMP should include a focus on inventory and planning for communication site identification and management.

3.2.6 Transportation and Access

Comprehensive and proactive transportation planning has not been an emphasis area for the BLM in resource management planning and implementation. The development of transportation routes, whether planned through projects, such as oil and gas developments or created by recreation users, has traditionally been viewed as an acceptable part of the development of BLM lands. Research from the past 20 years on the impacts of roads on resources, wildlife, and other users, and actual experience by BLM with these impacts is increasing the need for well-designed and integrated transportation planning. Transportation planning needs to assess the cumulative and individual impacts of existing and proposed routes to resources, determine the appropriate road and trail construction standards needed on routes to allow for motorized and nonmotorized access for land management needs, make decisions on allowed vehicle use and seasons of use, and make decisions on road and trail maintenance, reconstruction, realignment, and reclamation needs that provide a transportation system that is balanced with other resources and uses, while providing adequate access.

The 1989 Little Snake RMP included a transportation plan; however, it contains very little direction on how to integrate transportation needs with resource and use needs. This transportation plan is essentially a map that displays the approved transportation system at the time of publication. This map shows the numbered BLM roads that are considered the official road system. There are about 170 miles of these roads that receive maintenance on a scheduled and as-needed basis. The map also displays nonnumbered BLM roads and trails, which do not receive maintenance but which have been interpreted as also being part of the officially accepted BLM route system. There are about 600 miles of these roads; however, the map does not show the number of miles of actual routes that are in existence and used on-the-ground. Inventory efforts by BLM over the past 10 years have attempted to identify these 'nonsystem' routes, especially in Sand Wash and other areas heavily used by motorized recreationists. Based on these inventory efforts, it is estimated that there might be as many as 3,000 miles of these nonsystem routes within the RMPPA. Most of these routes are low standard, two-track roads that are used by OHV recreationists, while others are single-track trails that have been developed through use by dirt-bike users, access range improvements, and old seismographic dozer-created routes that are used occasionally by OHVs. None of these routes receive maintenance through BLM and their impacts on other resources are not managed.

In addition to the BLM route system are State and county road systems. These roads are usually constructed to higher standards than BLM roads and provide the primary arterial and collector road systems for access to and through BLM lands. Some of the county roads within the RMPPA have not been authorized through ROWs, but have been adopted by the counties through their maintenance of these roads. The condition, maintenance, and standards of these roads have largely not been integrated with BLM resource considerations.

Motorized access to the public lands within the RMPPA is provided by routes of all kinds and sizes ranging from State highways to paved roads, gravel roads, and jeep and OHV trails. The two most populated areas are Steamboat Springs in Routt County and Craig in Moffat County. Outside of those towns, most of the RMPPA is remote and accessible only through smaller unimproved roads, such as county roads, dirt tracks and trails. Some routes date back to the settlement and prospecting era. Others have been pioneered by OHV users in the recent years. In comparison to the motorized system of routes, the non-motorized trail system is small. Hikers and horse riders mostly travel cross-country or follow natural travel corridors rather than using developed trails.

The LSFO manages access for the purposes of providing legal access to public lands and of providing BLM employees access to public lands for administrative purposes. Transportation within the planning area is managed for a variety of purposes by multiple agencies, including the State of Colorado, Routt,

Moffat, and Rio Blanco Counties, BLM, and private individuals and corporations (Map 3-39). However, many routes are rough and rarely or never maintained. The goal of the transportation and access program of the LSFO is to actively manage travel, access, and OHV use within the area to meet public demand.

An ongoing issue, which cannot be resolved in the RMP process, but which is nevertheless important to local governments (especially Moffat County), is the resolution Revised Statute (RS) 2477 road assertions. Contained in the 1866 Mining Law, the RS 2477 authority was intended to facilitate settlement of the West by granting the ability for counties and States to assert a “right-of-way for the construction of highways over public lands.” Congress repealed RS 2477 in 1976 when it enacted the FLPMA. Since then, it has been an ongoing issue among the federal government, counties, and States as to which routes were actually developed under the RS 2477 authority, and thus are the responsibility of the counties.

Moffat County has been active in the RS 2477 debate and has established an inventory protocol (June 2002), a maintenance protocol (January 10, 2003), a map showing their RS 2477 assertions (Map 3-41, January 10, 2003), and established stipulations in Moffat County Resolution 2003-05 (<http://www.co.moffat.co.us/NaturalResources/rightsofway.htm>). The LSFO is unaware of any RS 2477 assertions for the RMPPA in Routt or Rio Blanco Counties at this time.

The authorizing authority for many of these Moffat County asserted routes may well be RS 2477; however, only the courts have the authority to make a binding determination on the validity of a R.S. 2477 assertion. However, the United States Court of Appeals for the Tenth Circuit in *Southern Utah Wilderness Alliance v. Bureau of Land Management (SUWA v. BLM)* (425 F.3d 735 (10th Cir. 2005)) expressly authorized BLM to make nonbinding determinations concerning the validity of R.S. 2477 claims for its own planning and management purposes.

The following sections describe the current conditions and trends for travel management, access, and OHV use within the RMPPA.

3.2.6.1 Travel Management

The goal of the travel management program of the LSFO is to provide appropriate access for BLM permittees, to provide for administrative access for management of public lands, and to provide a balanced mix of motorized and non-motorized opportunities across BLM-administered lands within the RMPPA.

Current Conditions

Related to transportation planning is travel management. Travel management is the identification, through RMP planning, of areas where motorized vehicle use is allowed, restricted, or not allowed depending on resource and use considerations. BLM has intended to designate areas as open to OHV use in the past, unless such designation was in direct conflict with other specific resource management decisions, such as land use restrictions associated with WSAs and ACECs. In the past 15 years, OHV use has greatly increased, and has affected resources and wildlife and caused conflicts with users. This has been the case throughout the West, including the RMPPA. Without an actively managed travel management system in place, the transportation system is difficult to manage as new routes are created through repeated off-road use by motorized vehicles.

Under the current RMP, about 71 percent of the BLM-administered lands of the RMPPA have open travel management designations, 24 percent are limited to existing or designated roads and trails, and 5 percent are closed (Map 3-40). Table 3-36 summarizes acres within the planning area that have restrictions on

OHV travel (the balance of acreage within the planning area is classified as open to OHV use). Travel management signing for the closed areas in Cross Mountain WSA and Diamond Breaks WSA was completed following the signing of the 1989 Little Snake RMP. Other areas that were adequately signed in the past 15 years are the Little Yampa Canyon SRMA and the Fly Creek Serviceberry areas. Until 2004, most of the remaining closed and limited use areas were not signed and subsequently not enforced. The lack of signing, education, and enforcement in these areas has resulted in the same proliferation of user-created routes as in the open areas. Additional signing for areas designated as limited in the 1989 Little Snake RMP is planned for 2005. The BLM Planning Regulations require that transportation plans (including determinations of open and restricted routes) be completed for areas designated as limited within five years of the completion of a revised RMP. Routes can be restricted to specific vehicle types to provide a mix of motorized and non-motorized recreation, and they can be seasonally restricted to protect wildlife and other resources.

Characterization

The primary factors describing the condition of travel management within the planning area are—

- ❑ The need for a comprehensive approach to travel management that considers the relationship among various resources, access for authorized permittees, and recreation uses
- ❑ Unauthorized uses emanating from designated routes causing impacts on other resources
- ❑ Conflicts between users, both motorized and non-motorized.

Use of the public lands within the planning area is increasing, which includes travel and access. Public lands within the RMPPA are becoming more popular for a variety of activities. To gauge and manage the increased popularity and use of the route network, travel within the planning area must be managed more actively and based on updated data. Active management and monitoring will necessarily include a baseline of updated GIS and other data to adequately plan resource use and monitor activities. This might require Landsat analysis with on-the-ground verification and data collection across resource specialties. The management need includes a non-motorized trail system and a motorized trail system for both single-track and two-track.

3.2.6.2 Access

Current Conditions

As shown in Map 3-39, the RMPPA is not bisected by an interstate highway. The main east-west highway is U.S. Highway 40, and the primary north-south route is Colorado SH 13. Much of the RMPPA is relatively remote.

Characterization

See Section 3.2.3 above for information on recreational use of public lands in the RMPPA. Section 3.2.3 details a substantial increase in recreational use of BLM-administered lands within the RMPPA. In addition to increased recreational use, the inability to legally access some public lands within the planning area indicates the need to comprehensively plan for access as part of the RMP revision process.

The 1989 Little Snake RMP established access areas for primarily recreation and forestry uses. The RMP also established areas requiring the physical posting of BLM boundaries (see Map 2 on page 20–21 of the 1989 Little Snake ROD).

There is insufficient boundary marking of BLM-administered lands, particularly those lands that are adjacent to other federally managed or private parcels. In addition, changes in use and needs for access requires that access be analyzed and updated. In areas where legal access has never existed, the public is continuing to lose access to BLM-administered lands where private landowners are closing access through their privately owned parcels. Access to public land needs to be assessed in the revised RMP. For example, management might require that BLM obtain legal access to isolated public lands.

3.2.6.3 Off-Highway Vehicles

OHVs include both motorized and non-motorized vehicles, of varying sizes and capabilities, from ATVs and motorcycles to trucks and sport utility vehicles (SUV), over snow vehicles, and bicycles. The dominant type of OHV use in the planning area is motorized.

Areas within BLM-administered lands of the RMPPA are designated by BLM as open, limited to existing roads and trails, limited to designated roads and trails, and closed to OHV use. The designations are as follows:

- ❑ **Open.** Areas designated as open are available for OHV travel without restriction, based on an analysis that determines there are “no compelling resource protection needs, user conflicts, or public safety issues to warrant limiting cross-country travel.”
- ❑ **Limited.** Areas designated as limited to either designate or existing roads and trails restrict OHV travel to protect resources. Restrictions could include the number or types of vehicles, time or season of use, use of existing roads and trails only, use of designated roads or trails, or licensed use only. BLM may also impose other restrictions as necessary to protect resources.
- ❑ **Closed.** OHV travel is not allowed in areas designated as closed. Areas are closed in order to protect resources, ensure visitor safety, or reduce user conflicts.
- ❑ **Temporary.** Areas may be closed to OHV use temporarily to allow resources to recover or for other purposes.

Current Conditions

As is the case throughout the West, the LSFO has realized a dramatic increase in OHV use within the RMPPA. In light of this increase, the LSFO has had difficulty monitoring and managing OHV use on BLM-administered lands. As a result, there is a need for planning OHV use within these lands. Table 3-36 summarizes acres within the planning area that have restrictions on OHV travel (the balance of acreage within the planning area is classified as open for OHV use).

Table 3-36. Travel Management Designations

Area	Open	Limited (existing roads and trails)	Limited (designated roads and trails)	Closed	Seasonal Closure
Ant Hills WSA		X			
Axial Basin		X			
Bighole Gulch		X			
Brown's Park cellular site			X		
Cedar Mountain			X		
Chew Winter Camp WSA		X			
Cold Springs Mountain		X			

Area	Open	Limited (existing roads and trails)	Limited (designated roads and trails)	Closed	Seasonal Closure
(portions)					
Cottonwood Creek			X		
Cross Mountain WSA				X	
Lands adjacent to Cross Mountain WSA		X			
Diamond Breaks WSA				X	
Duffy (SRMA)					
Fly Creek				X	
Fragile Soils		X			
G Wash		X			
Hoy Mountain			X		
Irish Canyon ACEC			X		
Little Yampa/Juniper Canyon SRMA, Zone 1			X		
Lookout Mountain ACEC			X		
Limestone ACEC				X	
Lower Little Snake (South Nipple area)		X			
Lower Vermillion					
Maybell Uranium Pit				X	
Middle Mountain					
Peterson Draw WSA		X			
Pole Gulch		X			
Serviceberry				X	
South Sand Wash	X				
Union					
Vale of Tears WSA		X			
Vermillion Basin (portions)		X			
West Cold Spring WSA		X			
Wild Mountain			X		
Willow Creek		X			
Yellow Cat Wash					
All Areas not otherwise designated	X				
Total¹	991,920	229,930	56,930	72,480	0

¹ Acreage totals do not equal the sum of the listed resource areas, as the boundaries of some areas overlap.

Characterization

Some of the key drivers for the increase in OHV activity include—

- ❑ Greater public interest in OHV activities
- ❑ Increasing pressures in other areas
- ❑ A relatively longer season for nonwinter use
- ❑ The proximity of the planning area to larger urban and suburban areas
- ❑ Improved vehicle technology
- ❑ Availability of open use areas
- ❑ World-class big-game hunting.

The trend of increased OHV use is evidenced by significant resource impacts resulting from a proliferation of roads and trails. The LSFO does not have quantitative numbers on trends regarding OHV use; however, the statewide trend is dramatic. According to the Colorado Division of Parks and Outdoor Recreation, the number of registered OHVs in the State increased from 11,744 in 1990 to 88,988 in 2003. It is clear that the statewide increase has also been realized within the RMPPA.

Increased OHV activity within the RMPPA is expected to continue, with varied increases depending on the area and motorized/non-motorized use. Some non-motorized uses can be expected to increase, such as mountain biking. The LSFO considers the RMPPA relatively “undiscovered” and with its proximity to a major urban area and other public lands that are experiencing dramatic increases in use, the upward trend in use is expected to continue. Current management is insufficient to protect many of the important natural resources in the RMPPA in light of the increase in OHV activity.

3.3 CURRENT SOCIAL AND ECONOMIC CONDITIONS AND TRENDS

The Little Snake RMPPA contains two main counties, Moffat and Routt. Although bordering each other, they exhibit quite different social and economic characteristics. Moffat County is a more traditional rural county with a high dependence on agriculture, resource extraction industries, and essential services. Routt County contains the City of Steamboat Springs and its ski area, and is associated with a relatively large influx of “amenity” migrants. This distinction between counties becomes apparent when examining a series of comparisons. These comparisons are well developed in the Sonoran Institute’s *Economic Profile System, Moffat and Routt Counties* (Sonoran Institute 2002), hereinafter called EPS. Data from the Colorado Department of Local Affairs’ (DOLA) *Colorado Economic and Demographic Information System (CEDIS)* and *Colorado County Profile System* also contributed greatly to the analysis.

3.3.1 Overview of the Socioeconomic Study Area

A population comparison of Moffat and Routt counties, the State of Colorado, and the U.S. indicates overall growth from 1970 to 2004. Figure 3-18 illustrates these increases. Both counties significantly exceed the U.S. average growth rate. In addition, over the time period, Routt’s growth rate of 3.5 percent exceeds that of Moffat (2.3 percent) by 1.2 percentage points. According to DOLA, the population in 2004 was 13,471 in Moffat County and 21,004 in Routt County. The truly remarkable part of Figure 3-18 is the steep upward trend in population growth in Moffat County from 1974 to 1984, following the energy boom of the 1970s and early 1980s. This shows more than a doubling of population during those 10 years, from slightly more than 6,000 people in the county in 1974 to over 14,000 in 1984. Over that period, Moffat County’s population growth rate was faster than either the State of Colorado or the entire United States. This was followed by a decline of nearly 3,000 people, or 20 percent, in the following 5 years. In contrast, in Routt County, population growth has followed a smoother trend and has increased by 50 percent in the last 15 years, following a slight decrease in the late 1980s.

Employment and personal income growth reveal similar conclusions (Figure 3-19 and Figure 3-20). After Moffat County’s energy-related boom in the 1970s, job creation has been significantly slower than in the rest of the State, averaging close to the U.S. level. Yet, job creation in Routt County has increased

over six times since 1970, more than double the growth rate of Colorado. Both employment and personal income growth compare favorably to the national figure as well. In Routt County, general services, such as retail trade, finance insurance and real estate, and construction, have been the fastest growing sectors during the last 30 years.

Figure 3-20 shows that per capita personal income has increased by about 50 percent in Moffat County (2002 dollars). This growth trailed both the Colorado and U.S. performances. In contrast, per capita income nearly doubled in Routt County, at a rate that exceeded all other trends shown in the figure. According to DOLA, per capita income in 2003 was slightly above the U.S. average in Moffat County, at \$23,607, while it was \$34,699 in Routt County. This gap is not reflected in wages (which were \$32,854 per year per job in Moffat during 2003 versus \$30,491 in Routt in the same year), but rather show up as a series of differences in the two populations. First, differing levels of education exist in the two counties. Forty-two percent of Routt County residents over 25 years old have bachelor's degrees; only 12.5 percent have a degree in Moffat County. Moreover, Moffat's unemployment rate is double that of Routt. These two features partially explain the 11.6 poverty index in 1999 for Moffat County, indicating that for every household that made \$100,000, there were 11.6 households earning under \$30,000. The poverty for Routt County index was only 1.4.

A probable explanation for these differences is that, often, wages earned in Routt County go to workers who reside in Moffat County. The *Economic Profile System* (Worksheet 20) indicates that earnings' inflows from commuters living in Moffat County have grown from \$25 million in the early 1980s to nearly \$60 million in 2002. In Routt County, earnings' outflows exceed inflows, and so is the opposite of Moffat County. The most remarkable aspect is that the inflows of earnings to Moffat County are nearly identical to the outflows from Routt County. Thus, the close relative wages give Moffat workers additional opportunities in Routt County at similar pay.

In contrast, Routt County's per capita income variation suggests a much greater reliance on non-labor income, which might come from government pensions or investment returns. This fact is concealed in value of labor versus non-labor income because of the inflow of workers, which makes total labor income relatively high in Routt County. Thus, the dependence of the two counties on non-labor income is more similar than might be expected (28.3 percent of total income in Moffat and 29.7 percent in Routt). Despite the resemblance in proportions, a large portion of the labor income earned in Routt goes to Moffat residents.

Related to these results, Moffat County's housing affordability index was 154 in the year 2000, which is greater than the benchmark of 100 (an index of 100 indicates that a family with median income can afford the median priced house). The median household income, expressed in year 2000 dollars to adjust for inflation, remained substantially unchanged between 1989 and 1999 at around \$41,500. Yet, housing prices rose from about \$70,000 in 1990 to \$105,000 in 2000 (EPS, Worksheet 5). This led to lower affordability, as the index declined from 198 (in 1990) to 154 (in 2000). Also, housing affordability has declined in Routt County. A family with median income could only meet 82 percent of median housing costs in 2000 (down from 114 in 1990). The median household income (year 2000 dollars) increased from \$41,382 (in 1989) to \$53,612 (in 1999). However, housing prices rose from \$127,009 (in 1990) to \$268,500 (in 2000), an increase of 111 percent in a decade, or a 7.5 percent growth in prices per year (EPS, Worksheet 5).

A final perspective is related to land use and ownership patterns in the two counties. Moffat County contains over three million acres of land, making it almost twice the size of Routt County. The federal government owns more than half of the land in Moffat (57 percent), and owns slightly less than half of the land in Routt County (44 percent). Most of the federal land in Moffat County is under BLM jurisdiction (88 percent) and so, is under review in this assessment. Routt County only has about 85,000 acres under

BLM management (about 13 percent) out of 670,000 acres of federally owned land; thus the management alternatives will have less of an impact there. The Forest Service manages most of the remaining federal land. State ownership is a minor percentage of total land in both counties. The remaining area is privately owned (37 percent of total land in Moffat County and 51 percent in Routt County). Most of the private land is in agricultural uses, and, by far, most agricultural land is rangeland, with that use accounting for 84.1 percent of agricultural land in Moffat and 81.6 percent in Routt.

3.3.2 Employment and Earnings by Industry

Employment and industry incomes in the two main counties of the Little Snake RMPPA are shown in Table 3-37. The table is broken into seven sectors that contain 29 specific industries. The key dimensions of each sector are discussed below. The data are adapted from the IMPLAN database for 2002, with a more detailed table specifying the industries that make up the sectors presented in Appendix P (Minnesota IMPLAN Group, Inc. 2002).

Specific industry sectors are often separated into groups based on the roles they play in a local economy. First, some sectors produce and export products out of the region. They are often based on natural resources, such as coal, oil, and gas or are based on agriculture. Although these industries can employ many workers, their markets are not dependent on the local population's size. Regional promoters of economic development often seek these export-oriented sectors, as they bring in new dollars from outside the local economy. The new dollars are spent by workers and firms inside the economy and then create ripple or multiplier effects, increasing demand for the products and services of other businesses in the local economy. These export-based industries are often seen as the key to economic development and are often viewed as part of the "traditional" western economy.

Table 3-37. Output and Employment Values for Routt and Moffat Counties, 2002

Sector	Moffat County			Routt County		
	Industry Income (Thous. \$)	Employment Persons	Employee Compensation (Thous. \$)	Industry Income (Thous. \$)	Employment Persons	Employee Compensation (Thous. \$)
Agriculture	9,746	583	1,697	11,097	585	1,704
Construction and Manufacturing	15,423	324	8,562	173,675	3,750	139,530
Food Retailing Services and Hotels	41,980	1,358	24,008	162,414	81	21,098
Energy, Utilities and Minerals	195,271	1,087	72,422	155,759	1,224	69,944
Recreation	118	25	195	2,210	174	1,521
Services	96,166	1,714	45,001	541,188	8,228	198,313
Government	60,261	1,052	49,316	81,771	1,478	65,468
Total	418,965	6,143	201,201	1,128,114	15,520	497,578

Source: Minnesota IMPLAN Group, Inc., IMPLAN database for 2002 (See also Appendix 3.1).

Three sectors, agriculture; energy, utilities and minerals; and commercial recreation, can clearly be classified as export-oriented or export based.

Agriculture is the first group of industries in this category. Cattle ranching is dominant, with about 75 percent of both agricultural earnings and employment derived from this sector in the two counties. The other two significant production activities within agriculture are pasture, which is closely related to cattle; and other animal agriculture, which, at least in Moffat County, is mainly lamb and sheep production.

Secondly, the energy, utilities and minerals sector provides important economic activities related to BLM land management decisions. Coal extraction is, by far, the largest industry in this sector. In Moffat County, power transmission is also a large industry; therefore, much of the coal mined there is used in power generation. Oil and gas is a relatively small part of this industrial group, yet provides significant tax revenue. It is expected to have considerable growth if energy prices remain high. Oil and gas also is affected significantly by the alternatives. In keeping with the difference between the two counties, the overall energy sector accounts for about 40 percent of industry employment in Moffat County and only 14 percent in Routt County.

Many of the BLM management alternatives will have an impact on commercial recreation, so while smaller than others, there are potentially effects that vary by management alternative. Recreation, as listed here in Moffat County, is small, accounting for less than 1 percent of total employment. Yet, skiing is quite significant in Routt County, where it employs 8 percent of workers. The values in Table 3-37 for recreation do not fully capture its significance because they refer to the production of recreation activities by commercial operators. In this analysis, the entire set of expenditures by hunters, fishermen, hikers, and users of OHVs is attributed to recreation, which is much greater than the expenses that recreators give to outfitters or ski resorts. That is, tourists also spend money on restaurants, hotels, and retail goods, so the total value of recreation far exceeds the amount shown in the recreation sector because benefits accrue in other sectors.

The second broad category of industries provides services to the local population, and includes retailing, automobile services, real estate, and health. These industries will grow as population and incomes grow and are the kinds of businesses that have replaced manufacturing in the U.S. economy over the past 50 years (Eggers and Ioannides, 2006). In addition, these industries provide services for the new Western economy by providing needed support for those new entrants who come to the region for lifestyle and recreation interests. These entrants bring new dollars from non-labor income into the economy and demand a range of recreational and lifestyle services. So, the same industries that provide for the local populace can also act as base industries in a regional economy. The remaining sectors in Table 3-37 are, therefore, often related to population and income growth in the counties. As well, they can be key businesses that gain from the growth of tourists and migrants drawn to the region for lifestyle reasons.

The first sector in this group is construction and manufacturing. Three construction industries comprise this sector, as well as manufacturing, although there is little activity in either county. The largest industry in both counties is residential construction, accounting for 35 percent to 42 percent of employment in the sector. The industry, however, is about 10 times larger in Routt than in Moffat County. Secondly, services are tied to many other activities in the economy. Many are directly related to population and income growth and include health, auto repair, finance, insurance and real estate, and housing services. In terms of proportions, health is the largest service, with 540 employees in Moffat and 1,096 employees in Routt County. In addition, health services should grow faster with increases in the number of retirees. The services sector accounts for about 21 percent of total industry output in Moffat County versus 36 percent in Routt County.

The food services, retailing and hotels sector includes four industries that are often heavily dependent on tourism activity, and, as such, could be significantly affected by changes in land use in the Little Snake RMPPA. In both counties, most employees are in food services and retailing, which together account for about 80 percent of employment in this sector. Once again, this industry group is far larger in Routt than

in Moffat County, as the sector employs 1,358 persons in Moffat and 4,539 in Routt. These industries account for about 9 percent of industry output in Moffat County and 13 percent in Routt County.

The final sector is government and education, which is generally tied to population, but in Moffat County, this sector is larger, partly because of the presence of numerous federal agencies with broad responsibilities. In Routt County, much Forest Service land and employment exists as well. government employment is clearly a significant component of total employment in both counties and is based on both general government services and education. This sector accounts for about 17 percent of total employment in Moffat County versus only 7.4 percent in Routt County.

Although non-labor income can replace traditional natural resource-based industries to bring outside dollars into the economy, some issues are implied in Table 3-37. The approximate average annual wages can be derived by dividing the employee compensation by the number of workers, which shows that salaries are usually much better in traditional export base industries than in the service industries. The average in energy, utilities, and minerals are around \$60,000 per year and \$45,000 in the government sectors, which contrasts with \$25,000 in services and \$30,000 in construction *and* manufacturing. The number of proprietors and part-time workers in a sector affects these figures, so they are approximate indicators. For example, the wages in agriculture are just \$2,900 in both counties because many ranchers are part-time operators who do not hire outside employees. The same is true of recreation, which has average wages of only \$8,000 across the two counties.

One limitation to achieving higher wages in the region is that more employment opportunities can be found in the services industries than in the base industries, as less than one third of total jobs are found in the highest paying industries. Thus, changes in the structure of economies towards the service-based new West suggest that attention must be paid to finding quality jobs.

3.3.2.1 Overview of Key Sectors

Because the outlook for several sectors is especially tied to the management alternatives, further discussions of oil and gas and recreation are presented. In Chapter 4, simulations across the various alternatives are given, while websites to provide methods used, and the details and assumptions for each analysis are found in Appendix P.

Oil and Gas Drilling and Extraction

One major economic activity on LSFO lands is drilling and extracting natural gas and oil. The LSFO, in its RFD document, notes that 2,112 wells currently exist in the RMPPA, but only 881 are actively producing. However, the LSFO expects significantly more activity in the future, to the point that 3,031 wells could be drilled during the next twenty years (Conrath and Eng, 2005). The oil and gas industry consists of two primary activities, drilling wells to produce natural gas, oil, or both; and then extraction, which occurs after the well has been drilled and the economic value has been determined. Therefore, these functions are separated later in the analysis.

Table 3-38 describes recent trends in oil and gas production in the two counties under review in this socioeconomic analysis. First, production has varied over the past 3 years, with natural gas production expanding by about 15 percent and oil declining by 19.4 percent. By far, most gas production is in Moffat County, while Routt County typically accounts for about 30 percent of total oil production. In value terms, using 2005 prices (\$6 per million cubic feet [MMCF] for gas and \$55 per barrel of oil), total gas production was worth \$133.4 million, while oil production was valued at \$19.3 million. Moffat County collected \$127.1 million of the total energy-related production value, which was 85 percent of the total, while Routt County received \$6.2 million, or 15 percent of the production value.

The BLM share of total oil and gas production from federal mineral estate reported in Table 3-38 is very large, averaging about 90 percent over the 3 years observed. This suggests that the management decisions by BLM will have material economic impacts within the two counties, especially in Moffat County. The expectations of increasing prices and significantly growing production could easily lead to a quadrupling of production values during the life of the plan. Finally, the tax receipts related to oil and gas, discussed in Section 3.3.3, imply that Moffat County receives about 4.3 percent of total government receipts from oil and gas-related taxes, which is about \$1.0 million. If tax rates stay the same, receipts from this source to Moffat County could almost triple if the new wells expected are actually put in place over the life of the plan. (Payments in lieu of taxes [PILT], which account for about one third of oil and gas taxes, would not grow nearly at the rate that the number of wells do.)

Table 3-38. Gas and Oil Production

	2003	2004	2005
COUNTY AND BLM GAS PRODUCTION (MMCF)			
Moffat	18,451	19,402	18,827
Routt	100	90	67
Total	18,551	19,493	18,895
BLM	15,564	16,613	17,901
(% of total)	83.9	85.2	94.7
COUNTY AND BLM OIL PRODUCTION (BARRELS)			
Moffat	306,520	278,814	256,966
Routt	61,586	56,788	105,713
Total	368,106	335,602	362,679
BLM	273,449	249,557	217,477
(% of total)	83.9	85.2	94.7

Sources: Estimates by LSFO and Colorado Oil and Gas Conservation Commission (COGCC).

The oil and gas industry has the highest capital-labor and output-labor ratios of any business activity in the two economies. This means that businesses have to find large volumes of capital to generate each job (For example, the output-to-labor ratio is \$2.77 million per laborer in oil drilling and \$1.33 million per laborer in oil extraction. By comparison, in the coal industry, it is \$231,000 per laborer and only \$96,000 in construction). Also, despite the large sales values and significant tax receipts, purchases by these companies tend to be non-local. On average, the sector purchases 18.2 percent of its inputs from the local economy, according to assumptions used in the modeling exercises.

The Regional Oil and Gas Setting

To assess the position of Moffat and Routt counties within the region, a regional perspective was developed based for six counties in Wyoming, four in Utah and five in Colorado. The results are presented in Table 3-39. This region produced \$26 billion of oil and gas in 2005. The Wyoming counties of Sublette, Sweetwater, Lincoln, Fremont, Uinta, and Carbon produced the largest percentage, at 65 percent, with Sublette alone accounting for more than 30 percent. The counties of Routt, Moffat, Garfield, Mesa, and Rio Blanco in Colorado produced 22 percent of the total production, while the Utah counties of Carbon, Emery, Uintah, and Duchesne produced about 13 percent.

The industry income, which includes proprietors' income, employment compensation, indirect income, and taxes, was in excess of \$15 billion for the whole region in 2005, while the industry employed 17,722 workers in 2002. Sweetwater County, Wyoming, employed the largest number of people, at 1,941 workers, followed by Uintah County, Utah, with 1,590 people. Employment does not exactly follow production because some counties contain towns such as Rock Springs, Wyoming, and Vernal, Utah, which are regional centers for the industry. These areas include many corporate and administrative functions that are not found in all counties with high production.

Table 3-39. Regional Oil and Gas Production, Income and Employment, 2005

County	Output Oil (thousand barrels)	Output Gas (thousand mcf)	Industry Output Oil and Gas (thousand \$)	Industry Income Oil and Gas (thousand \$)	Employment 2002 (number of workers)
Routt CO	67	104	5,555	2,957	17
Moffat CO	257	18,866	203,280	62,646	61
Garfield CO	914	269,043	2,714,219	1,486,418	399
Mesa CO	20	10,557	105,413	44,531	440
Rio Blanco CO	36,558	5,654	2,512,781	1,469,219	712
Colorado Total	37,748	304,120	5,535,693	3,062,814	1,613
Carbon UT	9	74,821	738,376	475,769	178
Emery UT	3	16,607	163,959	88,435	84
Uintah UT	4,365	163,568	1,906,157	1,214,013	1,590
Duchesne UT	6,671	20,090	646,422	376,626	950
Utah Total	11,048	275,086	3,454,914	2,154,842	2,802
Lincoln WY	762	83,538	874,866	536,737	257
Freemont WY	3,101	209,238	2,271,490	1,403,223	356
Sublette WY	5,104	814,968	8,378,647	5,180,580	493
Uinta WY	2,247	141,774	1,548,879	690,192	1,012
Sweetwater WY	4,866	222,569	2,521,548	1,600,636	1,941
Carbon WY	1,615	101,165	1,106,019	553,010	387
Wyoming Total	17,694	1,573,252	16,701,449	9,964,378	4,446
Grand Total	132,981	4,304,916	25,692,056	15,182,034	17,722

Sources: Colorado Oil and Gas Conservation Commission; Utah Division of Oil, Gas and Mining; Wyoming Oil and Gas Conservation Commission

Moffat County ranked above only four other counties in the region in terms of natural gas production and value in 2005 and created less than 1 percent of the total value of oil and gas production in the region. The total expected production growth over 25 years represents only 5 percent of current regional production and is less than the current annual production in some individual counties in the region. Moreover, much of the benefit might accrue to the region rather than just the county because of the purchases of specialized inputs from the regional industry.

The position of Routt and Moffat counties, as small players in the region, complicates the forecasting exercise made in Chapter 4. First, because of relatively small reserves, the area may only be developed

when there is an increase in costs in other parts of the region, or when development ceases in other fields. If a continued shortage of drilling rigs and labor remains, these scarce resources might be better employed in areas with greater reserves and less risk. (Much of Moffat County would require exploratory drilling to establish viable fields.) It is also possible that few new workers, either on a temporary or permanent basis, would migrate into the community if sufficient capacity in the region exists to handle drilling in Moffat County when the time is appropriate to do so. Drilling rig teams might live in mancamps, but be isolated from the local economy almost exclusively. Thus, the anticipated benefits would be less than estimated in the current forecasts, but so might be the costs.

For example, a significant number of wells could be drilled using workers who live in Rock Springs. Then, increased crime rates, rising housing costs, and other possible downsides to the growth in the oil and gas labor force would not occur. Neither would the gains in indirect business activity, because the laborers would not be spending any significant time in the area. Yet, the production from the wells would still flow, as would the associated tax revenues. One other possibility is that Moffat County could experience a boom in demand for housing as workers throughout the region experience a greater desire to live in an area less touched by the large oil and gas labor force in other counties. Thus, even without production, there could be increased demand for housing in the region.

Recreation Activities in the RMPPA

Recreation is an important multiple use, and one that makes a perceptible contribution to the local economy via purchases of gasoline, lodging, supplies, etc. To quantify local economic effects of BLM land recreation, visitor use and visitor expenditures must be estimated. The largest and most visible expenditures for recreation come from hunting and fishing, as there are licenses required and a significant amount of nonresident participation. In addition, there are many visitors who engage in hiking, OHV recreation, horseback riding, and mountain biking, for which little data had been collected. Therefore, the Northwest Colorado Stewardship (NWCOS), an independent stewardship group, funded Colorado State University (CSU) to determine the use and economic contribution of non-hunting and fishing recreation on BLM lands in Moffat County. CSU used surveys in a variety of recreational sites during Fall 2005 and Spring 2006. (See Appendix P for websites that contain specific results for this analysis).

Non-Hunting and Fishing Recreation in Moffat County

A significant range of recreation activities was examined in the survey during Fall 2005 and Spring 2006. Many of the sites surveyed were trailheads that are part of the Yampa Valley trail and are used for mountain biking. River access sites administered jointly by BLM and the Colorado State Parks (e.g., Duffy Mountain River Access) were also surveyed. Some areas, such as West Juniper Mountain trailhead, emphasize non-motorized recreation including hiking, horseback riding, and mountain biking. The Irish Canyon Interpretive Site consists primarily of a large petroglyphic panel. Sand Wash Basin is a major OHV area used by motorcycles and ATVs. Thus, a wide range of potential activities was assessed in this survey work.

The CSU study estimated that 6,500 visitor days are associated with non-motorized recreation, while 26,000 visitor days are devoted to motorized opportunities. The Craig and Steamboat areas appear to capture a sizeable portion of total visitor spending, with about three-fourths of total visitor spending occurring within Moffat and Routt counties. These estimates are based on small sample sizes, thus provide only an approximate use estimate. Each non-motorized visitor spent \$19.21 per day, while motorized visitors spent \$27.58 per day. Annually, the direct expenses by these users of LSFO land amounted to about \$850,000.

Many multiple use outputs from BLM land are not traded in markets and might not have measurable onsite expenditures associated with them. Without expenditures, or prices, they cannot be included in regional economic analysis. However, economists have long recognized that absence of market price does not mean an absence of value to society. For a resource to have economic value, it must meet only two conditions: provide some individuals with enjoyment or satisfaction and be scarce. These criteria are met for a variety of multiple use outputs in the LSFO, such as clean water, wild horses, wilderness, nongame wildlife, etc. These are often referred to as “public goods” (economic term given by Samuelson, 1955). Air, water, noise, and visual pollutants are “public bads.” The economic values of nonmarketed resources can be reflected in implicit markets by using housing prices near positive amenities, such as wilderness (Phillips, 1999). Because the time and expense of conducting studies to measure housing price gains associated with public goods and public bads, as well as the nonmarket offsite values of wilderness and Wild and Scenic Rivers, it was decided not to perform original studies in these areas. However, a literature review is provided in this assessment that suggests dimensions relevant to the LSFO.

The benefits of proximity to wilderness or clean water are referred to as “use values.” The opportunity to see wildlife or wild horses while driving to work or a recreation site is also a use value. Viewing wildlife or wild horses often involves little or no expenditure, but it yields a large consumer surplus, or net economic value, as the benefit comes at little or no expense. Alternatively, coalbed methane wells, air pollution, or water pollution can reduce use values, whether through property prices (BBC Research & Consulting, 2001) or detracting from a recreation experience. Although the CSU visitor survey only measures use values for those visitors using the BLM resource, there are other values of public goods arising from BLM administered lands in the RMPPA. These public goods also provide an offsite or passive use value to millions of Coloradoans who may not frequently visit the LSFO, yet still derive benefits from knowing wilderness and wild and scenic rivers exist and are protected in Colorado (Walsh, Loomis and Gillman, 1984; Sanders, Walsh and Loomis, 1990).

Hunting and Fishing in Moffat and Routt Counties

Hunting and fishing are important parts of Colorado’s, as well as Moffat and Routt’s, tourism economy (Pickton and Sikorowski, 2004). In their study, Pickton and Sikorowski report the direct expenditures for six categories of hunting and fishing activities. Their study shows that the largest portion comes from elk and other large game hunting, followed by fishing. Fifty-six percent of direct expenditures in Moffat County go to large game hunting, while the comparable figure for Routt County is 46 percent. Slightly more than 80 percent of those total expenditures come from nonresident hunters. Fishing is much more important in Routt than in Moffat County, accounting for 34 percent versus 15 percent of total expenditures on hunting and fishing. According to the study, the total effects on the local economy are \$25.5 million in Moffat County and \$14.9 million in Routt County. BLM land provides a significant opportunity for hunters of large game. Of the 72,000 hunter days going towards elk hunting in Moffat County, an estimated 32,000 hunter days were used on BLM land.

CDOW and BLM wildlife biologists were not able to provide impacts on hunter days across management alternatives. However, for illustrative purposes, the impact of the CDOW elk management plan for Bear’s Ears and White River Management Units (Finley, 2005a and 2005b) was examined. The analysis found that the reduction in elk herds called for in the plan would lead to about \$1.02 million less per year in direct expenditures for large game hunting on BLM land. This would be equivalent to a 27 percent reduction in total direct expenditures generated on BLM land. The total income lost from this policy change would be \$670,000, with a consequent lower need for about 26 laborers (although much of this might be temporary, seasonal employment).

3.3.3 Public Finance and Government Services

The Moffat County Department of Revenue and DOLA's State Demography Office state that, in 2002, Moffat County relied primarily on intergovernmental transfers and taxes for government revenues, which accounted for 50 percent (up from 38 percent in 1991) and 40 percent of total revenues, respectively. General property tax revenues were 73 percent of total taxes, amounting to \$22.1 million. In 2002, Routt County's major revenues came from general taxation, which accounted for 56 percent of the total revenues of \$23.7 million, or \$13 million. These revenues were mostly from general property taxes and sales/use taxes. The second major source of revenues in Routt County was intergovernmental revenue of almost \$8 million, or 26 percent of total revenues in 2002.

The total expenditure of the Moffat County government reached \$25.4 million in 2002, which was mainly spent in five categories. These included general government costs (15 percent); public safety and judicial (12 percent); public works, including road maintenance (19 percent); other operating expenditures, including health, social services, and recreation (24 percent); and capital outlays (26 percent). For Routt County, total expenditures were \$21.4 million, which was also spent in mainly the same categories: general government costs (23 percent); public safety and judicial (25 percent); public works, including road maintenance (23 percent); other operating expenditures, including health, social services, and recreation (18 percent); and transfers to other governments and enterprises (12 percent). It appears that Moffat County has spent in excess of its revenues, while the Routt County did not.

Of particular interest is the extent and types of levies on oil and gas on BLM land, which were about 4.5 percent of total revenues in Moffat County (If these revenues had come from a sector based on sales taxes, this would be consistent with an industry with about \$20 million in sales). Four types of taxes levied on the oil and gas industry are reported in Table 3-40. The largest and most consistent source of revenue was the federal mineral lease tax revenues, which are collected by the Minerals Management Service in the U.S. Department of the Interior. Colorado receives \$30 to \$60 million from the U.S. Government, which is distributed to Colorado counties based on residence reports of employees within the industry. This consistent revenue suggests employee stability in the area and, perhaps, stability in the leases held. The second largest tax category is the PILT (Payment in Lieu of Taxes). These are federal payments to local governments that help offset losses in property taxes due to federal ownership of acreage in a county. The other two tax categories are property taxes, which can be changed based on the assessed value of the oil and gas improvements on federal land; and severance taxes, which are related to the number of employees in a county, as a proxy for production.

Table 3-40. Total Revenue Received as a Result of Permitting Federal Lands in Moffat County

Source	2002	2003	2004	2005
PILT	277,999	635,390	317,051	300,000
Property Tax	89,209	55,362	106,485	133,050
Severance Tax	4,463	3,679	3,748	6,763
Federal mineral lease	576,482	620,015	661,654	640,000
Grand Total	948,153	1,314,446	1,088,938	1,079,813

Source: Moffat County Department of Revenue.

3.3.4 Quality of Life Considerations

The Moffat and Routt County societies demonstrate many features considered typical of the Intermountain West. The mix of public and private lands, wild rivers, open meadows, alpine climates,

wildlife and cattle, harsh winters, and dry temperate summers help create a human ecology as diverse as this natural environment. Directly or indirectly, the county economies are based on their natural resource base. Economies dominated by cattle and sheep ranching, or oil and gas, clearly depend on the area's quality of natural resources. However, these industries, certainly in Routt County and to an increasing degree in Moffat County, have given way to outdoor recreation (e.g., hunting, skiing, fishing, mountain biking, etc) and to the influx of migrants seeking lifestyle attributes, including retirees and telecommuters. The primary drivers of this economy may, therefore, be in conflict. This section reviews evidence and concerns in this regard.

3.3.4.1 Preferences Related to Use of Federal Lands

In 2001, Moffat County engaged in a survey of attitudes and preferences for the use of federal public lands in the county (Todres et al, 2003). Most respondents saw federal lands as important to the county economy and tax base. They felt the best way to use these lands was with a multiple use management strategy. Survey respondents did not generally want to see expansions to Dinosaur National Monument, creation of Vermillion National Monument, or designation of any additional BLM wilderness areas (there currently are no designated wilderness areas within Moffat County, only wilderness study areas). However, if any of these actions were taken, they would prefer that multiple use activities, such as grazing and oil/gas/mineral exploration and production, be available. Overall, there was no desire for any new land designations that would take away current land use practices.

The survey data were also evaluated for four subgroups: Moffat County residents who own significant amounts of land, and those who do not, and nonresidents who own significant amounts of land and those who do not. It is important to distinguish ownership and nonownership attitudes because landowners control critical natural resources in the county while nonlandowners pay the bulk of taxes and control voting outcomes. Nonresident nonlandowners tended to disagree with permitting gas, oil, and mineral exploration and production in the proposed Vermillion National Monument, while residents tended either to be neutral or to disagree or agree specifically with gas, oil, and mineral exploration and production additions to Dinosaur National Monument. Multiple use was the preferred land planning strategy when it included grazing and motorized recreation, but opinions diverged when it included multiple use involving gas/oil/mineral exploration and production.

3.3.4.2 Current Perspectives on Agriculture and Ranching

The livestock industry enjoys a long tradition, and, directly or indirectly, influences the great majority of private lands within the region. As a result, significant changes in the economic viability of the industry are likely to have important social and cultural implications. Like many communities with strong agricultural traditions, this region is increasingly concerned about maintaining an adequately large agricultural base that can justify the local provision of agricultural service providers and job opportunities for local youth.

Many members of NWCOS reflected these concerns that were tied to the overall growth of population in Moffat County, as well as those that were tied to the long-term outlook for agriculture, irrespective of management alternatives pursued in the Draft EIS. A recent master's thesis at Colorado State University by Nicholas Magnan examined Routt County residents' growth-related concerns about the conversion of privately held farms and ranches into rural residential properties (A summary is contained in Magnan, et al. 2005). In 1994, 96.5 percent of respondents said they would have voted "yes" on a referendum to protect range open space at no cost to them. In 2004, 93.7 percent said they would. When the referendum would cost respondents at least \$1.00, 91.1 percent said they would have voted "yes" in 1994, while the outcome was 91.3 percent in 2004. The participants identified the natural environment and ranch open space as the two most important contributions to well being. In 2004, western heritage was

the third most important characteristic of the County environment. Although these results may not be exactly consistent with preferences in Moffat County due to differences in income levels, they do reflect a strong interest in protecting the rural nature of Routt County.

3.3.5 Environmental Justice

Executive Order 12898, issued on February 11, 1994, requires the BLM to identify and address as “actions, leases, and authorizations that cause disproportionately high and adverse impacts to minority populations, low-income communities, and Tribes.” Thus, an environmental justice assessment requires determining whether any alternative has disproportionate effects on minority or low-income populations. Low-income populations are those families with incomes of below \$12,674 for a four-person household.

Based on Census data for Moffat County, less than 13 percent of households are in this income category. Hispanic/Latino is the largest minority with about 9 percent of the population. Other ethnic minorities, including American Indian, are less than 1 percent each of the total population. The -other races-category accounts for about 4 percent of the total population in Moffat County. According to Census data for Routt County, no more than 8.8 percent of the households are in the low-income category. Again, Hispanics are the largest minority, with about 2.2 percent of the population. Other ethnic minorities, including American Indian and other races, are all less than 1 percent each of the total population.

To ascertain whether there are disproportionate effects of the alternatives on minority and low-income populations, data on effects by each alternative will be reviewed and reported in Chapter 4. One inevitable problem in making the assessments is that data exist by ethnicity and household income, but not by sector employment and ethnicity, or sector employment and household income. Nonetheless, some inferences will be made in the next chapter.

3.3.6 Costs and Benefits of BLM Alternatives: A Preview of Chapter 4

This section contains a preview of Chapter 4. There, the four management alternatives will be evaluated in terms of the industry income they create, their compensation to laborers, and the total employment generated. In general, larger industry income or compensation to workers leads to greater *economic benefits* to the region from a particular alternative. Also, industrial and commercial firms provide additional benefits. These include contributions to colleges and municipalities and support to various nonprofit organizations. Moreover, potential benefits might include increased opportunities for employees to receive higher-than-average salaries, an improved distribution of income or more opportunities for training, and experience for local workers from a more diverse economy. Many of these added benefits are not quantifiable, or, as in the case of contributions, are not necessarily tied closely to the economic growth of a particular sector. Nonetheless, they are benefits and will be enumerated in Chapter 4. These benefits will be summarized in the first part of Chapter 4, after a baseline projection to the year 2025 has been made.

The outcomes for each alternative are driven by the performance of the oil and gas industry, which depends on the restrictions imposed in a given management alternative. The growth of industrial activity, especially related to oil and gas, will create a number of *costs*. One important issue is the need for oil and gas companies to use temporary workers when drilling activity is high. These laborers will not have work throughout the year, so they would not live in Moffat County. Instead, they would be migrants housed in temporary quarters. Without a vested interest in the community, they might not invest in the local economy to the same degree that permanent residents do. In addition, increased negative social behavior, sometimes associated with migrant workers, might occur.

There is a debate about the impact of seasonal restrictions on the oil and gas industry and how it bears on the socioeconomic cost issue. If restrictions were seasonal, more temporary employees would be used; therefore, fewer workers will become permanent residents. This leads some observers to suggest that the problem would lessen if seasonal restrictions were decreased. However, with or without seasonal limits, workers must see future job stability so that relocation is viable. This may be problematic given the boom-bust cycles seen often in energy prices. Indeed, if these workers become permanent residents, housing affordability could become more of a problem, although housing in Moffat County currently is quite reasonable by Colorado standards. This might be a greater problem in Routt County, except that the industry is much smaller there.

In addition, the alternatives contain a number of environmental effects that could lead to socioeconomic costs. For instance, existing oil and gas wells could impair scenic values and recreation experiences for hunters or hikers. The construction of wells, access roads, and pipelines would disturb the immediate ecology of an area. A significant amount of water is often pumped out of oil and gas wells, which could be of low quality and must be disposed of or returned underground. These actions have environmental effects, which could result in socioeconomic impacts. Many of these costs have not been identified quantitatively, but they need to be presented so that decisionmakers can decide how much weight to give to these potential costs.