CHAPTER 3
AFFECTED ENVIRONMENT

3.1 INTRODUCTION

The purpose of this chapter is to describe the existing biological, physical, and socioeconomic characteristics of the planning area, including human uses that could be affected by implementing the alternatives described in Chapter 2. This chapter includes a discussion of resources, resource uses, special designations, support and social and economic conditions. Each topic area includes an introduction followed by a description of current conditions and characterization that includes the indicators (which assess the resource condition) and trends (which express the direction of change between the present and some point in the past).

Certain types of resources that may be present in other planning areas, such as wild horses and burros, do not exist in the CRVFO and are therefore not covered in this section. Information from broad-scale assessments was used to help set the context for the planning area. The information and direction for BLM resources and resource uses has been further broken down into fine-scale assessments and information. The level of information presented in this chapter is commensurate with and sufficient to assess potential effects discussed in Chapter 4, based on the alternatives presented in Chapter 2.

Acreage figures and other numbers used are approximate projections; readers should not infer that they reflect exact measurements or precise calculations. Acreages were calculated using Geographic Information Systems (GIS) technology, and there may be slight variations in total acres between resources.

The planning area includes all lands, regardless of jurisdiction, within the CRVFO boundaries. However, the BLM makes decisions on only those lands and federal mineral estate that it administers (the decision area). The 73,602-acre Roan Plateau portion of the CRVFO planning area is covered under the separate Roan Plateau RMP Amendment, rather than under this RMP/EIS. An exception is that the Roan Plateau planning area is covered in the Wild and Scenic Rivers (WSR) Suitability Study and associated management guidance, presented in Appendix C and Chapter 2 of this document, respectively. Also the air quality analysis included in this RMP did include impacts of oil and gas development of the Roan Plateau in the cumulative effects; however the oil and gas development analyzed in the direct and indirect effects section of this RMP/EIS did not include Roan Plateau development.

3.2 RESOURCES

This section contains a description of the biological and physical resources of the CRVFO and follows the order of topics addressed in Chapter 2:

- Air resources (Air Quality and Climate)
- Soils
- Water resources (Surface and Ground)
- Vegetation
- Fish and wildlife
- Special status species
- Cultural resources
- Paleontological resources
- Visual resources
- Wildland fire ecology and management
- Lands with wilderness characteristics outside Wilderness Study Areas
- Cave and karst resources

3.2.1 Air Quality - Air and Atmospheric Values

Air pollution control programs are based on a combination of federal and state legislation. The Clean Air Act (CAA) is the primary federal legislation and state legislation provides additional air quality management authority. The US Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for several different pollutants, which are often referred to as criteria pollutants (ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, suspended particulate matter, and lead). Standards for suspended particulate matter have been set for two size fractions: inhalable particulate matter (PM_{10}), and fine particulate matter (PM2.5). The Colorado Air Quality Control Commission has adopted state ambient air quality standards that generally are equal to current or former federal standards. Additionally, hazardous air pollutants (HAPs), which are suspected to cause cancer or other serious health effects, are regulated under the CAA but ambient air quality standards have not been set by EPA. The HAPs presented in this report are from current ambient air quality monitoring and HAPs generally associated with oil and gas exploration, and are evaluated in the impacts of Chapter 4. The Air Pollution Control Division (APCD) of CDPHE implements regulatory and planning programs based on federal and state regulations. CDPHE issues air quality permits for many stationary sources, including stationary sources with uncontrolled actual emissions of 200 pounds per year, 2 tons per year, 5 tons per year, or 10 tons per year, depending on the pollutant. However, most mobile sources (such as vehicles) and stationary sources that emit less than these threshold quantities do not require issuance of a CDPHE air quality permit. The CAA and the Federal Land Policy and Management Act of 1976 (FLPMA) require BLM and other federal agencies to comply with federal, state, tribal, and local air quality standards and regulations. FLPMA further directs the Secretary of the Interior to take any action necessary to prevent unnecessary or undue degradation of the lands [Section 302 (b)], and to manage the public lands "in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values" [Section 102 (a)(8)].

The BLM is responsible for developing land use plans that provide for compliance with applicable pollution control laws, including state and federal air, water, noise, or other pollution standards or implementation plans, and to manage the public lands in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values. Moreover, such plans may also establish management goals and objectives for federal lands and resources which require managing activities so as to attain or maintain a higher standard of air quality than required by the CAA.

Clean air, expansive vistas, and minimal acidification of the lands, streams, and lakes are significant values to be pursued in the planning area. Some activities on BLM lands could affect these air-quality-related values both in the planning area and on lands adjacent to the planning area. Furthermore, BLM plans may contribute to climate change, depending on the types of land uses and the intensity of those uses. Accordingly, activities on CRVFO lands must comply with federal air quality regulations. Deterioration of air quality could result in imposed restrictions on those activities. Air resource management is accomplished by establishing desired goals and objectives and management actions in land use plans that, at a minimum, must comply with regulatory standards, but may also go beyond simple regulatory requirements in order to prevent unnecessary or undue degradation of the lands within the scope of its authority to do so. Achieving management objectives requires implementation of certain actions to achieve those objectives. For example, an objective of assessing mercury deposition in an aquatic system might include air quality monitoring of this non-regulated pollutant, or an objective of reducing atmospheric pollution might include requiring advance designed engines as conditions of approval in a BLM permit. Air resource management goals and objectives for this RMP are summarized in Chapter 2, Table 2-2.

Emissions consist of criteria pollutants and their precursors, hazardous pollutants, and greenhouse gases. Criteria pollutants include carbon monoxide, lead, particulate matter, ozone, nitrogen dioxide, and sulfur dioxide. Greenhouse gases (GHG) which the BLM analyses are carbon dioxide, methane, and nitrous oxide. Hazardous pollutants include a long list of pollutants identified by the EPA and include pollutants such as mercury, benzene, and toluene. Activities on BLM lands in the CRVFO area which have the potential to emit these pollutants include wildfires, prescribed burns, mechanical thinning and other vegetation management activities, vehicle travel on paved and unpaved roads; off-highway vehicle (OHV) activity on roads, trails, and off-road areas; energy development, mineral extraction, and mining operations; livestock grazing; and camping and other recreational activities. Combustion processes in wildfires, prescribed burns, and other vegetation burns produce reactive organic compounds, nitrogen oxides, carbon monoxide, PM_{10}, $PM_{2.5}$, and GHG emissions. Similarly, fuel combustion in vehicle engines produces reactive organic compounds, nitrogen oxides, carbon monoxide, PM_{10}, $PM_{2.5}$, and GHG emissions. Vehicle travel on unpaved roads or in off-road areas generates fugitive dust that contains PM_{10} and $PM_{2.5}$ Energy development, mining operations, and mineral extraction activities use vehicles and equipment that produce reactive organic compounds, nitrogen oxides, carbon monoxide, PM_{10}, $PM_{2.5}$, and GHG emissions. Camping and other recreational activities produce pollutant emissions through vehicle use, campfires, camp stoves, and use of portable internal combustion engines. Livestock grazing activity produces dust that contains PM_{10} and $PM_{2.5}$, while livestock themselves produce GHG pollutants through digestive processes and manure generation. Wind erosion from disturbed or sparsely vegetated lands produces PM_{10} and $PM_{2.5}$.

Air pollutant emissions caused by BLM activities include work-related vehicle travel by BLM personnel, prescribed burning programs, and hand thinning timber management activities and other vegetative treatments. Air pollutant emissions are a consequence of BLM management programs and authorized activities related to energy and mineral development, recreational use of BLM lands, and grazing leases on BLM lands. Activities directly undertaken by the BLM or requiring its approval must comply with applicable federal, state, tribal, and local air quality regulations and standards.

Current Conditions

Ambient Air Pollutant Concentrations

The entire CRVFO planning area is considered in attainment or unclassified for all NAAQS, with one small exception. The Aspen area, in the southern portion of the CRVFO planning area, was previously designated a nonattainment area for inhalable PM_{10} and is now a PM_{10} maintenance area. Approximately 1.57 acres of BLM land are located within the Aspen PM_{10} maintenance area, as shown in Figure 3.2.1-1, CRVFO Aspen PM_{10} Maintenance Area. Any BLM action on the land within the Aspen PM_{10} maintenance area (i.e., any action taken on that 1.57 acres of land) that would result in PM_{10} emissions requires a general conformity analysis and, if warranted, a formal determination before such activity is authorized by the BLM. Since the maintenance area within the CRVFO is only 1.57 acres, it is very unlikely that a formal conformity determination would be required.

There are five APCD air pollution monitoring stations currently operating within the CRVFO planning area (Glenwood Springs, New Castle, Rifle, Parachute, and Aspen). Previous monitoring stations in Silt are no longer in operation. In addition, APCD monitoring stations are located near the CRVFO planning area in Clifton, Grand Junction, Meeker, Palisade, and Rangely. All of these monitoring stations measure PM_{10} concentrations. Monitoring stations in Grand Junction also measure $PM_{2.5}$ and carbon monoxide concentrations. Ozone is monitored at multiples sites, though most rural monitors near the CRVFO are not

operated by CDPHE. In 2010, the BLM installed and began operating two monitoring stations in the adjacent field office area, which is within the modeling domain of this RMP. Each station monitors ozone, PM2.5, NO_x, and several meteorological parameters. One station is located in Meeker and the other in Rangely. Although the stations were intentionally set up so that the data could be used for regulatory purposes by CDPHE, the data have not yet been subjected to quality assurance and quality control (QA/QC) and cannot at the time of this printing be used for regulatory determinations. Therefore, the data are provided for information purposes only. Table 3.2.1-1, Concentrations of Criteria Air Pollutants–Nearest Representative Values Within and Near the CRVFO Planning Area, is a summary of concentrations of ambient carbon monoxide in parts per million (ppm), ozone (ppm), and PM_{10} and $PM_{2.5}$ in micrograms per cubic meter ($\mu g/m^3$) from monitoring stations in or near the CRVFO.

Particulate Matter

As indicated in Table 3.2.1-1, Concentrations of Criteria Air Pollutants–Nearest Representative Values Within and Near the CRVFO Planning Area, PM_{10} is monitored at several locations within the CRVFO planning area, mostly along the Interstate 70 corridor. All available PM_{10} data indicate compliance with federal and state PM_{10} standards. There is no monitoring of $PM_{2.5}$ within the CRVFO planning area. The closest $PM_{2.5}$ monitoring location with quality-assured data is in Grand Junction. The data from Grand Junction indicate compliance with federal and state $PM_{2.5}$ standards.To date, $PM_{2.5}$ data from the Meeker station indicate compliance with the NAAQS, though these data have not been quality assured by the state to use for regulatory compliance verification.

Table 3.2.1-1
Concentrations of Criteria Air Pollutants—Nearest Representative Values Within and Around the CRVFO Planning Area

			Pollutant Concentration			
Location	**Averaging Time**	**Current Standard**	**2007**	**2008**	**2009**	**2010**
		Carbon Monoxide				
Grand Junction	1-hour maximum [a]	35 ppm	2.8	6.8	2.3	1.7
	8-hour maximum [a]	9 ppm	1.8	1.5	2.2	1.1
		Ozone				
Aspen	8-hour maximum [b]	0.075 ppm (state/federal)				0.063 [c]
Colorado National Monument	8-hour maximum [b]	0.075 ppm (state/federal)	0.067	0.067	0.064	0.063
Gothic	8-hour maximum [b, h]	0.075 ppm (state/federal)	0.067	0.067	0.067	
Meeker	8-hour maximum [b, h]	0.075 ppm (state/federal)				0.066 [c,]
Palisade	8-hour maximum [b]	0.075 ppm (state/federal)		0.070 [c]	0.064 [c]	0.067
Rifle	8-hour maximum [b]	0.075 ppm (state/federal)		0.066 [c]	0.062 [c]	0.065
Rangely	8-hour maximum [b, h]	0.075 ppm (state/federal)				0.058 [c]
Rio Blanco County (Greasewood Area)	8-hour maximum [b, h]	0.075 ppm (state/federal)				0.072 [i]
		Inhalable Particulate Matter (PM_{10})				
Aspen	24-hour maximum [d]	150 $\mu g/m^3$ (state/federal)	52	53	47.3	44.7
	Annual average	50 $\mu g/m^3$ (state)	17.3	16.9	16.3	15.2 [e]

Table 3.2.1-1 *(continued)*
Concentrations of Criteria Air Pollutants—Nearest Representative Values Within and Around the CRVFO Planning Area

Location	Averaging Time	Current Standard	Pollutant Concentration 2007	2008	2009	2010
Clifton	24-hour maximum [d]	150 μg/m³ (state/federal)	62 [c]	96 [c]	93	98
	Annual average	50 μg/m³ (state)	33.8 [e]	30.7	31.7	23.0 [e]
Glenwood Springs	24-hour maximum [d]	150 μg/m³ (state/federal)	28			
	Annual average	50 μg/m³ (state)	14.7			
Grand Junction (Pitkin Ave.)	24-hour maximum [d]	150 μg/m³ (state/federal)	118	120	105	107
	Annual average	50 μg/m³ (state)	36.8	34.9	30.3	26.8 [e]
Grand Junction (South Ave.)	24-hour maximum [d]	150 μg/m³ (state/federal)	72	83	77	76
	Annual average	50 μg/m³ (state)	28.4	31.1	24.5	19.1
New Castle	24-hour maximum [d]	150 μg/m³ (state/federal)	50			
	Annual average	50 μg/m³ (state)	24.9			
Parachute	24-hour maximum [d]	150 μg/m³ (state/federal)	64	88	89	87
	Annual average	50 μg/m³ (state)	29.4	45.7 [e]	25.0	22.6 [e]
Rifle	24-hour maximum [d]	150 μg/m³ (state/federal)	55	67	68	67
	Annual average	50 μg/m³ (state)	27.2	31.5	24.9	25.7 [e]
Silt (County Road 233)	24-hour maximum [d]	150 μg/m³ (state/federal)	27			
	Annual average	50 μg/m³ (state)	13.2 [e]			
Silt (County Road 327)	24-hour maximum [d]	150 μg/m³ (state/federal)	23			
	Annual average	50 μg/m³ (state)	10			
Silt (Owens Dr.)	24-hour maximum [d]	150 μg/m³ (state/federal)	27			
	Annual average	50 μg/m³ (state)	11.8			
Fine Particulate Matter ($PM_{2.5}$)						
Grand Junction (South Avenue)	24-hour maximum [f]	35 μg/m³ (state/federal)	22.7	25.0	30.6	34.5
	Annual average [g]	15 μg/m³ (federal)	9.18	9.43	9.44	9.28

[a] Annual second maximum values are reported in accordance with the format of the NAAQS.
[b] Three-year averages of the fourth highest daily maximum 8-hour average concentration are provided.
[c] Annual value given because insufficient data are available to calculate the 3-year average.
[d] Three-year averages of the second highest 24-hour average are reported. The standard may not be exceeded more than once per year on average over 3 years.
[e] This annual average does not satisfy EPA summary criteria.
[f] Three-year averages of the 98th percentile of 24-hour concentrations are reported.
[g] Three-year averages of the weighted annual mean are reported.
[h] Ozone data in Meeker and Rangely have not yet been verified through QA/QC.
[i] These data represent the fourth highest daily maximum 8-hour average concentration during a 1-year monitoring period from October 1, 2009, through September 30, 2010. Data are from a group of compressor stations in the Greasewood area.
Sources: Chick 2011, EPA 2011

Carbon Monoxide

There is no monitoring of carbon monoxide within the CRVFO planning area. The closest carbon monoxide monitoring location is in Grand Junction. Data from Grand Junction indicate compliance with federal and state carbon monoxide standards.

Ozone

There are no state-operated ozone monitoring stations within or near the CRVFO planning area with at least 3 years of ozone data (the minimum quantity of data needed to determine NAAQS compliance). The United States Department of Agriculture, Forest Service (US Forest Service), however, operates portable ozone monitoring stations at Ripple Creek Pass near the Flat Tops Wilderness, at Sunlight Peak near Glenwood Springs, at Ajax Mountain near Aspen, near Carbondale, and near Silt. The CASTNET dry deposition monitoring system includes ozone monitoring at Gothic (outside the CRVFO planning area) and on the east side of Rocky Mountain National Park. Data from the CASTNET ozone monitors have not been subjected to QA/QC evaluation, and thus cannot be used for regulatory determination of violations of federal ozone standards. In 2010, the BLM installed and began operating two monitoring stations in the adjacent field office, which are within this RMP's modeling domain. In addition to other parameters, each station monitors ozone. One station is located in Meeker and the other in Rangely. Although the stations were intentionally set up so that the data could be used for regulatory purposes by CDPHE, the data have not yet been subjected to QA/QC and cannot at the time of this printing be used for regulatory determinations. Therefore, the data are provided for information purposes only.

EPA is in the process of reconsidering the current ozone NAAQS of 0.075 ppm and has proposed to revise the standard to within the range of 0.060 to 0.070 ppm. The CRVFO and surrounding areas are currently designated attainment based on an earlier ozone standard of 0.080 ppm. EPA plans to determine ozone attainment designations in accordance with the future more stringent standard after it is finalized.

Hazardous Air Pollutants

EPA has not set ambient air quality standards for hazardous air pollutants (HAPs). Consequently, little ambient air monitoring data exist for these pollutants. EPA regulates HAP emissions by imposing emission restrictions on certain types of industries and equipment.

Wet deposition of mercury is monitored at the Buffalo Pass station at the south end of the Mount Zirkel Wilderness. That station began operation in 1999, but did not collect sufficient data in 1999, 2002, 2003, 2004, 2006, or 2007 to meet data completeness protocols for computing annual deposition rates. Reported annual wet deposition rates for mercury at Buffalo Pass were 0.09 gram per hectare (0.000080 pound per acre) per year in 2000; 0.08 grams per hectare (0.000071 pound per acre) per year in 2001; and 0.069 gram per hectare (0.000062 pound per acre) per year in 2005. The reported mercury deposition rates are generally less than wet deposition rates measured in other areas of the US.

Hazardous chemicals are used and produced by oil and gas extraction processes. Construction and operations of oil and gas wells can potentially pose health hazards due to HAP emissions from wells and from associated stationary sources, such as compressor stations. Abandoned wells may be a source of toxic contaminants if proper capping and maintenance procedures are not used. HAP emissions from vehicular traffic also occur, though emissions from these sources are less than vehicle emissions in urban areas.

As a result of the increased health concerns of residents, the Garfield County Board of County Commissioners initiated several studies in an attempt to characterize trends in air quality and potential human health risks (e.g., Coons and Walker 2008, Witter et al. 2008). The results of those studies are described in Section 3.6.1.

A Garfield County 2008 Air Quality Monitoring Summary prepared for the County (Air Resources Specialists 2009) summarized criteria pollutants and HAPs from four monitoring stations. The report concluded that air quality measurements in Garfield County did not violate air quality standards for ozone or particulate matter in 2008. Additionally, the measured ozone concentrations were less than the potential contribution of volatile organic compounds (VOCs) to ozone formation. The report compared HAPs concentrations and found that the local concentrations varied (more or less than regional) by location and pollutant (Air Resources Specialists 2009).

More recently, CDPHE obtained VOC and HAP monitoring data during a 1-year period from October 2009 through September 2010 at an active oil and gas compressor station area north of the CRVFO (Chick 2011). The monitoring study measured concentrations of 61 VOCs, HAPs, and other air pollutants. Twenty of the pollutants were not detected at any time. Formaldehyde was the only VOC/HAP that was detected in more than half of the samples. A health risk analysis was not performed with these data, and no residences are located near the monitoring site.

Visibility

The CAA requires a planning program with the goal that all areas of the country achieve the NAAQS within various specified time frames. For attainment areas that already meet the NAAQS, the federal Prevention of Significant Deterioration (PSD) permit program established a classification system defining the extent to which baseline air quality conditions can be degraded. Class I areas have the smallest allowable air quality deterioration limits. Class II areas allow greater deterioration of air quality, but must maintain air quality conditions in compliance with the federal air quality standards. Figure 3.2.1-2, CRVFO CAA Class I Areas, shows the locations of Class I areas in and near the CRVFO planning area. All of the area outside Class I areas is designated as Class II. One element of the PSD permit program is a review of the extent to which a proposed emission source will impair visibility conditions in Class I areas.

The BLM, as a federal land manager, has an "affirmative responsibility to protect the air quality and related values (including visibility)" of lands it administers that are within a Class I area, and to consider whether a proposed major emitting facility will have an adverse impact on those values [CAA Section 165 (d)(2)]. The CAA also requires states to develop programs to remedy existing visibility impairment in Class I areas if that visibility impairment is caused by man-made air pollution. The EPA has identified the following two general types of visibility impairment at Class I areas:

- Impairment due to smoke, dust, colored gases, or layered haze attributable to a single stationary emission source or a small group of emission sources.
- Impairment due to widespread, regionally homogeneous haze resulting from the cumulative emissions of varied emission sources in a region.

The PSD permit program addresses visibility impairment from nearby stationary emission sources. Regional haze impacts resulting from cumulative emissions in a region are being addressed through new State Implementation Plan planning requirements.

The EPA, BLM, US Forest Service (USFS), National Park Service (NPS), US Fish and Wildlife Service (USFWS), and regional associations of state air quality management agencies operate the Inter-agency Monitoring of Protected Environments (IMPROVE) program to monitor visibility conditions and particulate matter concentrations in or near Class I areas across the country. Some of the IMPROVE sites also document visibility conditions with remotely operated cameras. Six IMPROVE monitoring sites are located in Colorado, three of which are in or near the planning area. The NPS operates one monitoring station on the east side of Rocky Mountain National Park. The USFS operates monitoring stations at Buffalo Pass (south end of the Mount Zirkel Wilderness) and at Aspen Mountain Ski Area (east of the Maroon Bells-Snowmass Wilderness).

Visibility in Class I Areas

Table 3.2.1-2, Summary of Visual Range Data for the Aspen Mountain Ski Area IMPROVE Site, summarizes standard visual range data from the Aspen Mountain Ski Area IMPROVE site in the CRVFO planning area.

Table 3.2.1-3, Summary of Visual Range Data for the Rocky Mountain National Park IMPROVE Site, presents a summary of the standard visual range data from the Rocky Mountain National Park IMPROVE site near the CRVFO planning area.

Table 3.2.1-2
Summary of Visual Range Data for the Aspen Mountain Ski Area IMPROVE Site

	Standard Visual Range in miles			
Year	**Annual Average**	**Worst 20% of Days**	**Mid 20% of Days**	**Best 20% of Days**
2001	134	89	135	187
2002	135	75	131	193
2003	140	88	140	194
2004	Data not available	104	142	194

Source: IMPROVE 2008

Table 3.2.1-3
Summary of Visual Range Data for the Rocky Mountain National Park IMPROVE Site

	Standard Visual Range in miles			
Year	**Annual Average**	**Worst 20% of Days**	**Mid 20% of Days**	**Best 20% of Days**
1991	110	65	101	167
1992	107	66	101	164
1993	109	66	105	161
1994	104	63	98	152
1995	113	66	109	158
1996	114	63	106	172
1997	114	74	111	164
1998	106	66	100	153
1999	118	71	111	172
2000	113	60	107	175
2001	115	62	109	178
2002	112	50	104	187
2003	113	60	106	176
2004	Data unavailable	73	114	182

Source: IMPROVE 2008

Table 3.2.1-4, Summary of Visual Range Data for the Buffalo Pass (Mount Zirkel Wilderness) IMPROVE Site, summarizes standard visual range data from the Buffalo Pass IMPROVE site near the CRVFO planning area.

Table 3.2.1-4
Summary of Visual Range Data for the
Buffalo Pass (Mount Zirkel Wilderness) IMPROVE Site

	Standard Visual Range in miles			
Year	**Annual Average**	**Worst 20% of Days**	**Mid 20% of Days**	**Best 20% of Days**
1995	122	86	119	157
1996	114	76	110	157
1997	124	90	118	168
1998	111	75	105	151
1999	119	89	116	158
2000	No data	No data	No data	No data
2001	120	82	120	162
2002	123	72	129	180
2003	128	82	126	184
2004	Data unavailable	95	130	185

Source: IMPROVE 2008

Atmospheric Deposition

National Atmospheric Deposition Program (NADP) data are not available as convenient summaries by monitoring station. Where specific impact analyses require reference to historical deposition rate data, it is included in Chapter 4.

Characterization

Indicators

The most useful air quality indicators are ambient air pollution concentrations for the averaging times specified by federal and state ambient air quality standards, so that a determination can be made as to whether the air quality standards are being met. In the absence of ambient air quality standards for a pollutant or in the absence of ambient pollutant concentration data, daily, monthly, or annual pollutant emission quantities serve as an alternative air quality indicator.

Trends

As is apparent from the data in Table 3.2.1-1, Concentrations of Criteria Air Pollutants–Nearest Representative Values Within and Around the CRVFO Planning Area, available air quality monitoring data indicate a general trend of declining carbon monoxide levels at the Grand Junction monitoring station. With regard to ozone, a decreasing ozone concentration trend is apparent at the Colorado National Monument site. However, ozone concentration data at other monitoring sites are variable or insufficient to identify a trend. Particulate matter data indicate year-to-year variability in particulate matter concentrations with no distinct upward or downward trends. Finally, data from the IMPROVE stations do not indicate definite trends in visibility conditions.

In 1995, the Colorado APCD reviewed federal land management activities of the US Forest Service, NPS, BLM and USFWS to determine whether federal agency actions were creating visibility impacts in Class I areas (Colorado Air Pollution Control Division 1995). This review concluded that prescribed fire events sometimes created temporary visibility impacts on Class I lands, but that those visibility impact events were infrequent. The Colorado APCD concluded that prescribed fires on federal lands were not a significant problem for visibility conditions in Class I areas.

3.2.2 Climate

Climate and Meteorology

Climate represents the long-term statistics of daily, seasonal, and annual weather conditions. Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years (typically 30 years). Climate is both a driving force and a limiting factor for biological, ecological, and hydrologic processes, as well as for resource management activities such as disturbed site reclamation, wildland fire management, drought management, rangeland and watershed management, and wildlife habitat administration. Climate also influences renewable and nonrenewable resource management, affecting the productivity and success of many BLM activities; therefore, incorporating effective application of climate information into BLM programs, projects, activities, and decisions authorizing use of the public lands is critical for effective management. Climate data include information such as trends in precipitation, temperature, wind speed, cloud cover, relative humidity, and solar radiation. Appropriate application of climatic information is important when conducting land use planning and applying site-specific management actions.

Current Conditions

Much of the CRVFO planning area lies along the Colorado River and Eagle River drainages. The southern part of the CRVFO planning area is along the Roaring Fork River. Due to broad variations in elevation and topography within the planning area, climatic conditions vary considerably. January is typically the coldest month and July is typically the warmest month. The average daily temperature range for January along the Colorado River valley floor is about 7 degrees Fahrenheit (° F) to 35° F. The average daily temperature range in July is about 47° F to 87° F. Temperatures are generally higher at lower elevation areas than at higher elevations. High elevations can experience temperatures below freezing in any month.

In valley floor areas, the frost-free period, during which temperatures do not dip below 32° F, is generally 170 days between mid-April and mid-October. The annual average total precipitation at lower elevations is approximately 10 to 16 inches, with 40 to 60 inches of annual snowfall. At higher elevations atop the plateau, temperatures are cooler, frost-free periods are shorter, and both total precipitation and snowfall are greater than at lower elevations. Higher altitude communities such as Aspen and Vail receive 20 to 25 inches of total precipitation, including 130 to 180 inches of annual snowfall. Wind conditions reflect channeling and mountain valley flows due to complex terrain. Nighttime cooling enhances stable air, inhibiting air pollutant mixing and transport along the Colorado River valley. Dispersion potential improves farther east and west and along the ridges and mountaintops, especially during the winter/spring weather transition and summertime convective heating periods.

Table 3.2.2-1, Summary of Climate Data for Locations in the CRVFO Planning Area 1, summarizes readily available temperature, precipitation, and wind speed data for monitoring locations in the CRVFO planning area.

Table 3.2.2-1
Summary of Climate Data for Locations in the CRVFO Planning Area

Location	Parameter	Time Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Aspen	Average Daily Temperature, ° F	1948-1979	20.2	23.6	29.0	38.6	48.1	56.2	62.3	60.3	53.4	44.3	30.7	21.6	40.7
	Average Daily Temperature, ° F	1980-2007	22.1	25.4	32.4	39.5	48.7	57.0	62.5	61.0	53.8	44.5	31.1	22.3	41.6
	Maximum Daily Temperature, ° F	1948-1979	33.2	37.3	42.5	52.7	63.5	73.6	79.7	77.4	70.3	60.3	44.1	55.8	55.8
	Maximum Daily Temperature, ° F	1980-2007	35.3	39.2	45.4	52.6	62.8	72.6	78.0	75.6	68.6	57.6	43.4	55.5	55.5
	Minimum Daily Temperature, ° F	1948-1979	7.3	10.0	15.5	24.5	32.7	38.8	44.9	43.2	36.6	28.4	17.4	8.7	25.7
	Minimum Daily Temperature, ° F	1980-2007	9.0	11.7	19.5	26.3	34.7	41.3	47.0	46.3	38.9	29.5	18.8	9.8	27.7
	Days Below 32° F	1948-1979	31	28	30	26	14	4	0	1	7	23	29	31	224
	Days Below 32° F	1980-2007	31	28	30	24	11	2	0	0	5	20	29	31	212
	Days Above 90° F	1948-1979	0	0	0	0	0	0	0	0	0	0	0	0	0
	Days Above 90° F	1980-2007	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Precipitation, inches	1948-1979	1.8	1.6	1.9	1.6	1.4	1.3	1.5	1.8	1.6	1.5	1.6	1.9	19.4
	Total Precipitation, inches	1980-2007	1.7	2.1	2.7	2.5	2.1	1.4	1.8	1.6	2.1	2.1	2.6	1.8	24.4
	Days With Measurable Precipitation	1948-1979	11	10	9	9	9	7	10	11	8	6	8	10	110
	Days With Measurable Precipitation	1980-2007	11	11	12	12	11	8	10	12	10	9	11	11	129
	Snowfall, inches	1948-1979	25.0	21.1	23.3	12.6	3.1	0.6	0	0	1.8	7.1	18.4	24.1	137.1
	Snowfall, inches	1980-2007	25.1	27.3	28.1	19.4	7.5	0.9	0	0	1.3	11.2	27.8	24.4	173
	Wind Speed, mph	1996-2006	5.1	5.6	6.4	7.5	7.6	7.7	7.1	6.9	6.9	6.2	5.2	5.1	6.4
	Prevailing Wind Direction	1996-2006	S	S	S	S	S	SSW	SSW	SSW	S	SSW	S	S	S
Basalt	Total Precipitation, inches	1965-1972	0.8	0.8	0.6	1.3	1.0	1.7	1.1	2.0	2.0	1.6	0.8	1.3	15.1
	Days With Measurable Precipitation	1965-1972	7	7	6	8	8	9	8	10	10	9	6	9	97
	Snowfall, inches	1965-1972	15.1	12.0	6.3	3.3	0	0	0	0	0.5	5.1	5.6	17.9	65.8

Table 3.2.2-1 *(continued)*
Summary of Climate Data for Locations in the CRVFO Planning Area

Location	Parameter	Time Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Eagle	Average Daily Temperature, ° F	1948-1994	18.6	24.6	33.6	42.1	51.4	60.0	66.0	63.9	55.9	44.9	31.1	20.2	42.7
	Maximum Daily Temperature, ° F	1948-1994	34.0	40.2	48.0	58.4	69.3	80.2	85.9	83.3	75.9	64.1	46.6	35.3	60.1
	Minimum Daily Temperature, ° F	1948-1994	3.0	9.1	19.1	25.9	33.5	39.7	46.1	44.5	35.9	25.8	15.7	5.2	25.3
	Days Below 32° F	1948-1994	31	28	30	25	14	3	0	0	10	26	29	31	226
	Days Above 90° F	1948-1994	0	0	0	0	0	3	8	4	1	0	0	0	15
	Total Precipitation, inches	1948-1994	0.8	0.6	0.8	0.8	0.8	0.9	1.2	1.0	1.1	0.9	0.7	0.9	10.6
	Days With Measurable Precipitation	1948-1994	8	7	8	7	8	6	9	9	7	6	6	8	88
	Snowfall, inches	1948-1994	10.4	6.2	6.8	3.7	1.1	0.1	0	0	0.4	2.2	6.2	10.3	47.4
	Wind Speed, mph	1996-2006	3.9	4.6	5.9	7.2	7.1	7.1	5.3	5.1	5.1	4.9	3.8	3.6	5.3
	Prevailing Wind Direction	1996-2006	E	E	E	W	W	WSW	E	E	E	E	E	E	E
Glenwood Springs	Average Daily Temperature, ° F	1900-2007	24.3	29.7	37.9	46.3	55.2	63.2	69.6	67.8	60.0	49.1	36.0	25.8	47.1
	Maximum Daily Temperature, ° F	1900-2007	36.9	42.6	51.4	61.6	72.1	83.4	88.5	86.0	78.3	66.3	49.9	38.1	62.9
	Minimum Daily Temperature, ° F	1900-2007	11.7	16.7	24.3	31.1	38.3	44.1	50.7	49.5	41.9	32.0	22.3	13.5	31.3
	Days Below 32° F	1900-2007	31	27	27	17	5	1	0	0	2	16	27	30	183
	Days Above 90° F	1900-2007	0	0	0	0	0	6	15	9	1	0	0	0	31
	Total Precipitation, inches	1900-2007	1.5	1.3	1.4	1.6	1.4	1.1	1.3	1.5	1.6	1.5	1.2	1.3	16.6
	Days With Measurable Precipitation	1900-2007	8	7	8	8	7	5	6	8	7	6	6	8	88
	Snowfall, inches	1900-2007	17.1	9.4	6.6	1.7	0.2	0	0	0	0	0.7	5.6	15.2	56.5
Independence Pass	Average Daily Temperature, ° F	1948-1980	12.7	14.7	21.5	26.6	36.4	46.8	51.9	50.3	43.3	34.2	20.6	13.5	31.0
	Maximum Daily Temperature, ° F	1948-1980	27.2	30.1	36.2	41.6	50.8	63.3	68.5	66.3	58.6	49.3	34.2	27.2	46.1
	Minimum Daily Temperature, ° F	1948-1980	-1.8	-0.8	6.8	11.7	22.1	30.4	35.3	34.3	28.1	19.0	6.8	-0.2	16.0
	Days Below 32° F	1948-1980	31	28	31	30	30	20	5	9	24	30	30	31	298

Table 3.2.2-1 *(continued)*
Summary of Climate Data for Locations in the CRVFO Planning Area

Location	Parameter	Time Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
	Days Above 90° F	1948-1980	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Precipitation, inches	1948-1980	3.5	2.5	4.0	3.5	2.0	1.1	2.2	1.9	1.7	1.7	2.8	3.1	29.8
	Days With Measurable Precipitation	1948-1980	14	11	13	12	10	7	12	11	7	7	12	13	126
	Snowfall, inches	1948-1980	50.1	38.6	58.7	45.0	20.5	3.7	0	0	4.9	19.7	43.8	52.4	337.4
Rifle	Average Daily Temperature, ° F	1910-2007	23.1	30.2	38.9	47.8	56.4	64.6	71.1	69.0	60.4	49.1	36.3	25.9	47.7
	Maximum Daily Temperature, ° F	1910-2007	36.8	43.8	53.7	64.2	74.0	84.0	90.2	87.6	79.4	67.3	51.4	39.4	64.3
	Minimum Daily Temperature, ° F	1910-2007	9.3	16.5	24.2	31.4	38.8	45.2	52.0	50.4	41.4	31.1	21.3	12.4	31.2
	Days Below 32° F	1910-2007	31	27	27	17	4	0	0	0	3	19	28	30	187
	Days Above 90° F	1910-2007	0	0	0	0	0	8	18	13	2	0	0	0	42
	Total Precipitation, inches	1910-2007	0.9	0.8	1.0	1.0	1.0	0.7	1.0	1.1	1.1	1.2	0.9	0.9	11.6
	Days With Measurable Precipitation	1910-2007	7	6	7	7	6	4	6	7	6	6	6	7	76
	Snowfall, inches	1910-2007	11.8	8.7	4.0	0.6	0	0	0	0	0	0.7	4.3	13.0	43.1
	Wind Speed, mph	1997-2006	3.4	4.3	5/9	7.4	7.2	7.1	6.0	5.6	5.5	5.1	3.9	3.2	5.4
	Prevailing Wind Direction	1997-2006	S	S	W	W	W	W	W	W	W	W	S	S	W
Vail	Average Daily Temperature, ° F	1985-2007	17.8	21.2	29.6	37.2	46.2	53.8	59.3	57.8	49.9	39.6	26.1	17.3	38.0
	Maximum Daily Temperature, ° F	1985-2007	29.7	33.6	42.3	50.3	61.5	72.4	77.8	75.5	67.1	54.5	37.3	28.3	52.5
	Minimum Daily Temperature, ° F	1985-2007	5.9	8.7	17.0	24.1	30.9	35.2	40.8	40.1	32.7	24.6	14.8	6.3	23.4
	Days Below 32° F	1985-2007	31	28	31	28	20	8	1	2	15	28	30	31	252
	Days Above 90° F	1985-2007	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Precipitation, inches	1985-2007	1.8	2.1	1.8	2.2	1.7	1.5	2.0	1.9	2.1	1.7	2.0	1.4	22.1
	Days With Measurable Precipitation	1985-2007	12	12	10	10	9	8	10	12	10	7	11	9	121
	Snowfall, inches	1985-2007	32.8	34.1	24.7	21.2	4.1	0.3	0	0	1.2	7.7	30.6	26.1	182

The Aspen monitoring site for temperature and precipitation data was relocated in 1980.
Wind direction is the direction from which the wind is blowing.

Source: Data files from Western Regional Climate Center (2009a, 2009b, 2009c, 2009d, 2009e, 2009f, 2009g, 2009h, 2009i, 2009j).

Characterization

Indicators

Climate indicators include monthly, seasonal, annual, and long-term statistics for weather factors such as air temperature, days or hours with temperatures below 32° F, and days or hours with temperatures above 90° F; precipitation components such as water equivalent of total precipitation, days with measurable precipitation, total rainfall, total snowfall; average and maximum snowpack depths, and water content of snowpack; pan evaporation rates; and wind speed and direction patterns.

Trends

Aspen climate data are presented for two time periods, 1948-1979 (30 years) and 1980-2007 (27 years). Comparison of average climate indicators between these two time periods can be used to identify climate trends. Average daily temperature and minimum daily temperature increased by 0.9° F and 2.0° F, respectively. In addition, the number of days below freezing (32° F) decreased by 12 days per year. However, maximum daily temperature decreased by 0.3° F.

Precipitation increased between the two time periods. Total precipitation increased by approximately 5.0 inches and the number of days with measurable precipitation increased by 19 days per year. Snowfall also increased from approximately 137 inches per year to 173 inches per year, a 26 percent increase.

Climate Change

Climate is both a driving force and a limiting factor for biological, ecological, and hydrological processes, and it has great potential to influence resource management. Climate change is a phenomenon that could alter natural resource and ecologic conditions on spatial and temporal scales that have not yet been experienced. The Intergovernmental Panel on Climate Change (IPCC) has stated, "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic [man-made] GHG concentrations" (IPCC 2007). The general consensus is that as atmospheric concentrations of GHGs continue to rise, average global temperatures and sea levels will rise, precipitation patterns will change, and climatic trends will change and influence earth's natural resources in a variety of ways.

Ongoing scientific research has identified the potential impacts of man-made GHG emissions, changes in biological carbon sequestration, and other changes due to land management activities on the global climate. Through complex interactions on a regional and global scale, these changes cause a net warming of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Although natural GHG levels have varied for millennia, recent industrialization and burning fossil carbon sources have caused carbon dioxide equivalent (CO_2e) concentrations to increase dramatically and are likely to contribute to overall global climatic changes.

There are uncertainties associated with the science of climate change, but this does not imply that scientists do not have confidence in many aspects of climate change science. According to EPA some aspects of the science are "known with virtual certainty because they are based on well-known physical laws and documented trends" (EPA 2010a).

Decisions made under the RMP will have no meaningful direct effects on area weather conditions, but can have indirect effects resulting from activities that release GHG air pollutants, or from activities that terrestrially sequester carbon that would otherwise exist in the atmosphere as carbon dioxide.

Current GHG Conditions

GHGs are compounds in the atmosphere that absorb infrared radiation and re-radiate a portion of that back toward the earth's surface, thus trapping heat and warming the earth's atmosphere. The most important naturally occurring GHG compounds are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), and water vapor. CO_2, CH_4, and N_2O are produced naturally by respiration and other physiological processes of plants, animals, and micro-organisms; by decomposition of organic matter; by volcanic and geothermal activity; by naturally occurring wildfires; and by natural chemical reactions in soil and water. Ozone is not released directly by natural sources, but forms during complex chemical reactions in the atmosphere among organic compounds and nitrogen oxides in the presence of ultraviolet radiation. While water vapor is a strong GHG, its concentration in the atmosphere is primarily a result of, not a cause of, changes in surface and lower atmospheric temperature conditions.

Although naturally present in the atmosphere, concentrations of CO_2, CH_4, and N_2O also are affected by emissions from industrial processes, transportation technology, urban development, agricultural practices, and other human activity. In addition to these GHGs, three industrially generated GHGs also contribute to climate change: sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). CO_2 and CH_4 account for the most significant anthropogenic GHG emissions. BLM-authorized activities accounting for the largest quantities of GHG emissions include fossil fuel development and operations, large wildland fires, and activities using combustion engines (such as generators and vehicles). Therefore, for this RMP, quantification of GHG emissions includes only CO_2, CH_4, and N_2O.

A GHG's ability to contribute to global warming is based on its longevity in the atmosphere and its heat-trapping capacity. In order to aggregate GHG emissions and assess their contribution to global warming, the EPA has assigned each GHG a global warming potential (GWP) that is used to calculate CO_2e. The CO_2e for each GHG is calculated by multiplying the quantity of emissions by the GWP for that GHG. Total CO_2e emissions for all GHGs are then determined by adding the CO_2e emissions of each GHG. GWPs used for GHG emission calculations and reporting are $CO_2 = 1$, $CH_4 = 21$, and $N_2O = 310$. GWPs for other GHGs, including SF_6, HFCs, and PFCs, are typically much higher.

Global Climate Change Trends and Predictions

The IPCC and the National Oceanic and Atmospheric Administration (NOAA) estimated the following changes in global atmospheric concentrations of the most important GHGs (IPCC 2007; NOAA 2010):

- Atmospheric concentrations of CO_2 have risen from a preindustrial background of 280 parts per million by volume (ppmv) to 386 ppmv in 2009;
- Atmospheric concentrations of CH_4 have risen from a preindustrial background of about 0.70 ppmv to 1.79 ppmv in 2009; and
- Atmospheric concentrations of N_2O have risen from a preindustrial background of 0.270 ppmv to 0.322 ppmv in 2009.

The IPCC has concluded that these changes in atmospheric composition are almost entirely the result of human activity, not the result of changes in natural processes that produce or remove these gases (IPCC 2007). The IPCC estimates that mean global surface temperatures increased by 0.74° C (1.3° F) from 1906 to 2006 (IPCC 2007). In addition, the rate of warming averaged over the past 50 years is nearly twice that for the past 100 years.

Global and regional climate changes have already been documented and will continue to occur due to GHG concentrations already present in the atmosphere and ongoing global emissions of GHGs. The global mean surface temperature has increased by approximately 1.5°F since 1900 (USGCRP 2009). Climate models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Northern latitudes (above 24° N) have exhibited temperature increases of nearly 2.1°F since 1900, with nearly a 1.8°F increase since 1970 alone. Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHGs are likely to accelerate the rate of climate change.

In 2007, the IPCC indicated that by 2100 the global average surface temperature would increase by between 2.0°F and 11.5°F above 1980–1999 levels, depending on the assumptions made in the predictive model (IPCC 2007). The National Academy of Sciences has confirmed these findings but has indicated there are uncertainties regarding how climate change may affect different regions. Computer model predictions show that temperature increases will not be equally distributed but will likely be accentuated at higher latitudes. Warming during the winter is expected to be greater than during the summer, and increases in daily minimum temperatures are likely to be greater than increases in daily maximum temperatures. Increases in temperature would increase water vapor retention in the atmosphere and reduce soil moisture, increasing generalized drought conditions, while enhancing heavy storms. Although large-scale spatial shifts in precipitation distribution may occur, these changes are more uncertain and difficult to predict.

Climate change predictions are based on multiple modeling scenarios involving different sets of GHG emission assumptions. Emission assumptions are primarily based on determinations of global population growth, economic growth, fossil fuel development and use, and many other factors. The predictions described below are not based on implementation of GHG emission reduction programs, such as the Kyoto Protocol or EPA regulation of GHG emissions. For example, EPA recently began to regulate GHGs, and these regulations will decrease future US GHG emissions though a variety of methods. EPA regulatory actions to date are as follows:

- Setting GHG emission standards for new light-duty vehicles.
- Requiring mandatory reporting of annual GHG emissions from many types of stationary sources responsible for the bulk of U.S. GHG emissions.
- Requiring air pollution control agencies to review GHG emissions when issuing air quality construction and operating permits for stationary sources with large quantities of GHG emissions.
- Requiring identification and imposition of GHG emission reduction control technologies for large GHG emission sources before constructing new facilities or modifying or reconstructing existing facilities.

Projected changes are likely to occur over several decades to a century. Therefore, many of the projected changes associated with climate change described below may not be measurable within the reasonably foreseeable future. However, research on climate change science is ongoing, and it is expected that regional projects will only be finer in scale and will be more confident over time, as the science advances. To the extent practicable, BLM management will review its authorized actions and the impacts to or from climate change as the state of the science advances over the life of this RMP.

Climate Change Impacts on Colorado and Regional Resources

Because specific climate change predictions are not readily available for most of the CRVFO analysis area, climate change trends are summarized for western Colorado. Many of the following reported changes are derived from color shadings on US climate change maps (USGCRP 2009). Therefore, climate change predictions are within the given range and may not reach the maximum or minimum extents of the range. Past climate trends and future predictions for western Colorado are as follows (IPCC 2007; PCGCC 2007; RMCO-NRDC 2008; EPA 2010b, 2010b; USGCRP 2009):

- The average temperature increased by 1 to 3°F from a 1961-to-1979 baseline average to the average temperature measured from 1993 to 2008. By 2099, the average temperature is predicted to increase by 5 to 10°F above the 1961-to-1979 baseline. Temperatures are expected to increase more in winter than in summer, more at night than during the day, and more in the mountains than at lower elevations.
- The annual number of days above 90°F and the frequency of extreme heat events will increase.
- Annual average precipitation increased between 5 and 15 percent between 1958 and 2008. Based on modeling using a high emissions scenario, predicted precipitation changes indicate increased precipitation in the winter (up to +15 percent) and substantial decreases in the spring (from -5 percent to -20 percent) and summer (-5 percent to -15 percent). Fall precipitation is predicted to be within -5 percent to +5 percent.
- End-of-summer drought has increased during the last 50 years, and drought is expected to be more prevalent in the future.
- Annual runoff will decrease by 10 to 20 percent for the period 2041–2060, compared to period 1901–1970.
- Snowfall is predicted to decline in and near the CRVFO.
- Peak streamflow from melting snow is occurring earlier. In 2002, peak streamflow occurred up to 5 days earlier than during 1948. From 2080 to 2099, peak streamflow is predicted to occur 15 to 35 days earlier than during the 1951-to-1980 period.
- Very heavy precipitation occurred up to 10 percent more often between 1958 and 2007.
- Reduced winter snowpack and earlier snowmelt will cause less water to flow into the Colorado River, less water available for downstream residential and agricultural users, and shorter ski seasons, unless additional snowmaking is used to prolong the season.
- Earlier snowmelt means that peak streamflows occur earlier in the year, weeks before the peak needs of ranchers, farmers, recreationists, and others. In late summer, rivers, lakes, and reservoirs have lower flows and less capacity, which will cause the following effects:
    - Less water availability for irrigating crops and watering animals.
    - Reduced crop and livestock productivity if additional irrigation is not available.
    - Increased water temperatures that adversely affect coldwater fish and reduce recreational fishing.
    - Reduced mid- and late-summer stream flows that shorten tourism and recreation opportunities, such as white-water rafting and boating.

- More frequent, more severe, and longer-lasting droughts are occurring and are expected to become more prevalent.
- Warmer and drier conditions will stress ecosystems and wildlife due to the following effects:
    - Shrinkage of coniferous forests within Colorado and replacement with larger savannas and woodlands.
    - Greater pest infestations in pine forests, such as the pine beetle infestation in Colorado's lodgepole forests.
    - Contraction of aspen forests due to sudden aspen decline linked to reduced snowpack and drought.
    - Grassland and rangeland expansion into previously forested areas.
- Land will have increased susceptibility to fire with more frequent, larger, and more intense fires.
- Geographic flora and fauna will shift to the north or to higher elevations. Some species may be at greater risk of extinction if they cannot successfully migrate or adapt.
- Longer growing seasons may increase productivity for some crops, decrease productivity for others, and increase agricultural pest populations, including weeds and insects.
- Warmer and drier conditions will adversely affect air quality due to the following effects:
    - Increased ambient concentrations of particulate matter, as less vegetated soils are more susceptible to wind erosion.
    - Increased ozone formation.
    - Reduced visibility due to increased particulate matter and wildfire smoke.
- Climate changes may have the following effects on human health:
    - Heavy precipitation increases frequency and severity of flooding and may contaminate water supplies.
    - Heat waves stress some individuals, particularly older adults.
    - Increased concentrations of ozone, particulate matter, and smoke stress some individuals, particularly those with asthma or other lung disease and those who exercise strenuously during poor air quality episodes.

It should be noted that uncertainty remains about the precise nature, timing, and severity of these effects in a given area. Additionally, because the climate change models predict shifts in multiple climatic variables (e.g., the seasonal distribution, amount, and intensity of precipitation in addition to temperature regime), the precise relationship of these variables may profoundly influence the specific outcomes of climate change. It is also possible that some currently unknown future factors could result in different outcomes from those currently anticipated. Some of the predicted effects, particularly those involving shifts in plant and animal communities, may occur over a period of centuries due to the adaptiveness of the community and component species to changing conditions. Some community types may occur across an elevational or latitudinal range that represents a greater range of climatic conditions than the changes predicted by climate models. Existing communities may persist in conditions no longer favorable for their establishment. Therefore, elevational or latitudinal shifts in composition and structure may be discernible at the upper and lower margins of the community type, while intermediate areas show less or no change.

3.2.3 Soils

Soil resources provide the foundation for wildlife and vegetation, sustain healthy and productive rangelands and forest, and safeguard water and air quality. Livestock grazing, prime farmlands, wildlife habitat, fisheries, recreation, water quality, and forestry depend on the presence of suitable quality soils for their sustainable existence; therefore, soil attributes and conditions are important to BLM management decisions.

Conversely, soil resources within the CRVFO, especially in erodible soil areas, have the potential to be affected by the surface-disturbing activities that could result from a number of different decisions in the RMP. BLM management decisions on the location and amount of grazing, minerals activities, harvesting of forest products, fire management, roads, recreation, and OHV use would affect the removal of soils, removal of vegetation-holding soils in place, and otherwise contribute to, or mitigate, the potential for erosion and loss of soils.

Current Conditions

Soil Types

Soil resources are categorized by the National Resources Conservation Service (NRCS) into *land resource units* that consider significant geographic differences in soils, climate, water resources, or land use. Land resource units are generally several thousand acres in size and are typically coextensive with state general soil map units. Geographically associated land resource units are grouped into *major land resource areas*, which are in turn grouped into land resource regions. These large areas are used in statewide agricultural planning, as well as interstate, regional, and national planning. Most of the CRVFO planning area lies within the southern Rocky Mountains major land resource area. The dominant soil orders in the southern Rocky Mountain major land resource area are Mollisols, Alfisols, Inceptisols, and Entisols (NRCS 2006). The Colorado River valley west of Silt lies within the Warm Central Desertic Basins and Plateaus major land resource area. The dominant soil orders in this major land resource area are Aridisols and Entisols. Mollisols occur at the higher elevations, particularly in the northern part of the major land resource area (NRCS 2006).

Detailed soil surveys prepared by the NRCS are available for most of the CRVFO planning area. Each soil survey applicable to the CRVFO describes soil map units by their individual soil or soils that make up a unit. These descriptions indicate the limitations and hazards inherent in each. Descriptions include soil depth, range of elevation, origin, climate, physical properties, runoff capabilities, erosion hazard, associated native vegetation, wildlife habitat use, and capability for community development and other uses.

Biological Crusts

In such arid and semi-arid lands as dominate the planning area, vegetation cover is often sparse or absent. Nevertheless, in open spaces between the higher plants, the soil surface is generally not bare of life, but covered by a community of highly specialized organisms. These communities are referred to as biological soil crusts, or cryptogamic, cryptobiotic, microbiotic, or microphytic soil crusts, which are a complex of green algae, lichens, mosses, microfungi, cyanobacteria, and other bacteria. Biological soil crusts integrate through the top few millimeters of soil, coalescing loose particles together and forming a matrix that stabilizes and protects soil surfaces from erosive forces. These crusts occur in all hot, cool, and cold arid and semiarid regions. They may constitute up to 70 percent of the living cover in some plant communities. However, biological soil crusts have only recently been recognized as having a major influence on terrestrial ecosystems. They function as living mulch by retaining soil moisture and discouraging annual weed growth (BLM 2001c).

Biological crusts are well adapted to severe growing conditions, but are extremely susceptible to physical disturbances including domestic livestock grazing and recreational activities (such as hiking, biking, and off-road driving). Fire can also damage the crust, although low-intensity fires do not remove all of the crust structure, which allows for regrowth without significant soil loss.

Soil Erosion

Soil erosion is a concern throughout the western US, particularly in semiarid rangelands. The quantity of soil lost by water or wind erosion is influenced by climate, topography, soil properties, vegetation cover, and land use. While erosion occurs under natural conditions, rates of soil loss may be accelerated if human activities are not carefully managed (BLM 2007i). Trails can quickly turn into widely braided ruts, especially in wetlands and at streambank crossings. The resulting gully erosion can rapidly erode substantial quantities of previously stable soils (BLM 2007i). In the 1999 CRVFO Oil and Gas Leasing and Development Record of Decision (ROD) and RMP Amendment, two types of areas were identified as having potential erosion issues: all areas with slopes greater than 30 percent and erodible soils, and all areas with slopes greater than 50 percent (BLM 1999b).

Currently, soils are not considered erosive but rather prone to erosion, or they are described as erodible. In addition, there are some NRCS soil map units that are inherently prone to or have experienced mass wasting. Available NRCS soil survey soil map unit descriptions include data on erodibility. These descriptions are typically considered, among other applicable physical characteristics, in the decision-making process (BLM 2007j). Based on the NRCS soil survey and classification, approximately 873 acres throughout the CRVFO (federal surface only) are classified as "very severe" erosion soil types. Approximately 209,181 acres (federal surface only) are considered "severe" erosion soil type. Current stipulations seek to avoid disturbances to erosive soils and steep slopes.

Erodible soils are defined for this RMP as those where small changes in vegetation cover or level of disturbance can result in large changes in erosion rates. Areas with slopes greater than 30 percent where erodible soils occur, as defined by the NRCS, are considered fragile in nature. Areas with slopes greater than 50 percent are very likely to have erodible soils. The locations of previous mass wasting are considered to be areas with erodible soils due to past behavior and the slow process of soil formation in these areas.

Within the CRVFO are also areas where mass wasting, debris flows, or landslides have occurred in the geologic past and within historical times. These are areas where slopes saturated with water become detached and move downhill. Debris flows occurred on the south flank of Storm King Mountain in 1994 after heavy rains washed debris onto I-70 at the mouth of several drainages that had been denuded earlier in the year by a large fire (CGS 2000). The Glenwood Springs Debris Flow Hazard Zone Area of Critical Environmental Concern (ACEC) includes several areas with steep slopes, sparse vegetation cover, and unstable geologic conditions that are prone to mass wasting processes.

Soil Compaction

Soil compaction is a complex process that depends on the nature of the loading and moisture content of the soil, as well as characteristics such as particle size, organic matter content, structure, and percent of coarse fragments. Soil compaction occurs in response to pressure exerted by machinery or animals. The risk for soil compaction is greatest when soils are wet. Compacted soil allows less water to infiltrate, resulting in increased volume and velocity of surface runoff. The overland flow has greater energy to detach and transport soil

particles, resulting in increased soil erosion (BLM 2007j). Time limitations and seasonal road closures are often necessary to protect soil loss during saturated conditions.

Characterization

Indicators

When adequate soil stability and infiltration and permeability rates are present, the character of surface runoff is optimal to support necessary ecosystem services. Indicators of adequate soil conditions include appropriate canopy and ground cover, plant litter accumulation in place rather than transported and sorted by overland water flow, and the presence of appropriate organic matter in the soil to vigorously support a diversity of plant species with a variety of root depths. Indicators of degraded soil conditions include upland swales having greater or denser vegetation cover than adjacent uplands, minimal expression of rills, soil pedestals, or actively eroding gullies. Erodible soils are defined for this RMP as soils where small changes in vegetation cover or level of disturbance can result in large changes in erosion rates. Erodible soils are often located in areas with slopes greater than 30 percent.

While land health standards for soils are largely being met, one notable exception has been identified in the Hubbard Mesa area (north of Rifle, Colorado) due to livestock grazing and heavy OHV use (BLM 2007j).

Trends

All surface-disturbing activities have the potential to negatively impact soils. However, some activities such as fluid and solid mineral development and travel management have longer-term soil impacts, as the roads associated with these activities are likely to increase in the future. As populations increase, BLM lands within the CRVFO and surrounding area are receiving increasing season-long use by both permitted users and the general public. User-created roads and trails are not only increasing, but are also being used throughout the year. During the rangeland health assessments, accelerated erosion has been observed due to unmaintained roads and an abundance of trails.

Some climatologists are predicting climate changes in the future in Colorado. A recent report prepared for the State of Colorado (Ray et al. 2008) analyzed past and present climate data and forecast that southwestern Colorado will experience warmer temperatures in the next few decades. The report summarizes potential issues for land and water managers given their climate forecast. The report issues are summarized below, along with potential effects on BLM resource management programs.

- Increasing temperatures could raise evapotranspiration by plants, reduce soil moisture, and alter growing seasons, which could require adjustments to vegetation-based programs such as livestock management.
- Increasing temperature and lower soil moisture could shift mountain habitats toward higher elevation, which could require the BLM to similarly shift management actions associated with these habitats.
- Changes in long-term precipitation and soil moisture could affect groundwater recharge rates, which could diminish spring and well discharge rates needed to support a variety of resources on public lands.

Maintaining current soil resources will continue to be a priority in the CRVFO.

3.2.4 Water Resources

Water resources include surface water and groundwater 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 native fishes and other aquatic organisms. The water present in the planning area 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.

Amounts of rain and runoff, water impoundments and withdrawals, pollution from outfalls, erosion of soils, and the health of the watersheds and riparian areas affect surface water resources. Recharge, withdrawal, and infiltration of contaminants affect groundwater resources. BLM management decisions regarding oil and gas development, mining, grazing, recreation, and forestry have potential negative effects on water resources.

Current Conditions

Surface Water

The three major rivers that flow through the CRVFO planning area are the Colorado, Roaring Fork, and Eagle (Figure 3.2.4-1, CRVFO Watersheds). The Colorado River originates in the mountains of central Colorado and flows from the northeast to the southwest through the center of the planning area. The Roaring Fork River flows northwest, is joined by the Crystal River, and flows into the Colorado River in the center of the planning area. The Eagle River flows west into the Colorado River in the eastern part of the planning area. Minor rivers in the planning area include the Piney River, tributary to the Colorado River and the Fryingpan River, tributary to the Roaring Fork River (BLM 2007j).

The planning area lies entirely within the upper Colorado River watershed. The rivers and streams in the planning area all flow into the Colorado River or its tributaries. Figure 3.2.4-1, CRVFO Watersheds, shows the individual watersheds within the planning area. Figure 3.2.4-2, CRVFO Water Resources, shows the perennial streams, springs and water bodies, streams with instream flow water rights, streams with highly impaired water quality, and drinking water source areas within the planning area.

The rivers and streams in the CRVFO usually convey peak flows in May and June from the melting snowpack in the higher elevation areas. "The duration and quantity of peak spring runoff depends on the size of the snowpack and other weather-related factors." Intense short-duration summer convective storms are common within the CRVFO and can result in significant stream flows, particularly in intermittent and smaller perennial streams. Precipitation ranges from 10 inches along the Colorado River Valley to over 40 inches annually at elevations above 9,000 feet in the mountains (BLM 2007j).

The US Geological Survey (USGS) collects gage data on the Colorado, Piney, Eagle, Roaring Fork, Crystal, and Fryingpan Rivers at several locations within the planning area. Historic gage data are also available at select stations within the planning area.

Water Quality

Surface water quality in the planning area is generally good, with variations depending primarily on geology, precipitation, vegetation cover, and land use. The geology of the watershed is a main determinant of surface water quality. In areas of predominately granite, basalt, and sandstone, the surface water tends to be good quality, with low sediment and salinity yields. These formations tend to occur at higher elevations within the planning area. The water quality in the headwater areas meets or exceeds water quality standards established

by the state for the beneficial uses on tributary streams (BLM 2007j). Approximately 396 miles of perennial streams and rivers and over 800 perennial lakes, including stock ponds and reservoirs, exist throughout the planning area. Many more intermittent and ephemeral streams, intermittent lakes and catchments are also present. These water sources are critical for the storage, filtration, and release of water, while providing critical wildlife habitat.

There are some water quality concerns at lower elevations. In the lower elevations, geologic formations, such as the Mancos and Pierre shale, Eagle Valley Evaporite, Green River, Wasatch, and Morrison occasionally supply sediment to, and increase salinity and selenium levels in, surface water, thereby naturally contributing to water quality degradation. In general, concentrations of major ions tend to increase in an upstream to downstream gradient in major rivers, causing overall water quality farther down in the watershed to become poorer (i.e., less suitable for beneficial uses such as drinking water). Where water is impaired in the Upper Colorado River Basin, sediment, salinity, and selenium are the primary water quality pollutants of concern (BLM 2007j).

The highest sediment loads occur during periods of high flow, in response to spring snowmelt and following high intensity precipitation events. The highest dissolved salt concentrations occur during low flow periods, typically late fall and winter (BLM 2004a). The type and amount of vegetation cover also greatly affect pollutant yield from watersheds. Areas with more expansive and thicker vegetation cover are likely to have a greater potential to resist soil erosion, thus limiting sediment, salinity, and selenium delivery to streams during runoff events (BLM 2007j).

Ground-disturbing activities, such as road or well pad construction and OHV use, can increase sediment yield and other pollutant loads carried in stormwater to rivers and streams. Increased stream discharge, alteration of peak flow timing, and modification of a stream's normal sediment loads can occur where roads and pads are located near drainages. Increases in impervious surface often result in sediment transport and concentration of runoff. The increase in flow quantity and sediment loads can modify stream channel morphology and degrade water quality. It should be noted, however, that BLM requires the implementation of measures to reduce the potential for transport of sediments into surface waters, and CDPHE mandates and enforces stormwater runoff controls for the same purpose.

The quality of water flowing through BLM administered lands is regulated by the State of Colorado under authority from EPA under the Clean Water Act of 1977 (CWA). The relevant orders, laws, regulations, and guidelines include Executive Order 11988 (Floodplains Management), Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado (BLM 1997a), Colorado River Salinity Act, and the Colorado Water Quality Control Division Stormwater Permit Program (BLM 2007j). Surface water quality in Colorado is governed by the CDPHE Water Quality Control Division. Water Quality Classifications and Standards for the Lower Colorado River Basin, Regulation 33, provides the classifications and numeric standards for the GFSO planning area.

The CWA gives the State of Colorado the authority to create, implement, and revise water quality standards for stream segments within each river basin of the state, depending on the beneficial uses assigned to each segment. Beneficial uses include aquatic life warm or cold, water supply, agriculture, and recreation. Colorado's water quality criteria are set by the Department of Public Health and Environment – Water Quality Control Division. These regulations provide classifications and numeric standards for Colorado's river basins.

Section 303(d) of the Clean Water Act requires that states submit to the EPA a list of those waters for which technology-based effluent limitations and other required controls are not stringent enough to implement water quality standards. Colorado State Regulation #93 (5 Colorado Code of Regulations (CCR) 1002-93, "Section 303(d) List of Water-Quality-Limited Segments Requiring Total Maximum Daily Loads (TMDLs)") fulfills that requirement. Colorado State Regulation #94 (5 CCR 1002-94, "Colorado's Monitoring and Evaluation List") identifies water bodies where there is reason to suspect water quality problems. Water bodies that are impaired, but it is unclear whether the cause of impairment is attributable to pollutants as opposed to pollution, are also placed on the Monitoring and Evaluation List.

Table 3.2.4-1, lists the water bodies within the CRVFO not meeting water quality standards for assigned uses for one or more pollutants (CDPHE 2008b, 2008c).

Table 3.2.4-1
Water Bodies in the CRVFO Planning Area on 2006 Section 303(d) List or Monitoring and Evaluation List

List	Segment Description	Portion	Impairment
303(d)	Tributaries to Colorado River, Roaring Fork to Parachute Creek except for specific segments	All	Selenium
303(d)	Rifle Creek, including tributaries from County Road 251 to Colorado River	All	Selenium
Monitoring and Evaluation	Colorado River, Roaring Fork River to Parachute Creek	All	Sediment
Monitoring and Evaluation	Colorado River, Parachute Creek to Gunnison River	All	Sediment
Monitoring and Evaluation	Tributaries to Colorado River, Roaring Fork River to Parachute Creek, excluding specific segments	Mamm Creek, South Canyon Creek	Iron (total recoverable concentrations)
Monitoring and Evaluation	Rifle Creek, including tributaries from County Road 251 to Colorado River	All	E. coli

Source: CDPHE 2008b, 2008c

Selenium, a mineral found in marine sediments like Mancos Shale, occurs in the western portion of the planning area. One of the main causes of selenium pollution is irrigation runoff through Mancos Shale. This irrigation water percolates deep into the shale, causing selenium to leach into groundwater, eventually resurfacing in area rivers and streams. Tributaries to the Colorado River from the Roaring Fork River to Parachute Creek are listed on Colorado's 303(d) list of water-quality impaired water bodies for selenium. The lower Gunnison River Basin and Grand Valley are other areas in the region with high selenium concentrations in surface water. Interagency efforts, including the Selenium Task Force, have been created to develop cost-effective methods for addressing selenium pollution in western Colorado (BLM 2007j).

Where stream segments are suspected of having water quality problems, but existing data are inadequate to make a determination, segments are placed on Colorado's Monitoring and Evaluation List until more data become available. The main stem of the Colorado River from Roaring Fork to the westernmost extent of the CRVFO is on the Monitoring and Evaluation List for sediment, and Mamm Creek and South Canyon Creek are listed for total recoverable iron (BLM 2007j).

The Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado (BLM 1997a) require assessing five different standards on BLM lands to determine land health. Land Health Standard 5 states that the water quality of all water bodies located on or influenced by BLM lands will meet or exceed Colorado State Water Quality Standards. Land health assessments have been conducted in the planning area since 1999. Each year, a set of usually neighboring watersheds is selected for assessment. The results of the completed land health assessments indicate that all watersheds assessed were meeting the land health water quality standard at the time of the assessment.

Current special management areas in the field office include water quality management areas, municipal watersheds, and debris flow hazard zones. Water quality management areas include the following areas with known water quality problems: Divide, Horse, Willow, Poison, Milk, and Alkali Creeks and the Upper Colorado River. Of these areas, Horse, Willow, Poison, Milk, and Alkali Creeks were investigated.

Municipal watersheds designated in the RMP include those in the City of Rifle and the Town of New Castle. Rifle's Beaver Creek watershed is an important water source that the BLM manages under the Municipal Watersheds designation, which prohibits surface disturbance on BLM lands within the watershed. Other towns such as Parachute and Silt have not incorporated municipal watershed designations into their regulations. However, the BLM recognizes and protects these watersheds accordingly. Additionally, municipal watersheds and source water areas are protected during oil and gas development under Colorado Oil and Gas Conservation Commission protections (COGCC 2010).

The primary source of drinking water for New Castle is East Elk Creek. Most of this watershed is in federal ownership, with BLM lands in the lower watershed area and US Forest Service lands in higher elevation areas. Most of the municipal watersheds for other towns within the CRVFO are excluded from the current Municipal Watershed designation in the RMP because they are in higher elevation areas managed by the US Forest Service or they are privately owned (BLM 2007j).

Hazardous chemicals are used and produced by oil and gas extraction processes (EPA 2004; URS 2006, Witter et al. 2008; Geoffrey 2010). Spills of these chemicals can pollute surface water, groundwater, and soils. Long-term impacts depend on the volume and chemistry/toxicity of the spilled materials or fluids. Spills with low levels of condensate may have minimal long-term impacts to soil and water resources, whereas spills of concentrated hazardous materials could have more serious impacts, depending on the spill volume, the toxicity of the compound, and the volume and flow rate of waters into which the spill is carried. Currently tanks and other facilities on well pads are required to be enclosed with containment rings to reduce the potential for leaks to flow off pads and into surface waters, and the stormwater runoff controls enforced by CDPHE also reduce this potential. Nonetheless, accidental releases of fluids may flow or be transported via runoff into drainages, and a finite but low potential exists for a direct release from a fluid-haulage truck into a waterway.

Changes in groundwater quality due to ongoing hydrofracturing are not expected, because this process occurs at depths below 5,000 feet, while fresh-water aquifers are typically less than 2,000 feet deep, and most domestic wells are less than about 500 feet deep. In addition, casing and cementing of well bores are required by the BLM and COGCC as a means of isolating gas-producing strata from fresh-water aquifers. Although a rare occurrence, the hydrofracturing process may inadvertently perforate zones in unintended strata, potentially creating a pathway for migration of hydrofracturing fluids and produced fluids into shallower groundwater or surface waters.

Abandoned wells may continue to be a source of toxic contaminants if proper capping and maintenance procedures are not used. The single documented instance of groundwater contamination in the CRVFO area was found to be a 40-year-old well on non-BLM land that was improperly plugged and abandoned (URS 2006). That occurrence resulted in more stringent requirements by both the BLM and COGCC, including specific COAs that outline wellboring and cementing, fluids handling, and groundwater monitoring procedures when water wells or surface waters are identified within 0.5 mile of drilling activities. Water wells within 0.5 mile of drilling activities are also currently required to be monitored by the oil and gas operator. COGCC has recently increased the level of protection to groundwater from drill cuttings and flowback waters, which has encouraged oil and gas operators to utilize fluid recovery systems.

The potential for accidental releases of hazardous fluids and contamination of drinking water from drilling and hydrofracturing operations are a major public concern within the CRVFO area. Consequently, the Garfield County Board of County Commissioners has commissioned studies attempting to characterize potential exposures in contaminated water (Coons and Walker 2008,; Witter et al. 2008). See Section 3.6.1.

Water Use

To ensure water availability for multiple use management and the functioning of healthy riparian and upland systems, the BLM files for water rights on water sources, such as springs and seeps, where a water right has not been previously designated under Colorado water law. The BLM also collects stream data and makes recommendations to the Colorado Water Conservation Board for stream segments suitable for instream flow rights, which only the Colorado Water Conservation Board can hold in Colorado. Instream flows are the minimum flows necessary to support fish, other aquatic organisms, and aquatic habitat in a stream or stream segment (BLM 2007j). Approximately 44 streams and/or rivers have adjudicated instream flow water rights on sections of the stream throughout the planning area – totaling over 498 stream miles. Though these water rights are junior to most existing water users, they may help to protect BLM sensitive fish populations and riparian areas during low flow periods in the summer and winter.

Many aspects of fluid mineral development require the use of water, including well drilling, drilling fluids, hydrofracturing and completion activities, dust abatement on roads and pads, and hydrostatic pipeline testing. The amount of water needed in the drilling and hydraulic fracturing process depends on the type of formation (e.g., coalbed, shale, or tight sands) and the fracturing operations (e.g., well depth/length and fracture job design) (EPA 2011b). In the planning area, drilling of a vertical or directional oil and gas well requires 6,000 barrels of fresh water (0.7 acre-feet), of which up to 50 percent is treated and reused in drilling. Total consumption of fresh water, including all uses, is approximately 0.77 acre-feet per well. Hydrofracturing operations require a much larger volume of water (7.7 to 9.7 acre-feet), but water quality does not need to be as high as for drilling. Consequently, water used in hydrofracturing consists primarily of produced water. Horizontal wells, because they are longer and, especially involve hydrofracturing along a greater length of the borehole, consume 2.5 to 3 times as much fresh water as vertical or directional wells, or approximately 15,000 to 18,000 barrels (1.8 to 2.1 acre-feet) per well.

Despite the use of produced water, there is still the need to purchase industrial water from sources outside of the planning area. The cumulative effects of the removal of large volumes of fresh water, in an ever drier climate with increased urban demand, may stress water resources such as springs or drinking water sources, where recharge is limited. In an effort to quantify water depletions in the Colorado River for the four endangered big river fishes, the US Fish and Wildlife issued a programmatic biological opinion that assumes 0.77 acre-feet of water is depleted per well within the BLM Colorado River Valley planning area (BLM 2008i).

In the biological opinion, the 0.77 acre-feet depletion rate is an average based on current local data, and takes into account all aspects of water use to develop and transport natural gas resources.

Groundwater

Surface exposures west of the Grand Hogback consist predominately of the lower part of the Green River Formation and the underlying Wasatch Formation. The area contains both alluvial and bedrock aquifers. Unconsolidated alluvial aquifers are the most productive aquifers in the region (EPA 2004). The groundwater exists in shallow, unconsolidated alluvium associated with the Colorado River and its depositional processes (BLM 2006a). Generally, alluvial well depths are less than 200 feet, with few in excess of 400 feet and typical water levels ranging from 50 to 100 feet. The quality of alluvial groundwater in the Colorado River Basin can vary widely, and is affected by return flow quality, mineral weathering and dissolution, cation-anion exchange with alluvial minerals, and organic compound loading from fertilizer and pesticide leaching.

The most important bedrock aquifers are known as the upper and lower Piceance Basin aquifer systems (EPA 2004). The upper and lower aquifers are separated by the Mahogany Zone of the Parachute Creek Member of the Green River Formation. The Mahogany Zone is a poorly permeable oil shale, which effectively serves as an aquitard between the two water-bearing zones. South of the Colorado River, these aquifers have largely been eroded off, exposing the lower Green River and Wasatch Formations.

Some water-bearing intervals are found in the Mesaverde Group (Glover et al. 1998), which is made up of the Williams Fork and Iles Formations, and lies unconformably below the Wasatch Formation. Depth to the top of the Mesaverde is more than 5,000 feet; and water quality of this aquifer is considered poor due to high levels of dissolved minerals.

Groundwater is recharged from snowmelt in upland areas that receive more precipitation than lower areas (EPA 2004). In the planning area, recharge flows from areas near the upland margins to discharge areas near principal stream valleys. The natural discharge areas are generally found along the Colorado River and its tributaries (USGS 1995). Throughout the RMP planning area, there are approximately 632 springs and/or seeps, many of which have been developed for range improvements and livestock watering sources. Approximately 423 of these water sources have decreed water rights for multiple beneficial uses, such as range, wildlife, and fire suppression. Many of these groundwater sources have associated riparian vegetation or wetland characteristics; however, some sources may only have intermittent flow. Regardless, these water sources are critical areas for wildlife and for maintaining overall watershed health.

East of the Grand Hogback, in the Eagle Basin, alluvial wells along the Colorado River and its tributaries are the most productive for groundwater resources. Water level and well depths are again very shallow, with most completed at depths less than 120 feet. The alluvium of the Eagle River Valley is underlain by the Eagle Valley Evaporite sequence, which can produce locally high concentrations of total dissolved solids (TDS). Flows associated with hot springs, such as Glenwood Springs and Dotsero, typically exhibit high concentrations of TDS as well.

Produced waters from oil and gas development typically are of poor quality and must be disposed of in accordance with BLM's Onshore Oil and Gas Order No. 7; Disposal of Produced Water (43 Code of Federal Regulations (CFR) 3160). Most water is stored onsite (in ponds or pits) and then trucked to an approved facility or disposed of in water injection wells. Most companies operating on BLM land in CRVFO are

treating the produced water and reusing it for drilling operations (BLM 2007j). Additionally, BLM mitigates risk to groundwater through site-specific COAs and stipulations as discussed in Chapter 4.

Standards for protecting groundwater quality are found in CDPHE, Water Quality Control Division's Regulation 41, The Basic Standards for Groundwater, and Regulation 42, Site-Specific Water Quality Classification and Standards for Groundwater.

Characterization

Indicators

The BLM owns and manages approximately 20 percent of land surface in the resource area. Other federal agencies, the state of Colorado, and private landowners manage and own the rest. Given the pattern of surface land ownership, assessing water resource is challenging. The resource condition is assessed primarily through the Land Health Assessment (LHA) process.

The 1997 Colorado Standards for Public Land Health and Guidelines for Livestock Grazing Management RMP Amendment was approved to help determine what constitutes healthy BLM lands. Standard 2 (Riparian Systems) and Standard 5 (Water Quality) contain indicators related to impacts to water resources. The Standard 2 indicators include those that relate to the health of upland soils discussed in Section 3.2.3 (Soil Resources) as well as the following:

- Streambank vegetation is composed of species and communities that have root systems capable of withstanding high streamflows.
- Plant species indicate maintenance of riparian moisture characteristics.
- Stream is in balance with the water and sediment being supplied by the watershed (e.g., no headcutting, no excessive erosion or deposition).
- Vegetation and free water indicate high water tables.
- Vegetation colonizes point bars with a range of age classes and successional stages.
- An active floodplain is present.
- Residual floodplain vegetation is available to capture and retain sediment and dissipate flood energies.
- Stream channels are of the size and meander pattern appropriate for the stream's position in the landscape, and parent materials.
- Woody debris contributes to the character of the stream channel morphology.

Standard 5 indicators include the following:

- Appropriate populations of macroinvertebrates, vertebrates, and algae are present.
- Surface water and groundwater contain substances attributable only to humans within the amounts, concentrations, or combinations as directed by the Water Quality Standards established by the State of Colorado (5 CCR 1002-8). Examples of these substances are sediment, scum, floating debris, odor, and heavy metal precipitates on channel substrate.

Different watersheds are targeted every year for a systematic analysis of the five standards, including riparian condition and water quality. The goal is to rotate through the resource area, focusing on a set of neighboring watersheds each year for field visits and analysis. The water quality parameters measured in the field usually include flow, water temperature, pH, and specific conductivity. Riparian condition is assessed using Proper Functioning Condition (PFC) forms, which are part of the LHA.

Trends

Development is increasing at a rapid rate in many parts of the CRVFO. Land uses such as urban/suburban development and recreation, particularly in the Eagle River Valley, and burgeoning natural gas development within the Piceance Basin have created a rapidly expanding WUI which can be significant sources of point and nonpoint pollution (BLM 2007j).

Trends in the CRVFO include a rapidly increasing population with increased recreation use and demand, growth in urban/suburban development, and burgeoning natural gas development. Recreation activity is increasing significantly in more easily accessible WUI boundaries, as well as in more remote areas, due in part to population growth in the river corridor towns like Rifle and Eagle. Water resources will receive continued pressure from recreational, domestic, and commercial users. Increased energy production has created the need to analyze groundwater resources during the permitting process to help reduce concerns of groundwater quality and quantity within the Piceance Basin.

Some climatologists are predicting near-term climate change in Colorado. A recent report prepared for the state of Colorado (Ray et al. 2008) analyzed past and present climate data and forecast that southwestern Colorado will experience warmer temperatures within the next few decades. The report summarized potential issues for land and water managers given the climate forecast. Consequences of climate change as identified by Ray et al. (2008) are summarized below, along with potential effects on BLM resource management programs.

- Earlier runoff may complicate prior appropriation systems and interstate water compacts, affecting which rights holders receive water.
- Water quality is sensitive to both increased water temperatures and changes in patterns of precipitation, which could affect aquatic resources on public lands and downstream water uses.
- Stream temperatures are expected to increase as the climate warms, which could have direct and indirect effects on aquatic ecosystems, including the spread of instream non-native species and diseases to higher elevations, and the potential for non-native plant species to invade riparian areas.
- Changes in streamflow intensity and timing may also affect riparian ecosystems.
- Changes in reservoir storage affect river recreation activities; changes in streamflow intensity and timing will continue to affect rafting directly and trout fishing indirectly.
- Changes in long-term precipitation and soil moisture can affect groundwater recharge rates, which could diminish spring and well discharge rates on public lands needed to support a variety of resources.

Uncertainty remains about the precise nature, timing, and severity of these effects in a given area. Additionally, because the climate change models predict shifts in multiple climatic variables, the precise relationship of these variables may profoundly influence the specific outcomes of climate change. It also is

possible that some currently unknown future factors could result in different outcomes from those currently anticipated. Some of the predicted effects, particularly those involving shifts in plant and animal communities, may occur over a period of centuries due to the adaptiveness of the community and component species to changing conditions. Existing communities may persist in conditions no longer favorable for their establishment. Therefore, shifts in community composition and structure may be most discernible at either end of the range of tolerance of a community, while intermediate areas show less or no change.

3.2.5 Vegetation

Vegetation serves multiple purposes on the landscape and provides many ecosystem benefits. Vegetation stabilizes soils, prevents erosion, uses CO_2, releases O_2, 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 communities discussed below are those that provide the most important land cover across the planning area. Special status plant species are discussed in Section 3.2.7.

Oil and gas development, timber harvest and associated activities, fuels management, livestock grazing, recreation (such as OHV use), travel management, and special designations would affect vegetation. In particular, activities dealing with water rights and subsequent water diversions may affect riparian areas. Resources that would cause negligible effects include air quality, cultural resources, and visual resources.

Current Conditions

Vegetation Communities

The CRVFO planning area lies within two level III ecoregions: the Southern Rockies and Colorado Plateau. Ecoregions represent areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. They serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components (Chapman et al. 2006). The eastern two-thirds of the CRVFO are high elevation, rugged mountains where vegetation is dominated by conifers of the Southern Rockies ecoregion (Chapman et al. 2006). Vegetation types in this ecoregion are organized by elevation zones, with grass and shrublands in the lower elevation foothills, pinyon-juniper woodlands on the southern aspects, Gambel oak/mixed mountain shrublands on the northern aspects, gradually transitioning to aspen (*Populus* spp.), lodgepole pine (*Pinus contorta*), and Douglas-fir (*Pseudotsuga menziesii*) at mid-elevations, and finally, spruce-fir forests and tundra. The remaining western third of the CRVFO in the rugged tableland of the Colorado Plateau ecoregion is characterized by pinyon-juniper woodlands and Gambel oak shrublands (Chapman et al. 2006). The distribution of vegetation communities across the landscape is largely determined by precipitation, elevation, topography, aspect, soil type, and disturbance regimes.

The CRVFO contains 10 primary vegetation types (Figure 3.2.5-1, Vegetation Types). Despite the diversity in vegetation communities, nearly 70 percent of the CRVFO is occupied by three shrub and woodland communities (Table 3.2.5-1, Vegetation Communities within the CRVFO). Community information for the CRVFO is based on field inventory data.

Table 3.2.5-1
Vegetation Communities within the CRVFO

Vegetation Community	Acres	Percentage of CRVFO
Forests and Woodlands		
Pinyon-juniper woodlands	198,544	37
Coniferous forest[1]	47,576	9
Aspen	18,508	5
Rangelands		
Sagebrush shrublands	86,851	16
Mesic mountain shrublands	66,042	14
Gambel oak woodlands	49,124	9
Barren/talus slopes/rock	20,750	5
Grasslands	12,207	3
Salt-desert shrublands	2,428	1
Riparian		
Riparian	4,000	1

Source: BLM 2008b

[1]Grouping of lodgepole pine, Douglas-fir, Engelmann spruce/subalpine fir, and ponderosa pine

Vegetation – Forests and Woodlands

Aspen and coniferous forest lands occupy 14 percent of the CRVFO. Coniferous forest communities represent approximately 9 percent of the CRVFO and include lodgepole pine, Douglas-fir, Engelmann spruce/subalpine fir (*Picea engelmannii/Abies lasiocarpa*), and ponderosa pine (*Pinus ponderosa*). Quaking aspen (*Populus tremuloides*) dominates approximately 5 percent of the CRVFO (Table 3.2.5-1, Vegetation Communities within the CRVFO).

Woodland vegetation, characterized by pinyon pine (*Pinus edulis*) and juniper species (*Juniperus* spp.), occupies 37 percent of the CRVFO and is the dominant vegetation community type (Table 3.2.5-1, Vegetation Communities within the CRVFO). Woodland communities are found on dry, warm slopes, mesas, and ridges. The following discussion summarizes key characteristics of forest and woodland communities for the CRVFO.

Pinyon-juniper woodlands include pure stands of Utah juniper (*J. osteosperma*) at the lower elevations, with an increasingly greater component of pinyon pine and Rocky Mountain juniper (*J. scopulorum*) at higher elevations. The understory is typically dominated by shrubs and perennial bunchgrasses. These woodlands are found on warm, dry slopes at lower to mid-elevations on a variety of soil textures, ranging from stony, cobbly, gravelly, or sandy loams to clay loam or clay (Colorado Natural Heritage Program [CNHP] 2005).

Without wildfire, insects, or other diseases, and with favorable climatic conditions for establishment, pinyon-juniper woodlands begin to encroach into sagebrush communities. Evidence of pinyon-juniper encroachment is widespread within the CRVFO and throughout much of the Colorado Plateau. Pinyon-juniper stand density and canopy cover are also increasing and are beginning to inhibit understory diversity and productivity. Within the CRVFO, many of the pinyon-juniper communities exhibit a lack of well developed biological soil crusts. Biological soil crusts are important for stabilizing soils in arid and semiarid vegetation communities, in some cases accounting for up to 70 percent of the living cover (BLM 2001c). Intact crusts have also demonstrated the ability to inhibit seed germination for some species, including the exotic annual cheatgrass

(*Bromus tectorum*) (BLM 2001c). Biological crusts are sensitive to soil disturbance from activities such as grazing and OHV use.

Pinyon-juniper habitats vary in condition throughout the CRVFO. Many sites consist of mature to old trees, with a sparse herbaceous understory. The cover of native grasses and forbs in other stands is fairly good. Understory shrubs are also lacking in many areas and, where present, are generally in poor to fair condition. Shrubs are old, decadent, and severely hedged with little or no recruitment. Localized areas have moderate to high cheatgrass infestations that are closely associated with surface disturbances, such as fire or roads.

Lodgepole pine communities are common throughout the Rocky Mountains, though lodgepole communities represent only a small portion of the CRVFO (Table 3.2.5-1, Vegetation Communities within the CRVFO). Lodgepole pine communities are found on all aspects and slopes at higher elevations. Soils supporting these forests are generally well drained, gravelly, course textured, and acidic (CNHP 2005). This species colonizes rapidly following fire, developing dense even-aged stands. As these stands mature, their density and high fuel loading increases the likelihood of high-intensity or high-severity fire, as well as decreasing stand vigor and tree resistance to insects and disease. The CRVFO is on the western edge of the current mountain pine beetle (*Dendroctonus ponderosae*) infestation; relatively few trees have been infected yet, but the infestation continues to expand.

Douglas-fir communities are a minor component of the CRVFO (Table 3.2.5-1, Vegetation Communities within the CRVFO), generally occurring on steep north or northeast facing slopes at mid-elevations. Understory communities are typically shrubby, with a perennial grass component. Soils are usually shallow and sites are colder and moister than surrounding habitat, which supports primarily mixed mountain shrubs or aspen. Stand density is increasing in many stands, resulting in increased fuel loads and tree stress, increasing the likelihood of insect and disease infestation.

Engelmann spruce/Subalpine fir forest is a minor but important community in the CRVFO (Table 3.2.5-1, Vegetation Communities within the CRVFO). These communities occur on cold sites over a broad range of elevations (CNHP 2005). Spruce-fir communities often form in cold air sinks along mountain streams and ravines, where snowpack is persistent (CNHP 2005). Fire, insects, windthrow, and avalanches all contribute to the stand dynamics of these communities (CNHP 2005). Some Engelmann spruce are at or over maturity and are susceptible to insect infestation. Spruce beetle, affecting Engelmann spruce, has killed some spruce/fir stands but the infestation has not reached epidemic levels.

Aspen vegetation communities are common in the Rocky Mountains and account for roughly 5 percent of the forested land in the CRVFO (Table 3.2.5-1, Vegetation Communities within the CRVFO). Aspen communities typically occur in a mosaic with conifer and sagebrush communities. Understory vegetation is often a dense mix of grasses and forbs and an occasional shrub component (CNHP 2005). Aspen sprout vigorously following fire, establishing early seral communities, which are later converted to shade-tolerant species, such as subalpine fir and Douglas-fir, among others. Disturbance is needed to maintain aspen communities as mature trees become increasingly susceptible to insects and disease (CNHP 2005).

At the higher elevations of their range, most aspen stands in the CRVFO are in good condition, with little evidence of insects or disease and regeneration occurring throughout the understory. Aspen is vulnerable to insects and disease in the absence of disturbance. As with lodgepole pine communities, fire suppression has increased stand density and has created even-aged communities. At lower elevations, advanced age, disease,

and the recent drought have all contributed to reduced stand vigor. Some aspen stands are displaying increased mortality of mature and over-mature trees, and regeneration is limited or not occurring at all.

Vegetation—Rangelands

Vegetation communities in the planning area identified as rangelands include grasslands, salt-desert shrublands, sagebrush, mixed mountain shrublands, and Gambel oak woodlands. Barren/talus/rock outcrops are also included in this section because most of these communities occur within or adjacent to rangelands. Table 3.2.5-1, Vegetation Communities within the CRVFO, includes acres of each rangeland type on the CRVFO. Figure 3.2.5-1, Vegetation, displays their distribution.

Grasslands and grass/forb-dominated communities consist of perennial grass species often intermixed with forbs and scattered shrubs. Grasslands occupy 3 percent of BLM land in the CRVFO. They are often found as scattered patches on windswept ridges, on south-facing slopes, or on deeper soils in valley bottoms. At low to mid-elevations, these grasslands are dominated by needle-and-thread grass (*Hesperostipa comata*), bluebunch wheatgrass (*Pseudoroegneria spicata*), or Indian ricegrass (*Achnatherum hymenoides*). In the higher elevations of the planning area, such as on the flanks of Castle Peak or the northern side of King Mountain, subalpine grassy meadows are dominated by Thurber's fescue (*Festuca thurberi*) or Columbia needlegrass (*Achnatherum nelsonii*) or Letterman's needlegrass (*A. lettermanii*). Some grasslands in the planning area have become dominated by annual grasses, noxious weeds, or shrubs.

Salt-desert shrublands occur on one percent of BLM lands in the CRVFO planning area. They are found in the lower elevations up to 6,000 feet. The soils are typically saline, such as those derived from the Wasatch Formation, and occur on terraces and slopes above the Colorado River between DeBeque and Rifle. Salt-desert shrub communities are usually dominated by black greasewood (*Sarcobatus vermiculatus*), shadscale (*Atriplex confertifolia*), or other saltbushes (*Atriplex* spp.), with Wyoming big sagebrush (*Artemisia tridentata* spp. *wyomingensis*), low rabbitbrush (*Chrysothamnus depressus*), winterfat (*Krascheninnikovia lanata*), black sagebrush (*Artemisia nova*), and bud sagebrush (*Picrothamnus desertorum*) often a part of the shrub community. The understory is often sparse due to the saline soils, which inhibit the growth of species that are not salt tolerant.

Salt-desert shrub stands within the CRVFO that are in good condition often have a diverse understory that may include Salina wildrye (*Elymus salina*), western wheatgrass (*Pascopyrum smithii*), needle-and-thread grass (*Hesperostipa comata*), galleta grass (*Hilaria jamesii*), and sand dropseed (*Sporobolus cryptantha*). Microbiotic crusts, which are often an important component for soil protections and nutrient cycling, constitute a high proportion of the ground cover. Degraded sites within the CRVFO often have little microbiotic crust cover and may have high substantial infestations of cheatgrass and annual forbs. The salt-desert shrubland communities provide important winter range habitat, as the shrubs not buried by snow provide forage with high levels of protein and carbohydrates to wildlife and livestock. Shadscale has been browsed so heavily that it is becoming decadent or dying throughout much of the landscape.

Sagebrush communities in the planning area are dominated by Wyoming big sagebrush, mountain big sagebrush (*Artemisia tridentata* var. *pauciflora*), subalpine big sagebrush (*A. tridentata* ssp. *vaseyana*) or basin big sagebrush (*A. t.* ssp. *tridentata*). Collectively, all four sagebrush communities make up about 16 percent of the CRVFO. Each sagebrush type contains unique vegetation characteristics that define their role and importance in providing essential habitat for several wildlife species and valuable forage for livestock (Winward 2004). Among the *Artemisia* sagebrush types, two general distinctions can be made: sagebrush shrubsteppe and sagebrush shrublands (Boyle and Reeder 2005). Sagebrush shrubsteppe occurs in the Wyoming Basins

ecoregion of northwest Colorado. The combination of relatively high precipitation with lower average temperatures results in a mix of tall sagebrush species with a perennial bunchgrass understory. Sagebrush shrublands typically occur in the southern Rockies and the Colorado Plateau ecoregions of west-central Colorado. The climate in these areas is generally more arid than that found in the sagebrush shrubsteppe communities to the west. These stands of sagebrush often contain less understory growth than in the sagebrush shrubsteppe.

Wyoming big sagebrush grows on the driest sites of all big sagebrush species and subspecies, where annual precipitation ranges from 7 to 11 inches (Winward 2004). It is usually found on shallow to moderately deep, coarse-textured, very well-drained soils between 5,000 and 7,000 feet elevation (Boyle and Reeder 2005). Shrub height varies from as low as 8 inches on shallow soils to around 30 inches on deeper soils. Canopy cover is typically not as dense as for basin, mountain, or subalpine sagebrush, rarely exceeding 30 to 40 percent. In the CRVFO, these Wyoming big sagebrush shrublands are found at the lower elevations, predominantly in the western half of the planning area. Wyoming big sagebrush is palatable to wildlife and livestock, providing important winter forage for native ungulates, such as mule deer (*Odocoileus hemionus*). With habitat losses due to development, winter range is becoming more limiting and animals are concentrated into smaller areas. As a result, many of these stands have been heavily browsed, which has reduced stand vigor and productivity. Wyoming big sagebrush communities also provide valuable habitat for greater sage-grouse (*Centrocercus urophasianus*).

Fire is an important component of all sagebrush-dominated plant communities. Fire in the Wyoming big sagebrush communities occurs less frequently than in other sagebrush types (roughly 100 years or more) due to the lack of fine fuels needed to carry fire (Welch 2005). Where intervals since the last fire are long, the trend in the planning area is for sagebrush stands to become denser and less productive, with a sparse understory and a high percent of dead or decadent sagebrush. With a lack of disturbance, Utah junipers, and to some extent pinyon pines, often become established in these Wyoming big sagebrush sites.

Many of the Wyoming sagebrush communities within the CRVFO consist of old and even-aged stands of sagebrush. As these stands age, they are becoming decadent and declining in productivity. On many of these lower-elevation sagebrush sites, the perennial grass and forb understory is lacking in diversity and abundance, and in some cases, non-native annuals, particularly cheatgrass, now dominate the understory composition. The Wyoming sagebrush communities also comprise the bulk of mule deer winter range habitats. As these habitats become more limited due to development, the remaining browse exhibits moderate to severe hedging.

Basin big sagebrush is typically found on deep well-drained soils of valley bottoms and along ephemeral drainages in the 10- to 18-inch precipitation zone. Many areas dominated by basin big sagebrush have been converted to agriculture due to these site factors. Compared to adjacent Wyoming big sagebrush communities, basin big sagebrush requires slightly more moisture and requires it later in the season (Winward 2004).

Basin big sagebrush communities often contain a diverse understory of grasses and forbs. Other associated shrubs may include rubber rabbitbrush (*Chrysothamnus nauseosus*) and green rabbitbrush (*C. viscidiflorus*).

Basin big sagebrush is the least palatable subspecies of sagebrush, often showing little or no browsing use even in extreme winters when forage is scarce. Shrubs often grow up to 6 feet high and can occasionally reach

10 feet under favorable conditions, with a canopy cover up to 70 percent. The height of basin big sagebrush is of primary ecological importance with respect to its role as wildlife habitat, providing hiding and thermal cover for mule deer and elk (*Cervus elaphus*) and providing nesting and perching habitat for avian species (Winward 2004; Boyle and Reeder 2005). Cover and density often increase in basin big sagebrush stands with livestock use and long fire return intervals. Prescribed fires or mechanical or chemical treatment have been used to increase structural diversity in the sagebrush community and to increase cover and density of grasses, forbs, and sprouting shrubs. The relatively fertile nature of basin big sagebrush sites makes them susceptible to conversion to other uses, such as agriculture.

Mountain big sagebrush is found in deep soils at mid- to upper-elevation slopes and ridges between 6,800 feet and 8,500 feet, and where annual precipitation is often greater than 14 inches. Sites are typically very productive, with a diverse understory that provides forage for wildlife (Boyle and Reeder 2005). The fire return interval in mesic mountain big sagebrush sites with abundant grass and forb cover is more frequent than other sagebrush sites, roughly 25 to 30 years. Mountain big sagebrush can increase in canopy cover without periodic fire, disease, or other disturbance. Canopy cover on areas that have not had disturbance for several decades can reach between 40 and 50 percent (Winward 2004). Other shrubs typically associated with mountain big sagebrush include serviceberry (*Amelanchier* spp.), snowberry (*Symphoricarpos* spp.), mountain mahogany (*Cercocarpus montana*), or antelope bitterbrush (*Purshia tridentata*). Mountain big sagebrush communities are most common at the higher elevations in the eastern half of the CRVFO. Many of these sites have been treated in the past 50 years to reduce sagebrush canopy cover and to increase age-class diversity and herbaceous cover. This sagebrush type is an important component of sage-grouse brood-rearing habitat, so any sagebrush reduction projects must be designed to consider sage-grouse habitat requirements (Winward 2004; Boyle and Reeder 2005).

Subalpine big sagebrush is found on sites that are slightly moister than mountain big sagebrush. It can be found between the elevations of 8,500 and 10,000 feet, often as openings adjacent to aspen and spruce-fir forests (Winward 2004). In these areas, precipitation typically exceeds 14 inches (Boyle and Reeder 2005). In disturbed areas or areas of excessive grazing, it can develop canopies over 40 percent cover. As canopy cover reaches this level, the understory species decrease.

Subalpine sagebrush receives little browsing, likely due to the abundance of understory forage and its high elevation habitats, which are frequently buried in snow during much of the winter. Research suggests that wildfire has played less of an ecological role in maintaining a balanced overstory/understory ratio in subalpine sagebrush than in mountain big sagebrush habitats (Winward 2004).

Higher elevation sagebrush sites (mountain big sagebrush and subalpine sagebrush) may be even-aged and have a dense canopy cover in much of the CRVFO but are generally not decadent and still support a good cover and composition of herbaceous species.

Mixed mountain shrublands are a major component of the middle elevations of the planning area. Mesic mountain shrublands, which include a mixture of serviceberry, snowberry, Gambel oak (*Quercus gambelii*), sagebrush (*Artemesia* spp.), mountain mahogany, rabbitbrush, chokecherry (*Prunus virginiana*), squawapple (*Peraphyllum ramosissimum*), and antelope bitterbrush, make up about 14 percent of the CRVFO. These communities are frequently located on the midslopes between the low elevation pinyon-juniper woodlands and the higher elevation aspen and mixed conifers. Mesic mountain shrublands are common in the mountains south of Interstate 70, including the Hardscrabble, Divide Creek, and Crown areas. Since this community type

generally grows in areas of relatively abundant moisture, herbaceous plants associated with mesic mountain shrubs are often diverse and numerous. The understory density and diversity is inversely proportional to the amount of overstory canopy cover. Commonly associated herbaceous plants include Letterman's and Columbia needlegrasses, prairie junegrass (*Koeleria macrantha*), bluebunch wheatgrass, elk sedge (*Carex geyeri*), Indian paintbrush (*Castilleja* spp.), buckwheat (*Eriogonum* spp.), mat penstemon (*Penstemon caespitosus*), arrowleaf balsamroot (*Balsamorhiza sagittata*), and hawksbeard (*Crepis* spp.).

Mixed mountain shrub and oak habitats within the CRVFO generally exhibit good to excellent diversity and productivity of shrubs, grasses, and forbs. Many sites are almost completely covered by vegetation or litter.

Gambel oakbrush is a type of mixed mountain shrubland in which Gambel oak is the dominant species and is found at middle elevations in the planning area. This plant community occurs over approximately 9 percent of the CRVFO. Gambel oak is a rapid resprouter following fire, and provides tender shoots for wildlife browsing. Fire increases herbaceous production for 10 to 20 years until the shrubs regain their former height and density.

Barren areas, talus slopes, and rock outcrops are those areas within the RMP planning area that consist of barren soil, rock outcrops, or cliffs and talus slopes that support little or no vegetation. Barren areas, talus slopes, and rock outcrops are too steep and too sparsely vegetated to be beneficial to livestock or big game animals for forage. This cover type occupies approximately 5 percent of the CRVFO and is found in both the Colorado and Eagle River drainages.

Barren areas are usually caused by soil conditions that inhibit the growth of vegetation. Barren soils are concentrated on gypsiferous soils between the towns of Dotsero and Eagle. Although vegetation in these areas is quite sparse, microbiotic crusts are abundant and diverse and are key to holding these soils intact. Other barren areas are found as small inclusions on Wasatch soils between DeBeque and Rifle that are too steep or lack the proper soil characteristics to support more than minimal vegetation growth. These Wasatch soils also support at least two special status plant species: DeBeque milkvetch (*Astragalus debequaeus*) and DeBeque phacelia (*Phacelia scopulina* var. *submutica*).

Talus slopes form below cliffs of the Green River formation as the cliffs begin to weather and crumble. These talus slopes consist of shale shards of various sizes and often have very little soil development or are too steep and unstable to support most forms of vegetation. However, several endemic rare plant species in the CRVFO occur on these talus slopes, including parachute penstemon (*Penstemon debilis*), Roan Cliffs blazing star (*Mentzelia rhizomata*), and sun-loving meadowrue (*Thalictrum heliophilum*). Most of these species have biological characteristics that enable them to grow in these extreme conditions.

Rock outcrops are usually areas of sandstone that are resistant to weathering. These areas are exposed rock ledges and benches with soil deposition occurring only in cracks and low spots where soil accumulates.

In 1996, the BLM adopted the *Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado* to guide it and public land users to maintain or achieve healthy landscapes. The primary means of assessing the current condition of the vegetation communities within the CRVFO has been the land health assessment process. This involves a checklist of biotic, abiotic, and hydrologic features to determine whether the public land health standards are being met. The health of the vegetation is determined by the following:

- Analysis of the amount and distribution of noxious weeds and other undesirable species.
- Distribution of the native plant species across the landscape, with a density, composition, and frequency of species suitable to ensure reproductive capability and sustainability.
- Presence of mixed-age classes across the landscape sufficient to sustain recruitment and mortality fluctuations.
- Appropriate density and diversity of plant species to match the capability of the ecological site.

Vegetation—Significant Plant Communities

Significant plant communities are those that are globally rare, that are rare within the state, or that have not been substantially altered by human activity. The first two categories include vegetation communities in which the individual component species may not be rare but the unique association of plant species is rare or uncommon. The third category of significant plant communities involves plant community types that are significant not because of their rarity, but because they represent relatively pristine natural communities with few nonnative species.

Significant plant communities on BLM lands are important for many of the same reasons that special status plants are important. Urbanization, agriculture, and other human activities have greatly altered many of the natural plant communities on private land. BLM lands are therefore critical to maintaining the diversity of natural plant communities and biological diversity in general (BLM 1992a). Significant plant communities constitute relict (remnant) areas and may serve as comparison areas to assess public land health and analyze the impacts of human activities. These areas may also prove to be important for future scientific research.

In the CRVFO planning area, the only areas that have been inventoried for significant plant communities are portions of the Colorado River and Roaring Fork River riparian corridors. In the CRVFO decision area, 15 occurrences of 11 significant plant communities have been identified (Table 3.2.5-2, Significant Plant Communities in the CRVFO Planning Area). Most of these communities are in good condition, with little fragmentation or invasion of exotic species. In the riparian communities, fire or other disturbances pose a risk of invasion by tamarisk and other exotic species.

Balsam poplar (*Populus balsamifera*) woodland (GU/S2). There is one location where this community occurs in the CRVFO, which is a narrow riparian community, approximately 2.5 miles long by 30- to 60-feet wide, along upper Eby Creek. Tree cover is balsam poplar, with clumps of Douglas-fir. Shrubs consist of river birch, red-osier dogwood, and thin-leaf alder. The occurrence includes both public and private property.

Basin big sagebrush/basin wildrye (*Artemisia tridentata* ssp. *tridentata/Leymus cinereus*) (G2/S1). There is one location where this community occurs in the CRVFO, near a spring on the east side of Derby Mesa. It is a plant association that is relatively rare throughout its range, with very few occurrences in Colorado. This association seems to occur in small patches in mesic or seep areas that are moist enough to support basin wildrye, but not moist enough for true riparian species. The site is one-half mile long by 100- to 165-feet wide.

Narrowleaf cottonwood/common chokecherry (*Populus angustifolia/Prunus virginiana*) (G2/S1). This riparian community occurs in only one location in the CRVFO, along the Roaring Fork River, east of Snowmass.

Table 3.2.5-2
Significant Plant Communities in the CRVFO Planning Area

Scientific Name	Common Name	Status	Number of Sites
P. balsamifera	Balsam poplar woodland	GU/S2	1
Artemisia tridentata ssp. *tridentata/Leymus cinereus*	Basin big sagebrush/basin wildrye	G2/S1	1
Populus angustifolia/Prunus virginiana	Narrowleaf cottonwood/common chokecherry	G2/S1	1
P. angustifolia/Juniperus scopulorum	Narrowleaf cottonwood/Rocky Mountain juniper	G2G3/S2S3	2
Populus angustifolia/Betula occidentalis	Narrowleaf cottonwood/water birch	G3/S2	2
P. tremuloides/Acer glabrum	Quaking aspen/Rocky Mountain maple forest	G2/S1S2	1
P. deltoides ssp. *wislizeni/Rhus trilobata*	Plains cottonwood/skunkbush sumac forest	G2/S2	2
J. scopulorum/Cercocarpus montanus	Rocky Mountain juniper/mountain mahogany	G2/S2	1
J. scopulorum/Cornus sericea	Rocky Mountain juniper/red-osier dogwood	G4/S2	2
Shepherdia argentea	Silver buffaloberry shrubland	G3G4/S1	2
Betula occidentalis/Maianthemum stellatum	Water birch/mesic forbs	G4/S2	1
B. occidentalis/mesic graminoids	Water birch/mesic grasses	G3/S2	1

Source: CNHP 2008
Status: G = global ranking, S = state ranking. G1/S1 = critically imperiled; usually fewer than five known occurrences or few remaining individuals; G2/S2 = imperiled; usually between five and 20 occurrences or with many individuals in fewer occurrences. G3/S3 = vulnerable; usually between 20 and 100 occurrences; may have fewer occurrences but with many individuals. G4/S4 = apparently secure; uncommon but not rare. G5/S5 = secure; common widespread and abundant. U = unrankable; unrankable due to lack of information. NA = not applicable. X = Presumed extirpated

Narrowleaf cottonwood/Rocky Mountain juniper (*Populus angustifolia/Juniperus scopulorum*) (G2G3/S2S3). This riparian community is found along the Colorado River in two places within the CRVFO, one at Jack Flats and one approximately 1.5 miles east of Stifel Creek, along a wide meander of the Colorado River.

Narrowleaf cottonwood/water birch (*P. angustifolia/Betula occidentalis*) (G3/S2). This community occurs primarily on private land, along West Elk Creek, but a small portion of the community is found on public land.

Quaking aspen/Rocky Mountain maple (*P. tremuloides/Acer glabrum*) (G2/S1S2). Aspen/maple forests have been documented from a few scattered locations in the Colorado mountains (CNHP 1999). In the CRVFO planning area, the plant association occurs in upper Bear Creek, south of the Colorado River and east of Lookout Mountain.

Rio Grande cottonwood/skunkbrush (*P. deltoides* ssp. *wislizeni/Rhus trilobata*) (G2/S2). This low-elevation riparian community occurs in two places within the CRVFO: on an old oxbow of the Colorado River near the West Rifle exit from Interstate 70 and on the south side of the Colorado River at the foot of Samson Mesa.

Rocky Mountain juniper/mountain mahogany (*Juniperus scopulorum/Cercocarpus montanus*) (G2/S2). This is a high-elevation juniper woodland associated with mountain mahogany. It is only found in the CRVFO planning area in the Milk Creek drainage north of Wolcott. The community occupies an estimated 300 acres and includes both public and private lands, and is in good condition, with few weeds noted.

Rocky Mountain juniper/red-osier dogwood (*J. scopulorum/Cornus sericea*) (G4/S2). This is an unusual riparian woodland of Rocky Mountain juniper with an understory of red-osier dogwood. It is relatively common throughout the west but uncommon in Colorado. There are only two documented occurrences in the CRVFO planning area. Both are on the Colorado River, one just north of Jack Flats and the other one mile upstream of Stifel Creek. The Jack Flats occurrence is a relict site with only older-age class Rocky Mountain junipers. The Stifel Creek occurrence is a mixed-age class stand that is small but healthy.

Silver buffaloberry shrubland (*Shepherdia argentea*) (G3G4/S1). This unusual community is found in two places along the banks of the Colorado River. One site is immediately downstream of the town of Burns; the other site is found on public land between Cabin Gulch and the town of McCoy. Both are good examples of this community type, but both are small stands (less than 0.5 acres).

Water birch/mesic forbs (*B. occidentalis*/mesic forbs) (G3/S2). This is a small spring-fed riparian community located on the Colorado River east of the Rodeo Grounds, between Blue Hill and the Catamount Bridge.

Water birch/mesic grasses (*B. occidentalis/*mesic grass/grasses) (G3/S2). This is a riparian shrubland of birch and grasses associated with a spring on the east side of Derby Mesa. There is only one documented occurrence in the CRVFO planning area, and that is no more than one-half mile long by 15- to 30-feet wide

Vegetation—Riparian

Vegetation classified as riparian occurs along perennial streams, rivers, lakes, reservoirs, springs, and some intermittent streams. This vegetation type makes up approximately 1 percent of the total vegetation cover in the CRVFO. PFC assessments have been completed on many riparian corridors in the CRVFO (see below for further discussion of PFC assessments).

Typical riparian areas are lands that are near or contiguous with perennially and intermittently flowing rivers, streams, glacial potholes, and shores of lakes and reservoirs with stable water levels. Excluded are such sites as ephemeral streams or washes that do not exhibit vegetation dependent on free water in the soil (BLM 1992b). Riparian areas are considered a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence.

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and that, under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include marshes, shallows, swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas (BLM 1992b). Even though riparian areas and wetlands 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). A variety of physiognomic groups (Carsey et al. 2003) of riparian zones and wetlands occurs within the CRVFO, such as evergreen riparian forests and woodlands, mixed coniferous and deciduous forests and woodlands, deciduous dominated forests and woodlands, tall willow shrublands, short willow shrublands, non-willow shrublands, and herbaceous vegetation. These can be further subdivided into a variety of plant association (plant community) types, but insufficient data exist to provide a comprehensive listing of these. The location of riparian areas and wetlands within the CRVFO are presented in Figure 3.2.5-2, Riparian Proper Functioning Condition Assessments. There are approximately 280 miles of perennial, ephemeral, and intermittent steams

that support riparian vegetation in the CRVFO planning area. Including springs, lakes, and seeps, approximately 4,000 acres of riparian vegetation have been identified in the CRVFO planning area.

Information on the condition of these riparian areas and wetlands is available from PFC assessments that have been conducted since 1993. Many of these have been conducted as part of land health assessments on various landscapes within the CRVFO. Based on hydrology, vegetation, and erosion/deposition (soils) attributes and processes (BLM 1998a), the PFC assessments place the riparian area in one of five ratings, as follows:

- PFC—Most or all of the indicators (within the system's potential) have been met, and therefore Standard 2 has been achieved.
- Functioning At Risk (FAR) upward trend (UP)—Several indicators have not been met, but significant progress is being made toward achieving Standard 2.
- FAR no apparent trend (NA)—Several indicators have not been met, and generally Standard 2 has not been achieved.
- FAR downward trend (DOWN)—Several indicators have not been met, and generally Standard 2 has not been achieved.
- Nonfunctional (NF)—Several indicators have not been met, and consequently Standard 2 has not been achieved.

Since the approach of the PFC assessment is to evaluate most of the indicators for land health Standard 2, the resultant functional rating (PFC, FAR, NF) for each riparian area determines whether the standard is being achieved.

For lotic systems, a riparian-wetland area is considered to be in PFC when adequate vegetation, landform, or large woody debris is present to accomplish the following (BLM 1998a):

- Dissipate stream energy associated with high water flow, thereby reducing erosion and improving water quality.
- Filter sediment, capture bed load, and aid floodplain development.
- Improve floodwater retention and groundwater recharge.
- Develop root masses that stabilize stream banks against cutting action.
- Develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses.
- Support greater biodiversity.

For lentic systems, riparian-wetland areas are functioning properly when adequate vegetation, landform, or debris is present to accomplish the following:

- Dissipate energies associated with wind action, wave action, and overland flow from adjacent sites, thereby reducing erosion and improving water quality.
- Filter sediment and aid floodplain development.

- Improve floodwater retention and groundwater recharge.
- Develop root masses that stabilize islands and shoreline features against cutting action.
- Restrict water percolation.
- Develop diverse ponding characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, water bird breeding, and other uses.
- Support greater biodiversity.

Each riparian-wetland area has to be judged against its capability and potential.

Table 3.2.5-3, CRVFO Planning Area Lotic PFC Assessment (as of July 2010), Table 3.2.5-4, CRVFO Planning Area Lentic PFC Assessment (as of July 2010), and the Riparian PFC Assessment map (Figure 3.2.5-2, Riparian Proper Functioning Condition Assessment) show the most current results of PFC assessments within the CRVFO. Areas determined to be nonriparian systems are not shown on the tables. Contributing factors for a FAR and NF rating are listed in Table 3.2.5-5, Contributing Factors for FAR-NA, FAR Down, and NF Ratings. The lotic and lentic tables show only those riparian-wetland areas that have had a PFC assessment. The lotic table represents most riparian areas that occur along streams and rivers within the CRVFO planning area. PFC has not been assessed on riparian areas on most springs/seeps within the CRVFO, so there are no data depicted in the tables for these sites. In addition, a PFC assessment has not been conducted on many of the relatively smaller lentic systems that occur within the CRVFO (e.g., Castle Peak area).

Table 3.2.5-3
CRVFO Planning Area Lotic PFC Assessment (as of July 2010)

		Assessment Rating (in Miles)				
Riparian Area Name	**Date Assessed**	**PFC**	**FAR-UP**	**FAR-NA**	**FAR-Down**	**NF**
Abrams Creek Lower	6/4/02	2.0				
Abrams Creek Upper	6/4/02	3.2				
Alamo Creek	4/27/05	2.4				
Alkali Creek#1	5/19/09	0.9				
Alkali Creek#2	7/8/03	2.4				
Alkali Creek#3 Lower	5/14/03	1.7				
Alkali Creek#3 Upper	7/7/03	0.9				
Alkali Creek#4 Lower	5/23/02	1.9				
Alkali Creek#4 Upper	5/23/02			1.0		
Alkali Creek E Branch#3	5/14/03	0.8				
Alkali Creek South Fork	7/8/03	2.0				
Antelope Creek—Lower Reach	5/22/06	0.6				
Antelope Creek—Middle Reach	5/11/06		0.3			
Antelope Creek—Upper Reach	5/10/06	0.5				
Baldy Creek	7/9/09	2.1				
Barbers Gulch	6/21/95	3.2				
Battlement Creek#1	6/24/94	0.2				
Battlement Creek#3	5/2/00	1.4				
Bearwallow Creek	5/18/07	0.6				
Beaver Creek	4/28/04	0.1				
Belodi Creek	5/6/09	0.5				
Big Alkali Creek—Lower Reach	5/26/06	3.5				

Table 3.2.5-3 *(continued)*
CRVFO Planning Area Lotic PFC Assessment (as of July 2010)

Riparian Area Name	Date Assessed	Assessment Rating (in Miles)				
		PFC	FAR-UP	FAR-NA	FAR-Down	NF
Big Alkali Creek—Upper Reaches	6/19/06	5.7				
Bionaz Creek	6/15/95	1.4				
Black Creek	8/8/95	2.1				
Bob Creek	6/30/08	1.2				
Boiler Creek	5/30/07	1.2				
Brook Creek	7/8/09	0.9				
Brush Creek	522/01	3.1				
Butler Creek	5/16/01	0.03				
Butler Creek Lower	5/16/01	1.4				
Butler Creek Upper 1	6/21/01	0.8				
Butler Creek Upper 2	6/21/01	0.1				
Butler Creek Upper 3	6/21/01	0.2				
Cabin Creek Lower Reach	8/10/94			0.01		
Cabin Creek Upper Reach	7/5/95	1.7				
Canyon Creek	5/30/07	1.7				
Castle Creek Lower Reach#1	5/18/06	0.8				
Castle Creek Lower Reach#2	5/18/06	0.8				
Castle Creek Upper Reach	6/21/06		3.0			
Catamount Creek	6/20/06	5.4				
Cattle Creek	5/26/10	1.5				
Cedar Creek	7/5/95	0.9				
Clear Creek	5/20/09	1.5				
Colorado River	5/17/07	1.8				
Colorado River Kamm Mesa Reach	5/5/09	0.6				
Colorado River No Name	5/16/07	1.3				
Colorado River 2A	7/18/03	5.6				
Colorado River#1	5/23/06	15.1				
Colorado River#2	5/4/04	9.2				
Colorado River Dotsero Reach	8/15/08	5.7				
Colorado River Lower Crescent	7/8/04	0.6				
Colorado River Lower Eagles Nest	7/8/04	0.2				
Colorado River Lower Gentry	7/8/04	0.5				
Colorado River Lower Pipeline	7/8/04	0.6				
Corral Creek Upper Reach	5/20/09	0.3				
Cottonwood Creek	6/30/08	3.5				
Cottonwood Creek#1	4/27/04	0.4				
Cottonwood Creek West Fork	4/27/04	0.6				
Deep Creek	8/12/08	4.5				
Derby Creek	8/10/94	0.3				
Dry Creek	4/27/00	4.7				
Dry Fork Cabin Creek	7/5/95			1.4		
Dry Hollow Creek	5/19/09	2.4				
Dry Possum Creek	9/21/07	0.1				
Dry Rifle Creek	5/22/01	1.3				
Eagle River	7/9/02	0.5				
Eagle River Bair Acquisition	8/15/08	0.4				
Eagle River Lower	7/17/03	3.0				
Eagle River Upper	7/17/03	2.8				

Table 3.2.5-3 *(continued)*
CRVFO Planning Area Lotic PFC Assessment (as of July 2010)

		Assessment Rating (in Miles)				
Riparian Area Name	**Date Assessed**	**PFC**	**FAR-UP**	**FAR-NA**	**FAR-Down**	**NF**
East Canyon Creek	5/30/07	2.3				
East Divide Creek Reach#1	5/5/09	0.9				
East Divide Creek Reach#2	5/5/09	0.7				
East Fork Sheep Creek	4/26/05	2.2				
East Mamm Creek	5/19/09	1.2				
East Sopris Creek	5/22/10	0.4				
Eby Creek	7/17/03	1.5				
Egeria Creek	8/10/95	7.7				
Elk Creek	5/11/06	1.7				
Fisher Creek Lower	5/26/10	0.6				
Fisher Creek Upper	5/26/10	1.5				
Fitzpatrick Gulch	7/9/02	0.4				
Fourmile Spring	12/5/03	0.3				
Frost Creek	7/9/02	0.6				
George Creek	6/21/01	1.4				
Goodson Creek	5/11/06	2.0				
Grundell Creek	7/8/01	1.8				
Hack Creek	7/9/08	1.6				
Hardscrabble Gulch	7/8/02	2.4				
Harris Gulch	6/19/01	2.5				
Hernage Creek Lower	6/27/02	0.3				
Hernage Creek Upper	6/21/02	3.6				
Horse Creek Lower	4/20/05	4.1				
Horse Creek Middle	4/26/05	1.7				
Horse Creek Upper	7/10/08	1.2				
Huffman Gulch Creek	6/19/01	0.4				
Irrawaddy Creek Upper Reach	8/13/08	0.4				
June Creek	5/20/09	2.9				
Keyser Creek	5/17/07	0.9				
McHatten Creek	5/23/02				1.5	
Mesa Creek	5/26/10	0.6				
Middle Mamm Creek	5/19/09	0.9				
Middle Rifle Creek	5/16/01	0.1				
Middle Rifle Creek 1	6/26/01	0.9				
Middle Rifle Creek 2	5/22/01	1.3				
Milk Creek N Fork Lower#1	7/14/03	0.7				
Milk Creek N Fork Upper	7/8/03	1.7				
Milk Creek Reach #1	7/15/03	0.8				
Milk Creek Reach #2	7/15/03	0.3				
Milk Creek Reach #3	7/15/03	0.6				
Milk Creek Reach #4	7/8/03	3.2				
Mitchell Creek	5/16/07	0.9				
Monument Gulch	5/2/00		0.8			
Morris Creek	8/13/08	0.5				
Muddy Creek Lower	7/17/03		0.1			
Muddy Creek Upper	7/17/03	0.3				
Neilson Gulch	7/6/95	1.4				
Norman Creek	6/19/06	2.9				

Table 3.2.5-3 *(continued)*
CRVFO Planning Area Lotic PFC Assessment (as of July 2010)

		Assessment Rating (in Miles)				
Riparian Area Name	**Date Assessed**	**PFC**	**FAR-UP**	**FAR-NA**	**FAR-Down**	**NF**
North Fork Dry Rifle Creek	5/22/01	0.5				
North Fork Pete And Bill Creek	5/4/00		0.9			
North Fork Wallace Creek	5/3/00	0.8				
North Thompson Creek Lower Reach	6/20/94	0.6				
North Thompson Creek Upper Reach	6/20/94	1.7				
Oasis Creek	5/31/07	1.8				
Old Mans Gulch	7/8/02	1.0				
Paradise Creek	5/6/09	0.7				
Piceance Creek	5/16/01	0.6				
Piney River	5/11/06	2.0				
Poison Creek	4/27/05	2.9				
Pole Creek	7/8/09	0.6				
Posey Creek Upper	5/5/05	1.6				
Posey Creek Lower	5/6/05	2.6				
Possum Creek Lower	9/21/07	3.0				
Possum Creek Upper	7/31/07	1.1				
Prince Creek	5/25/10	1.2				
Prince Creek Enclosure	5/25/10	0.1				
Red Canyon Creek #2	6/15/95	0.4				
Red Dirt Creek Reach #1	4/27/05	1.4				
Red Dirt Creek Reach #2	8/9/94	0.8				
Riley Gulch Lower	4/16/04				0.9	
Riley Gulch Upper	4/16/04	1.0				
Rock Creek	8/9/94	3.2				
Rube Creek	7/27/95	0.7				
Salt Creek	6/28/02	0.5				
Sawmill Creek	6/21/02	3.8				
Sheep Creek	4/26/05	0.9				
South Canyon Creek	5/6/09	0.3				
Spring Creek Reach #1	6/30/08	0.3				
Spring Creek Reach #2	5/30/02	1.2				
Spruce Creek	6/30/08	1.2				
Spruce Crossing Gulch	5/20/09	1.5				
Starky Gulch South Fork	4/16/04	0.3				
Stifel Creek	5/10/06	1.8				
Stone Quarry Gulch	7/17/95					1.0
Sunnyside Creek	8/6/93	2.1				
Sutton Creek	9/27/02	1.5				
Sweetwater Creek	7/10/08	0.4				
Tepee Creek	5/12/06	2.6				
Third Gulch	6/27/02			2.2		
Thomas Creek	7/22/97	0.8				
Thompson Creek	6/20/94	2.0				
Tom Creek	7/1/08	1.2				
Trail Gulch 3	6/28/02	0.9				
Travis Creek	7/9/02	0.4				
Ute Creek	7/17/03	1.7				
Wallace Creek	5/3/00	1.3				

Table 3.2.5-3 *(continued)*
CRVFO Planning Area Lotic PFC Assessment (as of July 2010)

Riparian Area Name	Date Assessed	Assessment Rating (in Miles)				
		PFC	FAR-UP	FAR-NA	FAR-Down	NF
West Coulter Creek	6/30/10	2.0				
West Fork Sheep Creek	7/9/08	2.7				
West Mamm Creek	7/8/09	0.3				
West Rifle Creek	5/16/01	0.1				
West Sopris Creek	5/25/10	1.4				
Wheatley Gulch	6/15/95	0.9				
Willow Creek	5/4/05	3.5				
Totals		**263**	**5**	**5**	**2**	**1**

Source: BLM 2007j

Table 3.2.5-4
CRVFO Planning Area Lentic PFC Assessment (as of July 2010)

Riparian Area Name	Date Assessed	Assessment Rating (in Acres)				
		PFC	FAR-UP	FAR-NA	FAR-Down	NF
Blue Lake	7/8/03	9.0				
Castle Creek Ponds	6/21/06	2.4				
Consolidated Reservoir	6/30/10	5.9				
Domantle Lake	7/26/06	2.0				
Edges Lake	6/19/06	0.3				
Fravert Reservoir	5/23/01	2.0				
Grimes Brooks Reservoir	8/9/95	5.0				
Hack Lake	7/8/08	0.6				
Horse Creek Wetlands	7/18/08	19.0				
Horse Lake	7/8/08	0.1				
Picture Lake	7/7/03	7.0				
Totals		**53**	**0**	**0**	**0**	**0**

Source: BLM 2007j

Table 3.2.5-5
Contributing Factors for FAR-NA, FAR Down, and NF Ratings

Riparian Area Name	Causal Factor(s)
Alkali Creek #4 Upper	Drought and soils (gypsum land-gypsumsiorthids complex) produce sparse vegetation coverage in uplands adjacent to streams and causing some reduction in the amount of riparian vegetation.
Cabin Creek Lower Reach	Woody vegetation is insufficient to stabilize stream banks. Cause unknown.
Dry Fork Cabin Creek	Livestock grazing and washed out beaver dams reduced riparian vegetation and resulted in a vertically unstable system.
McHatten Creek	Heavy livestock grazing and trampling have reduced riparian vegetation cover. Convective storms, livestock, and big game use in uplands have also resulted in excessive erosion.
Riley Gulch Lower	Road encroachment has increased sediment deposition.
Stone Quarry Gulch	Amount and cover of riparian vegetation is insufficient due to lack of flow.
Third Gulch	Heavy livestock trampling and grazing in places has caused some reduction in the amount of riparian vegetation.

Source: BLM 2007j

Vegetation—Weeds

Controlling the rapid spread of invasive species and noxious weeds has become a priority for land managers. Appendix M includes the Colorado Noxious Weed List, which is separated into three categories: List A includes those species in Colorado that are designated by the Commissioner of the Colorado Department of Agriculture for eradication, List B includes those species for which a state noxious weed management plan is or will be developed and implemented to stop the continued spread, and List C includes those species that build from the goals of List B species, and for which additional education, research, and biological control will be provided to jurisdictions that choose to require management. Table 3.2.5-6, Garfield, Eagle, Pitkin, Routt, Mesa, and Rio Blanco Counties Noxious Weed Species, displays which of these species occur within the CRVFO planning area.

Table 3.2.5-6
Garfield, Eagle, Pitkin, Routt, Mesa, and Rio Blanco Counties Noxious Weed Species

Common Name	Scientific Name	State List Designation
Absinth wormwood	*Artemisia absinthium*	B
Black henbane	*Hyoscyamus niger*	B
Bouncingbet	*Saponaria officinalis*	B
Canada thistle	*Cirsium arvense*	B
Chamomile, scentless	*Matricaria perforate*	B
Chicory	*Cichorium intybus*	C
Common burdock	*Arctium minus*	C
Common mullein	*Verbascum Thapsus*	C
Common teasel	*Dipsacus fullonum*	B
Cutleaf teasel	*D. laciniatus*	B
Downy brome	*Bromus tectorum*	C
Field bindweed	*Convolvulus arvensis*	C
Hoary cress (whitetop)	*Cardaria draba*	B
Halogeton	*Halogeton glomeratus*	C
Houndstongue	*Cynoglossum officinale*	B
Jointed goatgrass	*Aegilops cylindrical*	B
Knapweed, diffuse	*Centaurea diffusa*	B
Knapweed, Russian	*Acroptilon repens*	B
Knapweed, spotted	*Centaurea maculosa*	B
Leafy spurge	*Euphorbia esula*	B
Musk thistle	*Carduus nutans*	B
Myrtle spurge	*Euphorbia myrsinites*	A
Orange hawkweed	*Hieracium aurantiacum*	A
Oxeye daisy	*Chrysanthemum leucanthemum*	B
Poison hemlock	*Conium maculatum*	C
Scotch thistle	*Onopordum acanthium*	B
Sulfur cinquefoil	*Potentilla recta*	B
Toadflax, Dalmatian	*Linaria genistifolia*	B
Toadflax, yellow	*L. vulgaris*	B
Yellow starthistle	*Centaurea solstitialis*	A
Bull thistle	*Cirsium vulgare*	B
Chamomile, corn	*Anthemis arvensis*	B
Dame's rocket	*Hesperis matronalis*	B
Dyer's woad	*Isatis tinctoria*	A

Table 3.2.5-6 *(continued)*
Garfield, Eagle, Pitkin, Routt, Mesa, and Rio Blanco Counties Noxious Weed Species

Common Name	Scientific Name	State List Designation
Russian olive	*Elaeagnus angustifolia*	B
Salt cedar	*Tamarix chinensis*	B
Wild caraway	*Carum carvi*	B
Chinese clematis	*Clematis orientalis*	A
Common tansy	*Tanacetum vulgare*	A
Knapweed, meadow	*Centaurea pratensis*	A
Perennial pepperweed	*Lepidium latifolium*	B
Plumeless thistle	*Carduus acanthoides*	B
Purple loosestrife	*Lythrum salicaria*	A
Quackgrass	*Elytrigia repens*	B

Source: Colorado Department of Agriculture Undated

The Noxious Weed Control and Eradication Act of 2004 requires the Secretary of Agriculture to provide assistance to eligible weed management entities in their attempts to control or eradicate noxious weeds on public and private land. In order to improve weed management capabilities within the planning area, the CRVFO has cooperative agreements with Garfield and Eagle Counties and an assistance agreement with the White River National Forest.

The CRVFO and its partners began targeting tamarisk treatment 5 years ago, and the control and elimination of tamarisk is an ongoing priority for CRVFO weed management. Approximately 60 acres of tamarisk have been treated. A Noxious and Invasive Weed Management Plan for Oil and Gas Operators (BLM 2007c) was adopted in 2007 to address the potential for weeds to increase due to the amount of surface disturbed by oil and gas development. Efficiency and effectiveness of weed management efforts could be significantly improved with a full-time Field Office Weed Coordinator and seasonal staff.

Characterization

Indicators

Forests and Woodlands

Forests and woodlands conditions will be assessed based on health (insect and disease affected areas by vegetation type), encroachment (conifers proliferating in aspen stands), invasion of non-native species, and density and decadence.

Rangelands

In the past decade, the CRVFO's primary means of assessing the current condition of the vegetation communities within the RMP planning area has involved using the LHA process. This process involves a checklist of biotic, abiotic, and hydrologic indicators to determine whether the public land health standards are being met. The indicators associated with Standard 3 for healthy plant and animal communities are as follows:

- Noxious weeds and undesirable species are minimal in the overall plant community.

- Native plant and animal communities are spatially distributed across the landscape with a density, composition, and frequency of species suitable to ensure reproductive capability and sustainability.
- Plants and animals are present in mixed-age classes sufficient to sustain recruitment and mortality fluctuations.
- Landscapes exhibit connectivity of habitat or presence of corridors to prevent habitat fragmentation.
- Photosynthetic activity is evident throughout the growing season.
- Diversity and density of plant and animal species are in balance with habitat/landscape potential and exhibit resilience to human activities.
- Appropriate plant litter accumulates and is evenly distributed across the landscape.
- Landscapes are composed of several plant communities that may be in a variety of successional stages and patterns.

Riparian Areas and Wetlands

Riparian-wetland areas are subject to Land Health Standard 2. Indicators that relate to this standard are as follows:

- Vegetation is dominated by an appropriate mix of native or desirable introduced species.
- Vigorous desirable plants are present.
- There is vegetation with diverse age-class structure, appropriate vertical structure, and adequate composition, cover, and density.
- Streambank vegetation is present and is composed of species and communities that have root systems capable of withstanding high streamflows.
- Plant species indicate maintenance of riparian moisture characteristics.
- Stream is in balance with the water and sediment being supplied by the watershed (e.g., no headcutting, excessive erosion, or deposition).
- Vegetation and free water indicate high water tables.
- Vegetation colonizes point bars with a range of age classes and successional stages.
- An active floodplain is present.
- Residual floodplain vegetation is available to capture and retain sediment and dissipate flood energies.
- Stream channels have appropriate size and meander patterns for the streams' position in the landscape and parent material.
- Woody debris contributes to the character of the stream morphology.

Weeds

Indicators of weed invasion and potential are the same as those used to assess the health of rangeland communities, since rangeland health is proportional to the extent and potential for weed invasion. Generally, the greater the diversity and cover of rangeland vegetation, and the lower the amount of surface disturbance and human presence, the lower the potential for weed invasion and spread.

Trends

Forest and Woodlands

Past decisions regarding forest and woodland vegetation management in the CRVFO emphasized such commodities as wood products and grazing production. Vegetation management policy on federal lands has changed, emphasizing forest health and hazardous fuel reduction. The National Fire Plan and the Healthy Forests Restoration Act guide much of the current forest management. The National Fire Plan established an intensive, long-term hazardous fuels reduction program and provisions to hasten hazardous fuel reduction. Forest-restoration projects are provided in the Healthy Forests Restoration Act. The Healthy Forests Restoration Act also emphasizes retaining larger trees and removing smaller diameter (ingrowth) trees to promote healthy, more fire-, insect-, and disease-resistant forests. Guidance is also provided by the BLM Vegetation Treatments Using Herbicides Programmatic Environmental Impact Statement (EIS) of 2007 (BLM 2007i), that directs the use of herbicides on BLM lands.

Fire suppression, past management, and climatic conditions, such as drought, have led to a decline in forest health. Many lodgepole, Douglas-fir, and spruce/fir forest communities are mature, dense, even-aged stands. High stand density magnifies competition among species and decreases tree vigor and productivity. Low vigor stands are more susceptible to insect and disease infestation, including mountain pine beetle. Large-scale mountain pine beetle infestations occur in portions of the CRVFO and are expected to continue unless forest management practices or disturbance decrease stand density and encourage multiage communities. Because the stands are dense and overmature, there is an increasing threat of large wildfires that would consume large areas of forest and leave the soils vulnerable to erosion.

Pinyon-juniper woodland communities also have experienced increased stand and canopy cover density. Overstocked stands have low vigor and a sparse understory component, increasing the likelihood of insect, disease, and non-native plant infestation. This trend will continue unless management practices or disturbance reduce stand density. Over the past 8 years, the CRVFO has treated an average of 6,866 acres of pinyon-juniper to improve stand health and to reduce hazardous fuel buildup in these communities. However, more needs to be done to improve community condition and to reduce the threat of wildland fire.

Vegetation communities in the CRVFO exist as a mosaic of different communities, with varying structure and age classes. The heterogeneous landscape limits the size and extent of any one vegetation community, and also limits the habitat suitable for infestation and spread of insects and disease. As a result, mountain pine beetle and pinyon ips beetle (*Ips confusus*), while present in the CRVFO, have not become large-scale outbreaks; rather, they have remained relatively localized, affecting a few individuals and not infesting entire stands. However, in the absence of vegetation management, such as thinning and prescribed fire, the potential for large-scale insect and disease outbreaks will increase.

Rangeland

Vegetation management objectives from the 1984 Glenwood Springs RMP (BLM 1984a) were limited to only providing adequate forage production for active livestock preference and CDOW's big game population goals and improving wildlife habitat conditions. Range management actions have focused on conducting vegetation treatments to improve age-class diversity and forage production, and on providing additional water sources to improve grazing distribution. Improving rangeland health was identified as a planning issue (Section 1.5.3). Range management would include a focus on supporting domestic animals as well as wildlife and plant communities and their habitat. Priority species to be considered include greater sage-grouse, elk, and federally

listed, proposed and candidate plants. Specifically, managing sagebrush communities for sage-grouse and sagebrush obligate species was identified as a preliminary planning issue. Habitat conversion, invasion by non-native and noxious species, and recreation use are increasing the need to designate land uses that would conserve sagebrush habitat and the species that depend on it.

The land health assessment process has been used to identify areas not meeting land health standards and the primary factors contributing to those conditions. Indicators of poor or declining rangeland health conditions were decadent sagebrush with low cover and species; diversity of perennial grasses, forbs, and biological soil crusts; increases in cheatgrass and other invasive species; monocultures of crested wheatgrass (*Agropyron cristatum*); and pinyon-juniper encroachment. Reasons for failing to meet the standards are as follows:

- Overgrazing or overbrowsing – current or historic – contributed to reductions in cover of herbaceous plants or shrubs, loss of palatable perennial grasses and forbs, loss of native plants, increase in noxious weeds such as cheatgrass, and encroachment of pinyon-juniper trees.
- Lack of fire—Increase in density and cover of sagebrush, sometimes leading to reduction in cover of grasses and forbs, encroachment of pinyon-juniper trees.
- Drought—Reduced vigor of vegetation, some mortality, some reduction in recruitment of young plants.
- OHV and other human recreation use—Destruction of vegetation, habitat fragmentation, introduction of noxious weeds.
- Natural gas development and right-of-ways (ROWs)—Direct loss of vegetation, change in species composition to early seral stage, introduction of noxious weeds and other undesirable, aggressive, non-native grasses, habitat fragmentation.
- Grazing—Heavy livestock grazing, combined with heavy big game winter use on some sagebrush and salt desert shrub communities, resulting in poor vegetation vigor, decadent sagebrush with poor recruitment, and reduction of native perennial grasses and forbs.
- Development of private lands—Physical loss of habitats on private lands due to development, thus reducing the connectivity and continuity of habitat on BLM lands.

If current livestock grazing was identified as a significant factor for not achieving or moving toward achieving the standards, management actions were implemented in coordination with the permittees and interested public. Actions taken have included changing the season or length of grazing use, implementing vegetation treatments, and developing additional water sources.

The BLM can contribute toward improving the trends discussed above by monitoring and controlling livestock use of allotments to sustain vegetation health, monitoring and regulating recreational uses, implementing and enforcing closure to fluid minerals leasing and other uses of BLM land, and identifying habitat problems related to unbalanced animal populations and working with the appropriate managing agency to resolve them.

In addition, it is important that the energy industry become a partner in BLM's efforts to maintain land health. This may require new and innovative approaches to developing natural gas and oil shale resources. It will require more focus on implementing best management practices (BMPs) in the construction of natural gas

facilities and associated ROWs and greater monitoring of reclamation results and adaptive management to respond appropriately when desired outcomes are not being achieved.

Increased knowledge of the vital role of fire in many ecosystems may contribute to changes in the use and management of fire aimed at returning a more normal fire regime, which may assist in sustaining the health of vegetation communities on BLM lands.

In order to meet the objectives of improving upland health and habitat for sage-grouse and big game species, and to reduce hazardous fuels, particularly in the WUI, the CRVFO has been implementing the following vegetation treatment projects: selective removal of pinyon pine and Utah juniper trees in sagebrush communities, brushbeating of sagebrush and oakbrush communities, seeding with grasses and forbs, mechanical thinning of pinyon-juniper woodlands, and prescribed fire. For the past 3 to 5 years, the BLM has treated approximately 300 to 400 acres a year.

Following wildfire, rehabilitation projects are implemented when deemed necessary to protect soils from erosion or to restore a healthy plant community. The CRVFO has had several large fires (greater than 1,000 acres) and some smaller fires (10 to 1,000 acres) in the past 15 years. Most of these fires were rehabilitated with one or more of the following treatment methods: broadcast seeding with grasses or forbs, application of straw bales or mulch, ripping and seeding of dozer lines, and weed monitoring and control. Success of fire rehabilitation efforts has varied, with generally better success in more mesic areas and poorer results in more arid environments. Some past fire sites in arid landscapes are now dominated by cheatgrass.

Riparian

Generally, the conditions of riparian areas and wetlands within the CRVFO planning area have improved over time. This is based on PFC assessment data, monitoring, and field observations.

Current data from Table 3.2.5-3, CRVFO Planning Area Lotic PFC Assessment, show 96 percent of lotic systems are at PFC or FAR-UP. This demonstrates that the land health standard is being met or moving in that direction for 96 percent of the lotic systems within the RMP planning area. For lentic systems, 100 percent of acres assessed are currently in PFC. This has changed little from initial assessments, but it does demonstrate that all lentic systems assessed to date are at PFC and are meeting the land health standard for riparian systems.

The CRVFO began to focus more on riparian area and wetlands management after the issuance of BLM Riparian Area Management Policy and the subsequent release of the Riparian-Wetland Initiative for the 1990s (BLM 1991b). These documents provided policy, strategies, and goals for the management of riparian areas and wetlands on BLM lands. Soon after the release of Technical Reference 1737-9, Riparian Area Management: Process for Assessing Proper Functioning Condition of Riparian-Wetland Areas (BLM 1993a), the CRVFO began an aggressive effort to complete PFC assessments. The results of these inventories focused management attention on those areas identified as NF, FAR-DOWN, and FAR-NA, and actions were implemented to improve areas in these categories.

Improved grazing management that has occurred over time has probably been one of the biggest factors driving improved conditions of riparian areas. There are still documented instances where livestock grazing is a factor preventing improved conditions of riparian-wetland areas, although these cases are now fairly isolated.

Weeds

A proactive weed management program would involve inventorying, coordinating weed control efforts, monitoring effectiveness of treatments, developing partnerships, obtaining federal funds, and initiating public outreach. The CRVFO and its partners have treated approximately 300 acres of noxious weeds per year excluding the oil and gas development areas. Weed treatments conducted by the oil and gas operators have increased markedly in the past several years, partly due to the dramatic increase in surface disturbances associated with oil and gas development (and a resulting increase in weeds becoming established). In addition, a Noxious and Invasive Weed Management Plan for Oil and Gas Operators (BLM 2007c) was adopted in 2007 to address the potential for weeds to increase due to the amount of surface disturbed by oil and gas development.

3.2.6 Fish and Wildlife

The BLM is responsible for managing habitats for fish and wildlife communities but is not directly responsible for managing fish and wildlife populations. Responsibility for direct population management instead belongs to USFWS and the CDOW. Therefore, the BLM is indirectly responsible for the health and well being of fish and wildlife populations that are supported by the habitats provided by the BLM lands under its purview. The BLM works cooperatively with the CDOW to manage wildlife habitats on BLM lands. The CDOW manages several species for economic values. In addition, the BLM is mandated to ensure that special status species are protected by virtue of the Endangered Species Act (ESA) and the BLM Land Use Planning Handbook (BLM 2005a). This goal is furthered through a memorandum of agreement with USFWS and the US Forest Service.

One method the BLM uses to measure the health of the land that it manages is through land health assessments. These assessments follow several standards that the BLM developed in response to public concern about livestock grazing management on western BLM lands. This concern prompted the BLM to develop new regulations for administration of livestock grazing. This process, which involved preparation of an EIS and extensive public involvement, resulted in new livestock regulations that became effective on August 21, 1995. One of the requirements of the regulations was that each BLM state director would, in consultation with the resource advisory councils in that state, develop standards for public land health and guidelines for livestock grazing management. The Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado were approved by the Secretary of the Interior on February 3, 1997 (BLM 1997a). These standards are listed in Appendix J.

Another method used to evaluate habitat is PFC on streams and water bodies. Information on the condition of these riparian areas and wetlands is available from PFC assessments that have been conducted since 1993. Many of these PFCs have been conducted as part of land health assessments on various landscapes within the CRVFO. The PFC assessment approach is discussed in Section 3.2.5, Vegetation.

Current Conditions

Fish and Aquatic Wildlife

Coldwater Sportfish and Native Fish

Higher-elevation waters (generally above 5,200 feet) of the CRVFO planning area support coldwater sport fishes, consisting primarily of rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), cutthroat trout (*Oncorhynchus clarki*), and Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*). Cutthroat trout in the planning area include hatchery-raised non-native subspecies as well as two subspecies native to Colorado: the Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) and the greenback cutthroat trout (*O. c. somias*). Greenback cutthroat trout is the subspecies native to eastern slope of Colorado (the South Platte and Arkansas Rivers) and a portion of the North Platte River in Colorado and Wyoming. Its presence on the western slope may reflect previous use of eastern slope fishes for stocking onto the western slope, or imprecise knowledge of cutthroat trout genetics. Other coldwater species include two non-native salmonids (trout and salmon)—the lake trout (*Salvelinus namaycush*) and kokanee salmon (*Oncorhynchus nerka*)—and coldwater non-native fishes. The last group include the mottled sculpin (*Cottus bairdi*), Paiute sculpin (*C. beldingii*), speckled dace (*Rhinichthys osculus*), mountain whitefish (*Prosopium williamsoni*), and mountain sucker (*Catostomus platyrhynchus*).

Waters generally below 6,500 feet support primarily cool water and warm water fishes, including introduced non-native species such as common carp (*Cyprinus carpio*), channel catfish (*Ictalurus punctatus*), yellow perch (*Perca flavescens*), walleye (*Sander vitreus*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), crappie (*Pomoxis* sp.), and bluegill (*Lepomis macrochirus*). Special status fishes in the planning area include the razorback sucker (*Xyrauchen texanus*), flannelmouth sucker (*Catostomus latipinnis*), bluehead sucker (*Catostomus discobolus*), Colorado pikeminnow (*Ptychocheilus lucius*), and roundtail chub (*Gila robusta*). Suitable habitat for two additional native warmwater native fishes, the humpback chub (*Gila cypha*) and bonytail (*G. elegans*), is not present within the planning area. Special status species are discussed in detail in Section 3.2.7, Special Status Species. Fish species of primary interest in the CRVFO planning area are listed in Table 3.2.6-1.

Table 3.2.6-1
Fish and Aquatic Wildlife Species of Primary Interest in CRVFO Planning Area

Grouping	Example Species	Rationale for Priority Designation
Coldwater sport fish	Brown trout, rainbow trout, brook trout, and cutthroat trout	Economic and recreational value
Warmwater sport fish	Yellow perch, largemouth bass, smallmouth bass, northern pike, and walleye	Economic and recreational value
Federally listed species	Greenback cutthroat trout, razorback sucker, and Colorado pikeminnow	Federally listed as threatened/endangered
BLM Sensitive Species	Colorado River cutthroat trout, bluehead sucker, flannelmouth sucker, and roundtail chub	Species designated by the BLM as sensitive
Amphibians	Boreal toad, Great Basin spadefoot toad, and northern leopard frog	High interest, BLM sensitive species, or federally listed, proposed, or candidate

Source: BLM 2007j

Invasive/Non-native/Competitive Fish

The brook trout, brown trout, rainbow trout, white sucker (*Catostomus commersonii*), and long-nose sucker (*Catostomus catostomus*), and, in some situations, the non-native perch and bass species listed above, are considered invasive, non-native, or competitive species in the CRVFO planning area. The three trout species are all coldwater species valued as highly sought after recreational sport fishes, while the suckers occur at varying elevations.

Amphibians

Habitat for the boreal toad (*Bufo boreas boreas*), a BLM sensitive species and federal candidate species, is located in the highest (subalpine) elevations of the CRVFO planning area, from 8,500 to 11,500 feet. Boreal toads occur primarily in beaver ponds, glacial (kettle) ponds, wet meadows, and lake or stream margins. Another amphibian of high elevations (7,900 to 9,800 feet), the wood frog (*Rana sylvatica*) is found in habitats similar to those of the boreal toad. Other amphibians of special interest include the northern leopard frog (*Rana pipiens*), a federal candidate species that occurs in well-vegetated perennial ponds and slow-flowing steams with good water quality in middle elevations, and the Great Basin spadefoot toad (*Spea intermontana*), a species living in seasonal pools and slow-flowing streams in the lowest elevations of the planning area (CRVFO only). As special status species, these high-interest amphibians are discussed further in Section 3.2.7.

Three additional amphibian species that are present in the CRVFO area but generally of less concern (due to wider ecological tolerances) are Woodhouse's toad (*Bufo woodhousii*), northern chorus frog (*Pseudacris triseriata*),

and tiger salamander (*Ambystoma tigrinum*). The toad is present in ponds and slow-flowing streams, including seasonal waters, at lower elevations. The chorus frog is found primarily in wetland marshes and pond margins, also including seasonal waters, and across a wide elevational range. The salamander occurs in both natural and human-built ponds, including stock watering ponds, through virtually the entire elevational range of BLM lands in the CRVFO area. Although of less concern than the amphibians listed previously, these species are nonetheless vulnerable to impacts from management actions and land uses due to being closely tied to suitable waters for breeding and overwinter survival.

Aquatic Habitats

Aquatic habitats in the CRVFO planning area consist of both lentic systems (ponds and lakes) and lotic systems (streams and rivers). Not all of the perennial aquatic habitats support fish, but most of the perennial waters support a diverse assemblage of aquatic insects. BLM activities influence approximately 1,050 miles of fish-bearing streams, approximately 300 miles of which are directly managed by BLM. The remaining 750 miles are managed by private landowners or other federal and state agencies, but are influenced by BLM management activities upstream or upslope. In addition, approximately 1,971 acres of lakes within the CRVFO planning area provide potential habitat for various species of fish. Approximately 24 species of fish are known to occur within the streams, rivers, lakes, and reservoirs of the CRVFO planning area. Critical habitat for two federally listed endangered fish species, the razorback sucker and Colorado pikeminnow, is designated in the section of the Colorado River in the southwestern portion of the CRVFO planning area. These species are discussed in Section 3.2.7, Special Status Species.

The aquatic species discussed above characterize the fisheries (Figure 3.2.6-1, Fisheries) and amphibian resources of the CRVFO planning area and emphasize taxa that are of most importance to the BLM in its land management, either because they are species with recreational value (sport fish), or species that occur in concentrated areas where they might be vulnerable to impacts, or special status species. The fisheries maps show the areas that have been evaluated for PFC and the general watersheds in the area. The special status species listed in Table 3.2.6-2, Fish and Aquatic Wildlife Species of Primary Interest in CRVFO Planning Area, are discussed in Section 3.2.7, Special Status Species.

The current aquatic habitat conditions for assessed portions of the CRVFO are summarized in the Final Analysis of the Management Situation, Glenwood Springs Field Office (BLM 2007k).

In summary, most aquatic systems managed by the BLM within the CRVFO are considered in good condition according to the Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado. Site specific portions of some streams are in a less than desirable condition that results from a variety of factors. These factors are overuse of streamside vegetation by terrestrial animals in search of drinking water and succulent forage, natural geological features, reduced seasonal flows caused by irrigation and other water rights uses, limited aquatic habitat potential, and road building and other ground-disturbing activities that increase sediment loads transported off-site. Where stream habitats are degraded, negative effects are considered to be physical damage to the stream bank and instream habitat, siltation of important microhabitats, diminished water quality, elevated levels of organic compounds, loss of streamside shading and thermal cover, and diminished oxygen levels. For additional detail regarding aquatic species and their habitats within the planning area, please refer to the Analysis of Management Situation (AMS).

Table 3.2.6-2
Wildlife Species of Primary Interest in the CRVFO Planning Area

Species	Rationale for Priority Designation
BIRDS	
Ducks, geese, and other waterfowl	Economic and recreational value
Great blue heron (*Ardea herodias*)	Concentrated nesting areas, protected by MBTA
Bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*)	High interest, apex predators, BLM sensitive species, protected by MBTA and BGEPA
Other raptors: osprey (*Pandion haliaetus*), peregrine falcon (*Falco peregrinus*), prairie falcon (*Falco mexicanus*), and ferruginous hawk (*Buteo regalis*).	High interest, apex predators, BLM sensitive species, and protected by MBTA
Greater sage-grouse (*Centrocercus urophasianus*)	High interest, economic and recreational value; candidate for Endangered Species Act protection
Upland gamebirds	High interest, economic and recreational value
Migratory birds (including Neotropical migrants and cavity-nesting species)	High interest, protected by MBTA
MAMMALS	
Bats	High interest, special status species
White-tailed prairie dog (*Cynomys leucurus*)	High interest; association with federally listed black-footed ferret
Bighorn sheep (*Ovis canadensis*)	High economic and recreational value
Rocky Mountain elk (*Cervus elaphus*)	High interest, economic and recreational value
Moose (*Alces americanus*)	High interest, economic, and recreational value
Mule deer (*Odocoileus hemionus*)	High economic and recreational value
Pronghorn (*Antilocapra americana*)	High economic and recreational value
Black bear (*Ursus americanus*)	High interest, economic and recreational value
Canada lynx (*Lynx canadensis*)	High interest, federally listed as threatened
Mountain lion (*Puma concolor*)	High interest, economic and recreational value

Source: BLM 2007j

Wildlife

Wildlife in the CRVFO includes priority terrestrial wildlife species, certain species of reptiles, birds, and mammals. (Amphibians are included under aquatic wildlife due to aquatic larvae and close association of adults to aquatic sites.) Terrestrial invertebrates are considered to have adequate populations when populations of the vertebrate species that prey on invertebrates are healthy. Information on the distribution of these species is provided by land health assessments, the Rocky Mountain Bird Observatory, CNHP, and GIS data maintained by CDOW. In addition, the CDOW maintains statistics on big game harvests, recreational use days, and population trends. Wildlife species of high interest in the CRVFO planning area are listed in Table 3.2.6-2, Wildlife Species of Primary Interest in CRVFO Planning Area. Note that most native species, excluding some waterfowl and upland gamebirds, are protected by the Migratory Bird Treaty Act (MBTA). The bald eagle and golden eagle are also protected by the Bald and Golden Eagle Protection Act (BGEPA).

Reptiles

Several species of reptile occur within the CRVFO planning area, mostly in lower elevations and in dryer habitats, such as semidesert shrub, sagebrush, and pinyon-juniper. Thus, species diversity of reptiles is higher in the drier western portion of the CRVFO planning area. Species that occur include lizards such as the collared lizard (*Crotaphytus collaris*), short-horned lizard (*Phrynosoma hernandesi*), sagebrush lizard (*Sceloporus graciosus*), plateau lizard (*S. undulatus*), tree lizard (*Urosaurus ornatus*), plateau striped whiptail (*Cnemidophorus*

velox), and snakes such as the racer (*Coluber constrictor*), gopher snake or bull snake (*Pituophis catenifer*), midget faded rattlesnake (*Crotalus oreganus concolor*) (a subspecies of the western rattlesnake), milk snake (*Lampropeltis triangulum*), smooth green snake (*Liochlorophis vernalis*), and western terrestrial garter snake (*Thamnophis elegans*).

Waterbirds

Numerous streams, rivers, reservoirs, ponds, and associated riparian vegetation provide excellent habitat for a wide variety of waterfowl and shorebirds. Waterfowl commonly nesting in the CRVFO area include the Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), gadwall (*A. strepera*), American wigeon (*A. americana*), blue-winged teal (*A. discors*), cinnamon teal (*A. cyanoptera*), and green-winged teal (*A. crecca*). All but the Canada goose and mallard primarily nest in ponds and lake margins rather than river margins. These two species nest in virtually all types of aquatic habitats. A variety of other waterfowl occur during migrations, including diving ducks such as the lesser scaup (*Aythya affinis*) and Barrow's goldeneye (*Bucephala islandica*), both of which nest in Garfield County, and American white pelican (*Pelicanus erythrorhynchos*).

A large wading bird, the great blue heron, nests and hunts for fish in cottonwood habitats along rivers and major tributaries. A variety of shorebirds pass through during migration, when they may stay briefly along the edges of streams and ponds in search of food. One of these, the white-faced ibis (*Plegadis chihi*), is a BLM sensitive species (see Section 3.2.7).

Grouse, Turkeys, and Chukars

Common upland gamebirds include the dusky grouse (*Dendragapus obscurus*) and wild turkey (*Melagris gallopavo*) in addition to the greater sage-grouse (*Centrocercus urophasianus*), a special status species discussed in detail in Section 3.2.7. Greater sage-grouse are present and continue to occupy sagebrush shrublands north of the Eagle and Colorado Rivers. While sage-grouse numbers are low in the CRVFO, the remaining occupied locations need to be considered for management protections. Dusky grouse are widely distributed throughout higher elevation conifer/aspen woodlands. Five subspecies of wild turkeys occur in the United States; the one in the CRVFO area is Merriam's turkey (*M. g. merriami*). Wild turkeys use a variety of habitats, including riparian areas, mixed mountain shrub, and pinyon-juniper woodlands. Turkeys have been transplanted into a variety of habitats in the CRVFO and utilize the valley bottomlands planning area. Small flocks of a non-native gamebird, the chukar (*Alectoris chukar*), can sometimes be found in the drier western portion of the CRVFO area, particularly in the rocky canyons north of Interstate70.

Migratory Birds

The term "migratory birds" applies generally to native bird species protected by the Migratory Bird Treaty Act (MBTA). This includes passerines (songbirds) as well as birds of prey and most other native species. For most migrant and native resident species, nesting habitat is of special importance because it is critical for supporting reproduction in terms of both nesting sites and food. In addition, because birds are generally territorial during the nesting season, their ability to access and use sufficient food is limited by the quality of the territory occupied.

Among the wide variety of species protected by the MBTA, special concern is usually given to the following groups:

- Species that migrate across long distances, particularly Neotropical migrant passerines (species that breed in North America and over-winter in Central and South America).

- Birds of prey, which require large areas of suitable habitat for finding sufficient prey.
- Species that have narrow habitat tolerances and hence are vulnerable to extirpation from an area as a result of a relatively minor habitat loss.
- Species that nest colonially and hence are vulnerable to extirpation from an area as a result of minor habitat loss.

Because of the many species that fall within one or more of these groups, BLM focuses on species identified by the USFWS as Birds of Conservation Concern (BCC). The current BCC list (USFWS 2008a) for Region 16 (Southern Rockies/Colorado Plateau) includes 10 species potentially present in or near the CRVFO planning area: bald eagle, golden eagle, flammulated owl, yellow-billed cuckoo, Lewis's woodpecker (*Melanerpes lewis*), willow flycatcher (*Empidonax traillii*), gray vireo (*Vireo vicinior*), pinyon jay (*Gymnorhinus cyanocephalus*), juniper titmouse (*Baeolophus griseus*), Brewer's sparrow (*Spizella breweri*), and Cassin's finch (*Carpodacus cassinii*). Of these, the bald eagle, flammulated owl, yellow-billed cuckoo, and Lewis's woodpecker also have special status as BLM or USFS sensitive species or as candidate threatened or endangered species, and are hence discussed in the Section 3.2.7, Special Status Species.

Mixed conifer (spruce-fir) habitats at the higher elevations of the CRVFO planning area support a variety of subalpine species, including Neotropical migrants such as the broad-tailed hummingbird (*Selasphorus platycercus*), olive-sided flycatcher (*Contopus cooperi*), Hammond's flycatcher (*Empidonax hammondii*), plumbeous vireo (*Vireo plumbeus*), ruby-crowned kinglet (*Regulus calendula*), hermit thrush (*Catharus guttatus*), western tanager (*Piranga ludoviciana*), yellow-rumped warbler (*Dendroica coronata*), chipping sparrow (*Spizella passerina*), dark-eyed junco (*Junco hyemalis*), and pine siskin (*Spinus pinus*), in addition to Cassin's finch.

Stands of quaking aspen attract additional Neotropical migrants such as the cordilleran flycatcher (*Empidonax difficilis*), western wood-pewee (*Contopus sordidulus*), tree swallow (*Tachycineta bicolor*), violet-green swallow (*Tachycineta thalassina*), house wren (*Troglodytes aedon*), warbling vireo (*Vireo gilvus*), and orange-crowned warbler (*Oreothlypis celata*).

Migratory birds commonly associated with oakbrush at middle elevations of the CRVFO planning area include Neotropical migrants such as the dusky flycatcher (*Empidonax oberholseri*), Virginia's warbler (*Oreothlypis vierginiae*), orange-crowned warbler, MacGillivray's warbler (*Oporornis tolmiei*), lazuli bunting *Passerina amoena*), lesser goldfinch (*Spinuss psaltria*), black-headed grosbeak (*Pheucticus melanocephalus*), and spotted towhee (*Pipilo maculata*).

Riparian woodlands and shrublands support Neotropical migrants such as Swainson's thrush (*Catharus ustulata*), Wilson's warbler (*Wilsonia pusilla*), and the fox sparrow (*Passerculus iliaca*) at higher elevations, and the Bullock's oriole (*Icterus bullockii*), yellow warbler (*Dendroica petechia*), house wren, and song sparrow (*Melospiza melodia*) at middle and lower elevations.

Pinyon-juniper woodlands at lower elevations provide habitat for BCC species such as the pinyon jay and juniper titmouse (*Baeolophus griseus*). Other species associated with this habitat type include Neotropical migrants such as the broad-tailed hummingbird (*Selasphorus platycercus*), western kingbird (*Tyrannus verticalis*), Say's phoebe (*Sayornis saya*), gray flycatcher (*Empidonax oberholseri*), mountain bluebird (*Sialia sialis*), plumbeous vireo (*Vireo plumbeus*), black-throated gray warbler (*Dendroica nigrescens*), chipping sparrow (*Spizella passerina*), lark sparrow (*Chondestes grammacus*), and lesser goldfinch.

Sagebrush and other low-elevation semidesert shrublands provide habitat for another BCC species, Brewer's sparrow, as well as other migrants such as the western meadowlark (*Sturnella neglecta*) and vesper sparrow (*Pooecetes gramineus*). In general, sagebrush habitats in the CRVFO planning area are too limited in extent to support the sage sparrow (*Amphispiza bellii*).

Raptors

Raptors, including falcons, hawks, eagles, and owls, serve as important indicators of overall ecosystem health because they are apex predators. Because they are present in smaller numbers than their prey and produce smaller numbers of young, birds of prey are also more vulnerable to adverse impacts from habitat loss or modification, or to nest failure due to disturbance. Diurnal birds of prey nesting in the CRVFO planning area include two BCC species (bald eagle and golden eagle) and five BLM sensitive species (osprey, peregrine falcon, prairie falcon, northern goshawk, and ferruginous hawk) (see Table 3.2.6-2 and Section 3.2.7). Other diurnal birds of prey include the American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), and Swainson's hawk (*B. swainsoni*) in open woodlands and sagebrush; the Cooper's hawk (*Accipiter cooperi*) and sharp-shinned hawk (*A. striatus*) in denser woodlots; and the northern harrier (*Circus cyaneus*) in low-elevation grasslands and semidesert shrublands.

Nocturnal birds of prey in the CRVFO area include the great horned owl (*Bubo virginianus*) and long-eared owl (*Asio otus*) in open woodlands at middle elevations, and three small owls: the northern saw-whet owl (*Aegolius acadicus*) in higher elevation conifer/aspen, and the northern pygmy owl (*Glaucidium gnoma*) and flammulated owl (a BCC and special status species) in middle elevation conifers, aspen, and oakbrush.

Cavity-Nesting Birds

Cavity-nesting birds include species that excavate nest holes in trees (primary cavity nesters) as well as those that use abandoned holes of other species (secondary cavity nesters). Cavity nesters may also include birds that use natural dead, damaged, or decaying trees. Such trees (commonly called snags) have historically been considered undesirable by forest managers though are now being recognized as important components to forested areas. Some 85 species of birds are considered cavity nesters (Scott et al. 1977). Primary cavity nesters in the CRVFO area include a variety of woodpeckers, the most common of which are the hairy woodpecker (*Picoides villosus*) in montane and subalpine conifers/aspen, the migratory red-naped sapsucker (*Sphyrapicus nuchalis*) in aspen and mid-elevation cottonwoods, the downy woodpecker (*Picoides pubescens*) in lower elevation aspen and cottonwoods, and the northern flicker (*Colaptes auratus*) throughout. Common secondary cavity nesters in the CRVFO area include the tree swallow (*Tachycineta bicolor*), violet-green swallow, white-breasted nuthatch (*Sitta carolinensis*), red-breasted nuthatch (*S. canadensis*), mountain bluebird (*Sialia sialis*), black-capped chickadee (*Poecile atricapillus*), mountain chickadee (*P. gambeli*), and house wren.

White-tailed Prairie Dog

Limited habitat is available in the CRVFO planning area for the white-tailed prairie dog. This species is found primarily on lands that contain salt desert shrub and xeric grassland habitats. Colonies of white-tailed prairie dogs create vegetation conditions that provide potential habitat for three special status species addressed in Section 3.2.7, the black-footed ferret (*Mustela nigripes*), mountain plover (*Charadrius montanus*), and burrowing owl (*Athene cunicularia*). During surveys conducted in 1988, CDOW identified six prairie dog colonies within the CRVFO planning area. Historical data and records indicated that 12 prairie dog colonies may have existed. The largest known site is 150 acres of mostly private land near Interstate70 at DeBeque. Five smaller prairie dog colonies, all about 20 acres in size, are present north of Rifle, north of Gypsum on private lands, east of the Eagle airport on private lands, and south of the Eagle airport on BLM land.

Bats

Eighteen species of bats inhabit Colorado. All are insect-eaters that roost during the day in trees, caves, buildings, and rock crevices and hunt in the dark (CDOW 2010a). Bat species most likely to occur in the CRVFO area include the little brown bat (*Myotis lucifugus*), Yuma myotis (*M. yumanensis*), long-eared myotis (*M. evotis*), fringed myotis (*M. thysanodes*), long-legged myotis (*M. volans*), California myotis (*M. californicus*), small-footed myotis (*M. ciliolabrum*), silver-haired bat (*Lasionycteris noctvagans*), western pipistrelle (*Pipistrellus hesperus*), big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), Townsend's big-eared bat (*Corynorhinus townsendii*), spotted bat (*Euderma maculatum*), pallid bat (*Antozous pallidus*), and Brazilian free-tailed bat (*Tadarida brasiliensis*) (CDOW 2010b). Several species of cave bats including the fringed myotis and Townsend's big-eared bat are BLM sensitive species and addressed in Section 3.2.7, Special Status Species.

Big Game Ungulates

The two big game ungulates (hoofed mammals) generating the most public interest are the Rocky Mountain elk and mule deer. Mule deer and elk occupy higher elevations, usually forested habitat, during the summer and then migrate to sagebrush-dominant ridges and south-facing slopes at lower elevation in the winter. BLM lands and private lands provide most of the winter range available to deer and elk. Winter ranges for elk, mule deer, and pronghorn antelope are essential to the survival of these species. The fragmentation and quality of big game winter ranges are of concern to the CDOW. As private lands become developed and native habitat is converted to unsuitable habitat or is lost altogether, more emphasis is placed on the remaining BLM lands that contain winter range habitats. In addition, concentrations of high populations of big game species are degrading winter habitats. Browse species in particular show poor vigor and moderate to severe hedging. The concentration of mule deer and elk on winter range can reduce plant vigor and productivity over time. Mule deer typically concentrate in the winter in sagebrush habitats along the Colorado, Eagle, and Roaring Fork Rivers. Elk typically concentrate along the Colorado and Roaring Fork Rivers, and most of the severe winter habitat for elk is located west of Glenwood Springs. Summer, winter, and critical winter ranges within the planning area for these species are shown in Figure 3.2.6-2, Elk Summer Range, Figure 3.2.6-3, Elk Winter Range, Figure 3.2.6-4, Mule Deer Summer Range, and Figure 3.2.6-5, Mule Deer Winter Range.

Big game are managed by data analysis units (DAUs). Each DAU usually is composed of several game management units (GMUs), but in some cases only one GMU makes up a DAU (Table 3.2.6-3).

Table 3.2.6-3, Big Game Population Status within the CRVFO depicts big population status by management areas within the CRVFO.

There is overwhelming evidence that big game experience some degree of competitive interactions with livestock and amongst each other. The magnitude of these effects in terms of deer productivity is poorly understood. The extent to which cattle, sheep, or elk may be responsible for observed declines in deer is unknown. Need for additional understanding of simultaneous foraging relationships among deer, elk, and livestock is evident from several studies published within the past 2 years. Beck and Peek (2005) evaluated interactions among cattle, sheep, deer, and elk on summer range in northeastern Nevada. Dietary overlap was lowest between deer and cattle, consistent with past research. Deer diets comprised 30 percent browse, 64 to 72 percent forbs, and 2 to 5 percent grass/grasses, while cattle diets comprised ≥92 percent grass/grasses. Potential for competition was higher between deer and sheep, and deer and elk. Overall, potential for ungulate forage competition was highest for forbs in aspen communities. Therefore, monitoring forbs was identified as the key component of a multi-species grazing management system. In Wyoming, Torstenson et

Table 3.2.6-3
Big Game Population Status Within and Near the CRVFO

Species	Data Analysis Unit (DAU)	Game Management Units (GMU)	Population Estimate 2009 Postseason	Population Objective
Mule Deer	7	11,211,12,13, 131,231,22,23,24	61,450	No finalized plan
	8	15, 35, 36,45	14,800	13,500-16,500
	12	41,421,42	20,750	17,000-23,000
	13	43, 47	6,410	No finalized plan
	14	44	1,950	No finalized plan
	41	31,32	7,960	No finalized plan
	42	33	8,320	7,700-9,400
	43	25, 26, 34	4,690	No finalized plan
	53	444	3,940	No finalized plan
Elk	6	11,12,13,23, 24,25, 26, 33, 34,131,211,231	42,890	32,000 – 39,000
	7	15,27	4,220	4,000-5,000
	10	21,22, 30,31,32	11,760	7,000-9,000
	12	35, 36	3,780	No finalized plan
	14	41,411,42,421,52,521	18,120	9,000-11,000
	15	43,471	4,240	No finalized plan
	16	44, 444, 45,47	7,200	No finalized plan
Moose	3	18,28,36,37,181,371	320	No finalized plan
Pronghorn	34	211,12,23	530	No finalized plan

Source: CDOW data and includes Game Management Units both within and beyond the Field Office boundaries

al. (2006) found elk and cattle diets to be dominated by grasses while mule deer consumed more forbs and shrubs. Greatest dietary overlap occurred between mule deer and elk during spring, and between elk and cattle during multiple seasons. Findholt et al. (2004) observed considerable dietary overlap among mule deer, elk, and cattle, indicating a potential for competition. Overlap between elk and deer was consistently about 60 percent under various grazing history scenarios. Sandoval et al. (2005) evaluated elk and mule deer diets in north-central New Mexico where livestock grazing had been absent for 60 years. They observed an overall dietary overlap of 64 percent between deer and elk, indicating a high potential for competition.

Livestock and wild ungulate carrying capacities should be evaluated holistically and used to guide stocking rate decisions and wild ungulate population objectives. Public and private resource managers should collectively apply the best scientific principles currently available regarding differential herbivore diet selection and foraging behaviors to manage multiple herbivores in an ecosystem context (Weisberg et al. 2002). This type of an approach is the only viable way to positively influence herbivory levels on managed landscapes where regulatory control of use is spread among multiple public and private entities with different agendas.

Moose occasionally use BLM lands but not to the extent of other big game. Since 2005, the CDOW has been undertaking a multi-year moose reintroduction project on the Grand Mesa, east of Grand Junction. In an effort to establish a self-sustaining population of moose on the Grand Mesa, moose are being translocated from other Colorado herds and from Utah (CDOW 2010c). Individuals from this reintroduction are showing up on BLM lands south of Rifle.

Pronghorn generally live in grasslands and semidesert shrublands on rolling topography that affords good visibility (CDOW 2011a). Pronghorn occur in limited numbers on BLM lands and in limited numbers near Toponas.

Bighorn sheep (*Ovis canadensis)* typically occur in steep, high mountain terrain. In Colorado, they prefer habitat dominated by grass, low shrubs, rock cover, and areas near open escape (CDOW 2011b). Throughout the west bighorn populations have struggled with disease outbreaks caused by contact with the more immune domestic sheep.

Twelve bighorn sheep herds occur on the adjacent White River National Forest (USFS 2002). The CDOW has identified four bighorn herds as high priority, based on the following: (1) they are native (not transplanted); (2) their population size is large; and (3) the relative ability is high to protect and perpetuate the herd from threats to habitat and/or disease. Those herds include Avalanche Creek, Snowmass-Maroon Creek, Gore Range, and Battlement Mesa. Eight other herds are identified as medium-to-low priority because they were (1) transplanted, (2) smaller in population size, and (3) relatively harder to protect and perpetuate from threats to habitat and/or disease. Those herds include Toner Creek, Derby Creek, South Fork of the White River, Deep Creek, Glenwood Canyon, Cline Top Mesa, Flat Tops, and Holy Cross herds (USFS 2002).

The Avalanche Creek, Battlement Mesa, Deep Creek, Glenwood Canyon, Cline Top Mesa, and Flat Tops herds randomly or seasonally use adjacent BLM lands. The Deep Creek, Glenwood Canyon, and Flat Tops herds have the greatest opportunity to come in contact with domestic sheep grazing on BLM lands. However, barriers of terrain, vegetation, and topography, as well as season of use differences, help to minimize the likelihood of physical contact between wild sheep and domestic sheep on BLM lands. In addition, vacant allotments, such as the Oasis Creek allotment, have afforded spatial separation and have reduced commingling potential (Figure 3.2.6-6, Bighorn Sheep Range).

Carnivore Species

Carnivore species that occur in the CRFVO planning area include black bear, mountain lion, and river otter. Black bears and mountain lions occur within all habitat types, and the documented overall range for black bears and mountain lions encompasses much of the planning area (. Black bears prefer mesic habitats, including subalpine forests, riparian areas, and dense oakbrush, mostly in middle and higher elevations. Mountain lions are generally found where mule deer are concentrated, generally in lower to middle elevations and often in rugged terrain. The river otter occurs along major rivers but is very limited in distribution. This species and the federally listed Canada lynx (*Lynx canadensis*) are addressed in more detail in Section 3.2.7, Special Status Species.

Other carnivores of public interest in the CRVFO planning area include the bobcat (*Lynx rufus*), coyote (*Canis latrans*), and red fox (*Vulpes vulpes*).

Other Mammals

Although of generally less economic importance or public interest than the priority species described above, small mammals are ecologically important in terms of maintaining an appropriate balance as either predator or prey species. Small predators include the long-tailed weasel (*Mustela frenata*), mink (*M. vison*), and American badger (*Taxidea taxus*), raccoon (*Procyon lotor*), ringtail (*Bassariscus astutus*), striped skunk (*Mephitis mephitis*), and spotted skunk (*Spilogale gracilis*). Small herbivores include larger rodents such as the beaver (*Castor canadensis*), muskrat (*Ondatra zibethica*), yellow-bellied marmot (*Marmota flaviventris*), pine squirrel (*Tamiasciurus hudsonicus*),

rock squirrel (*Spermophilus variegatus*), Wyoming ground squirrel (*S. richardsonii*), golden-mantled ground squirrel (*S. lateralis*), and chipmunks (*Tamias* spp.). Common lagomorphs include the black-tailed jackrabbit (*L. californicus*), mountain cottontail (*Sylvilagus nuttallii*), and desert cottontail (*S. audubonii*). Another lagomorph, limited to higher elevations, is the snowshoe hare (*Lepus americanus*), the primary prey species for the Canada lynx. Common nocturnal small mammals include the northern pocket gopher (*Thomomys talpoides*) bushy-tailed woodrat (packrat) (*Neotomoa cinerea*), deer mouse (*Peromyscus maniculatus*), and long-tailed vole (*Microtus longicaudus*), in addition to a variety of shrews.

Habitats Used

Wildlife habitats provided by BLM lands are characterized in Section 3.2.5, Vegetation. The discussions of aquatic and terrestrial habitat below identify attributes of these resources that are particularly important to their role in providing habitat for fish and wildlife.

Fish and wildlife habitat consists of approximately 562,320 acres of terrestrial uplands and 5,680 acres of riparian and wetland systems (568,000 acres total). The presence and interspersion of many habitat types support a large number of wildlife species. Elk, mule deer, bighorn sheep, mountain lion, raptors, and many nongame species, including migratory birds, use habitats in the area. The diversity and populations of fish and wildlife provide considerable recreational opportunity and economic benefit. The species discussed characterize the fish and wildlife resources of the CRVFO planning area and focus on the species that are most important to the BLM in managing its lands. They include game species, species vulnerable to impacts, and species with high economic or recreational value (Table 3.2.6-2, Wildlife Species of Primary Interest in CRVFO Planning Area). The special status species are discussed in Section 3.2.7, Special Status Species.

Terrestrial Habitats

The CRVFO has eight primary habitat types, as follows:

1. Semidesert shrub is composed mostly of sagebrush mixed with greasewood and saltbrush, and covers 89,279 acres (18 percent) of the CRVFO.
2. Pinyon-juniper woodland consists of mixed stands of pinyon pine and juniper, and covers 198,544 acres (39 percent) of the CRVFO.
3. Mixed mountain shrub and oak (includes mesic mountain shrub and gambel oak) is composed primarily of oakbrush and serviceberry, and covers 115,166,653 acres (23 percent) of the CRVFO.
4. Aspen habitat consists of quaking aspen stands that cover 18,508 acres (4 percent) of the CRVFO.
5. Conifer forest consists of mixed stands of Engelmann spruce and subalpine fir, and covers 47,576 acres (9 percent) of the CRVFO.
6. Riparian habitat consists of riparian-related species, including cottonwood, willow, and riparian grasses and forbs. This habitat type covers 4,134 acres (1 percent) of the CRVFO.
7. Grasslands make up 12,207 acres (2 percent) of the CRVFO.
8. Developed or barren habitats cover 20,750 acres (4 percent) of the CRVFO.

Habitat Conditions

The current condition of wildlife habitats varies across the landscape. Some habitat is altered by power lines, pipelines, fences, public recreation use, residential and commercial development, vegetation treatments,

livestock and wild ungulate grazing, oil and gas development, and roads (authorized, unauthorized, paved, and unpaved). These human uses contribute to degradation of habitat quality, fragmentation of habitat for several species, and expansion of areas that support noxious and exotic plant species. Natural geology also plays a role in some areas, as do regional climatic conditions. Areas with favored browse species, such as bitterbrush, aspen regeneration, serviceberry, and winterfat, or that are in important big game winter range have heavier use levels or poorer vigor than areas where these features are lacking or inaccessible because of steep slopes or snow depths.

Sagebrush. Sagebrush steppe vegetation is widely recognized as an important vegetation type for a variety of wildlife species, providing yearlong habitat for some species and critical winter habitat for others. Numerous species of songbirds, small mammals, and birds of prey depend on the sagebrush during the breeding season. Other species, such as mule deer, Rocky Mountain elk, and pronghorn, obtain food and cover during critical winter periods.

Sagebrush habitats within the CRVFO planning area vary from poor to good condition, with evidence of light to heavy use by browsers. In many areas, the perennial grass and forb understory is poorly established, and non-native annuals, most notably cheatgrass (*Bromus tectorum*), have outcompeted native species.

Many of the lower-elevation, Wyoming big sagebrush communities, which comprise the bulk of mule deer winter ranges, are old and decadent with moderate to severe hedging and poor diversity and cover of herbaceous species. Higher-elevation sagebrush sites (mountain big sagebrush and subalpine sagebrush) may be even-aged and have a dense canopy cover in much of the CRVFO, but are generally not decadent and still support a good cover and composition of herbaceous species. Other sagebrush communities are at risk from invading pinyon pine and juniper trees that will eventually crowd out the shrubs. Lack of fire or other disturbance seems to be contributing to a condition of extensive homogeneous stands of mature to over-mature shrubs and trees, with a decline in cover and productivity of shrubs and herbaceous vegetation. Habitat quality and usability for sagebrush-dependent species have declined in these areas. Although these sites are still meeting Standards for Public Land Health, some type of treatment to remove encroaching pinyon and juniper trees will be necessary in the near future to sustain the health of the land.

Salt-Desert Shrubland. Salt-desert vegetation communities support a wide range of wildlife species with substantial overlap with the sagebrush communities. However, the abundance of wildlife and diversity is lower because salt-desert types are substantially drier. Notable salt-desert wildlife species include kit fox (*Vulpes macrotis*) and antelope ground squirrel (*Ammospermophilus leucurus*). Reptiles are well represented in this type because of the lower elevations and warmer conditions.

Pinyon-Juniper Woodland. Pinyon-juniper woodlands provide important foraging and nesting habitat for some raptor species and many migratory songbirds, and security, forage, and thermal cover for a variety of small game, big game, and nongame wildlife.

Pinyon-juniper habitats vary in condition throughout the CRVFO. Many sites consist of mature to old trees with a sparse herbaceous understory. The cover of native grasses and forbs in other stands is fairly good. Understory shrubs are also lacking in many areas and, where present, are generally in poor to fair condition. Shrubs are old, decadent, and severely hedged with little or no recruitment. Localized areas have moderate to high cheatgrass infestations that are closely associated with surface disturbances, such as fire or roads.

Mixed Mountain Shrub and Oak. Mixed mountain shrub and oak habitats are important to turkey, black bear, mule deer, and elk, among others. Mixed mountain shrub and oak habitats generally exhibit good to excellent diversity and productivity of shrubs, grasses, and forbs. Many sites are almost completely covered by vegetation or litter. Understory vegetation is generally diverse and productive, with a good native perennial grass and forb component.

Quaking Aspen. Aspen are important habitats for a variety of species, including big game, turkeys, dusky grouse, black bears, and lagomorphs. Aspen provide security, forage, and thermal cover, as well as birthing and nursing habitat for big game, and nesting habitat for some species of raptors and cavity-nesting birds. Aspen stands are generally in good condition, with good productivity in the herbaceous understory. However, some stands are dominated by older trees, with low recruitment or regeneration of clones. Fire suppression is likely one of the main factors that has limited regeneration of aspen.

Coniferous Forest. Lodgepole pine and spruce-fir stands provide security, thermal cover, and bedding habitat for big game and are important for cavity-nesting birds, some raptors, and many owl species. Snowshoe hare (*Lepus americanus*), red squirrels (*Tamiasciurus hudsonicus*), and many other species of small mammals live in coniferous forests. Mapped potential habitat for the Canada lynx (*Lynx canadensis*) occurs in dense subalpine forest and willow-choked corridors along mountain streams. For a more complete discussion on forest habitats, see Section 3.2.5, Vegetation and Section 3.3.1, Forestry.

Riparian. Riparian areas consist of plant communities associated with streams and rivers. The structure, food, and water provided in riparian areas make them the single most diverse and productive habitat for wildlife. Where site potential allows, multi-canopy riparian areas with trees, shrubs, grasses, forbs, sedges, and rushes are exceptionally valuable as habitat for a wide array of wildlife species, including Neotropical migrant birds. Riparian areas dominated by herbaceous communities and with low potential for multi-canopy structure are nevertheless important as water and succulent food sources for wildlife. The presence of multiple-aged classes of woody and herbaceous vegetation generally indicates healthy wildlife habitat conditions. Riparian habitats or wetlands in nonfunctioning or functional-at-risk condition caused by erosion, lowered water table, or degraded vegetation composition or structure provide decreased wildlife habitat values.

Grassland. Grasslands are important for many ground-nesting and burrowing birds, such as burrowing owl (*Athene cunicularia*) and vesper sparrow (*Pooecetes gramineus*). In addition, small mammals such as the northern pocket gopher (*Thomomys talpoides*) and western harvest mouse (*Reithrodontomys megalotis*) use grasslands for forage and burrows. Birds of prey such as the prairie falcon and Swainson's hawk forage on the small mammals in this habitat (Wildlife Action Plan Team 2006; NatureServe 2008).

Developed and Barren. The conversion of native habitat to developed lands creates many adjustment challenges for the native wildlife community and most often results in eventual displacement. Still, developed landscapes are nonetheless repopulated by a new wildlife community capable of exploiting the ancillary benefits of human civilization. Lizards and snakes populate suburban open space through corridors leading to the wildland margin, and common amphibians have adapted to developed landscapes where ample water is present.

Agricultural lands contribute to wildlife conservation in three basic conditions: flooded fields, unharvested hay, and fallow fields. Flooded fields attract a host of bird species that feed on the invertebrates displaced or drowned by the flooding. Nesting birds such as vesper sparrows use unharvested hay, either grass or alfalfa.

Fallow fields tend to attract ground squirrel colonies and, if left undisturbed for long periods, generally experience a buildup of the rodent population that attracts raptors, including the American kestrel, red-tailed hawk, Swainson's hawk, and northern harrier.

Rock complexes in mountainous areas are used by roosting and nesting violet-green swallows, nesting black swifts (*Apus apus*), golden eagles, and prairie falcons, along with many other bird species. These rocks also provide important cover for large mammals, such as bighorn sheep, mountain lions, and bobcats, and for small mammals, such as ground squirrels (*Spermophilus* spp.), wood rats (*Neotoma* spp.), lagomorphs, and marmots (*Marmota flaviventris*).

Land Health Assessments. The current habitat conditions for assessed portions of the CRVFO are summarized in the Final AMS for the Glenwood Springs Field Office (BLM 2007k). The areas discussed were evaluated through Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado (BLM 1997a).

In summary, the condition of wildlife habitat varies across the CRVFO planning area, where some habitats have been fragmented and degraded by human encroachment and activities. In other areas, wildlife habitat is in good condition, providing productive habitat for several wildlife species. Many sagebrush stands, which also provide important critical winter habitat for big game, are in poor condition. Many stands are even aged and hedged by browsing and show signs of pinyon-juniper encroachment. Fewer than half of the landscapes within the CRVFO have been evaluated for Land Health Standard 3 (healthy plant and animal communities), so the discussion in this section, which is based on the land health assessments, may not reflect habitat conditions throughout the entire CRVFO.

Characterization

Indicators

Primary indicators of health of terrestrial animals are their population numbers, the condition of the individuals that make up these populations, the age structure represented within the population, and the population's distribution relative to its historic range. These are the types of information that CDOW tracks for species of game animals and, increasingly, for key nongame species. The BLM, in managing that habitat for these populations, uses a different set of metrics, such as the condition of shrubs, forbs, and grasses that make up the habitat used by animal species. Indicators of condition include estimates of overall vegetation cover in absolute terms, or 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 may also be evaluated. In evaluating plant indicators, species composition is assessed, as is the form of forage plants. The assessment of Standard 3 considers 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.

Trends

The BLM, in managing species' habitats, uses the Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado (BLM 1997a) that rate the condition of the habitat type used by the priority animal species. Indicators of condition include estimates of overall vegetation cover, or a relative comparison between portions of the habitat that are available and unavailable for animal use. The vigor and production of individual plant indicators and community species composition are also considered in

evaluating the status of the habitat. The BLM uses Multiple Indicator Monitoring and Rosgen Stream Classifications to assess stream and fish habitat capability and condition.

The current trends exhibited by wildlife habitat have a solid foundation in the land health assessments that are being completed for nearly all of the landscapes in the CRVFO. Land health assessments have been completed on six of the 13 landscapes identified. Portions of each landscape were found to meet Standard 3, and portions were failing to meet this standard. Reasons for failure to meet Standard 3 include the following:

- OHV and other human recreation use—Habitat fragmentation, loss of habitat, and abandonment of area caused by an increase in human activity.
- Natural gas development—Habitat fragmentation, loss of habitat, increased human use.
- Development—Causing physical loss of habitats on private lands in the area, thus reducing the continuity and value of habitat located on BLM lands.
- Lack of fire—Juniper encroachment and loss of sagebrush habitat.
- Ungulate grazing—Heavy livestock grazing in some areas, combined with heavy winter use by big game, resulting in loss of vegetation diversity and productivity.
- Drought—Poor productivity and vigor of vegetation.
- Invasion—Dominance of vegetation by undesirable and weedy species, most notably cheatgrass.

Fish

Primary indicators of health of aquatic species are their population numbers. The condition of fisheries habitat is linked to the condition of the adjacent riparian habitat and the characteristics of the stream channel. Riparian vegetation moderates water temperatures, adds structure to the banks to reduce erosion, and provides overhead cover for fish. Intact, vegetated riparian systems provide rearing areas for juvenile fish. Water quality, especially in regard to factors such as temperature, sediment, and dissolved oxygen, also greatly affects fisheries habitat.. The CDOW tracks the conditions of individuals that make up these populations, the age structure represented within the population, and the population's distribution compared with its historical range (CDOW 2002).

The population status of the native Colorado River cutthroat trout is stable to increasing because of the recent interest in reversing the downward trend of the species in Colorado. The CDOW, cooperating with BLM and USFS, has in recent years reestablished Colorado River cutthroat trout populations in historical habitat throughout Colorado. Since the early 1980s, the BLM and USFS have emphasized the protection of aquatic habitat over conflicting uses where this important species exists. In June 2006, CDOW put in place a Conservation Agreement for Colorado River Cutthroat Trout throughout the States of Colorado, Wyoming, and Utah (Colorado River Cutthroat Trout [CRCT] Conservation Team 2006).

Wildlife

Waterbirds. Waterfowl and shorebird populations fluctuated greatly between 1984 and 2005 because of climate. This group of birds is more dependent on annual moisture than any other wildlife because they depend on wetlands and open water habitat for breeding. Waterbird populations have been high during wet years and low during dry years. Because of these fluctuations, the population trend is stable, with no large measurable differences in 1984 and 2005 levels.

Sage-grouse and other Upland Gamebirds. The three important upland gamebird species that inhabit the CRVFO are the greater sage-grouse, dusky grouse, and wild turkey. Habitat for these species has not changed to any large extent since 1984, although some timber harvest has occurred in dusky grouse habitat. Dusky grouse winter in the high country, roosting and feeding in stands of Douglas-fir and lodgepole pine. The mountain pine beetle may potentially cause a drastic change in the winter habitat of the dusky grouse. Habitat for sage-grouse is decreasing because of continued conversion of sagebrush to other vegetation types (e.g., pinyon-juniper woodlands) and human development on private land. Wild turkey populations in Colorado are largest in the southwestern and southeastern portions of the state. Trapping and transplanting by CDOW is helping to reestablish turkeys in much of their ancestral range in Colorado.

Migratory Birds. Migratory bird populations include all birds not considered in other narratives in this section and primarily involve songbirds that inhabit all habitat types within the CRVFO. Most information collected since 1984 was gathered from the sagebrush steppe habitat type. Habitat conditions for these species were also stable; the vegetation composition and structure necessary to sustain breeding populations of the birds that use these habitats were present during the inventories and continue today.

Raptors. The CRVFO supports a variety of birds of prey, including American kestrels, prairie falcons, peregrine falcons (*Falco peregrinus*), Swainson's hawks, red-tailed hawks, northern goshawks, Cooper's hawks, sharp-shinned hawks, and northern harriers in addition to the great horned owl (*Bubo virginiana*) and several other owl species. The wide variety of habitats available in the CRVFO offers nesting and hunting habitat for these species. Nest sites have been located for most of the species listed and then checked for nesting in subsequent years. No information is available regarding population trends.

Big Game Ungulates. Mule deer population numbers have been stable or decreasing in the last few years, while elk numbers are generally increasing or stable. Potential causes of population declines in mule deer include a severe drought in the early part of the current decade, loss of winter habitat due to growth in the human population, associated land and resource developments that tend to be concentrated at lower elevations, and competition from the increasing numbers of elk.

Bats. White-nose Syndrome (WNS) is a fungal disease that has killed more than one million hibernating bats in the US (USFWS 2011). First documented in eastern New York in 2006, it has spread across the northeast and mid-Atlantic United States during the past 4 years and continues unchecked. This disease is named for the white fungus evident on the muzzles and wings of affected bats. Bats affected by WNS eventually die from starvation; however, the factors causing this starvation are unknown.

WNS is believed to be transmitted primarily between bats; however, aspects of the geographic spread suggest that humans may transmit WNS from infected sites to clean sites. Laboratory tests performed at the USGS National Health Center in Madison, Wisconsin have confirmed that a cave myotis (*Myotis velifer*) collected alive on May 3, 2010, from a cave in northwestern Oklahoma has tested positive for the fungus *Geomyces destructans* (USFWS 2010a). The cave myotis is the first uniquely western bat species to be infected by the fungus. This indicates that WNS is not isolated to bat species found only in the eastern US and will likely spread to other western states. The potential impact of WNS is considered to be significant due to the highly beneficial ecological and economic roles played by bats.

In an effort to stay ahead of this serious issue, the BLM has provided interim direction to Field Offices on how to prepare for the anticipated occurrence of WNS on BLM-administered lands nationwide. As of July

2010, the USFS indicated that it would close caves on federal forests and grassland in Colorado, Kansas, Nebraska, and most of Wyoming and South Dakota. This would limit human access to caves and help prevent further spread of the disease, as scientists believe it can be transported from cave to cave on clothing, boots, and equipment. The closure is expected to be in effect for 12 months (USFS 2010).

Habitat

The current trends exhibited by wildlife habitat have a solid foundation in the land health assessments that will eventually be completed for the entire CRVFO. Issues that have been noted include the following:

- OHV and other human recreation use, which cause habitat fragmentation, loss of habitat, and wildlife abandonment in areas as a result of increased human activity.
- Natural gas development, which causes habitat fragmentation, loss of habitat, and wildlife abandonment in areas as a result of increased human activity.
- Physical loss of habitats on private lands in the area caused by development, which reduces the continuity and value of habitat located on BLM lands.
- Lack of fire, which allows for juniper encroachment and loss of sagebrush habitat.
- Drought, which causes poor productivity and vigor of vegetation.
- Dominance of vegetation by undesirable and weedy species, most notably cheatgrass.

Overall, the trend for the assessed public land habitat is stable; that is, most habitat is in a desirable condition or is at least headed in that direction. Most assessed lands were determined to be meeting Standards for Public Land Health based on the composition, structure, and vigor of the vegetation. The species of wildlife and their population levels expected to occupy the assessed habitat were either observed during evaluations or were documented by discussions with CDOW, livestock operators, or others familiar with the assessed areas.

3.2.7 Special Status Species

Special status species are those with populations or habitat that have declined to the point of substantial federal or state agency concern. Species discussed in this section have been listed by USFWS or the State of Colorado or have been placed on the Colorado BLM State Director's Sensitive Species List. The USFWS manages threatened and endangered species and designated critical habitat, in cooperation with other federal agencies to support recovery. The BLM cooperates with USFWS to determine and manage habitats to support the species. Candidate species are managed to maintain viable populations with the objective of preventing the need for them to be listed by the federal government. Listed federally endangered and threatened species and those proposed for listing under the ESA require specific management. Section 7 of the ESA requires federal agencies to consult on any planned actions where these species reside. There are 46 federally listed, proposed and candidate species, BLM sensitive, and BLM species of concern within the CRVFO planning area.

BLM Manual 6840 (BLM 2008j) defines special status species as "(1) species listed or proposed for listing under the ESA, and (2) species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA, which are designated as BLM sensitive by the State Director(s). All federal candidate species, proposed species, and delisted species in the 5 years following delisting will be conserved as BLM sensitive species. Species designated as BLM sensitive must be native species found on BLM-administered lands for which the BLM has the capability to significantly affect the conservation status of the species through management, and either: (1) there is information that a species has recently undergone, is undergoing, or is predicted to undergo a downward trend such that the viability of the species or a distinct population segment of the species is at risk across all or a significant portion of the species range, or (2) the species depends on ecological refugia or specialized or unique habitats on BLM-administered lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk." It is BLM policy to provide sensitive species with the same level of protection that is given federal candidate species. The major objectives of this protection are to preclude the need for federal listing and to improve the status of such species so that their BLM sensitive recognition is no longer warranted.

Current Conditions

The CRVFO planning area contains suitable habitat and documented populations of 46 special status species. Information on these species, their habitats, as well as their listing status, is included in Table 3.2.7-1, Special Status Fish, Wildlife, and Plant Species in the CRVFO Planning Area.

Special Status Plants

Federally Listed, Proposed or Candidate Species

Two federally listed plant species are currently known to occur within the CRVFO. These are the Colorado hookless cactus (formerly Uinta Basin hookless cactus) (*Sclerocactus glaucus*) and Ute ladies'-tresses (*Spiranthes diluvialis*). In addition, there are two plant species proposed for listing: Parachute penstemon (*Penstemon debilis*) and DeBeque phacelia (*Phacelia submutica*). No federally listed endangered or candidate plant species are known to occur within the CRVFO.

Table 3.2.7-1
Special Status Fish, Wildlife, and Plant Species

Species	Status	Likelihood of Occurrence	Species	Status	Likelihood of Occurrence
PLANTS					
Cathedral Bluffs meadowrue	BLM-S; G2/S2	S	Parachute penstemon	FP; G1/S1	C
DeBeque milkvetch	BLM-S; G2/S2	S	Piceance bladderpod	BLM-S; G2/S2	S
DeBeque phacelia	FP; G4T2/S2	C	Roan Cliffs blazing star	BLM-S; G2/S2	C
Harrington's penstemon	BLM-S; G3/S3	C	Colorado hookless cactus	FT; G3/S3	C
Naturita milkvetch	BLM-S; G2G3/S2S3	C	Ute ladies'-tresses	FT; G2/S2	C
BIRDS					
American white pelican	BLM-S; G3/S1BN	U	Greater sage-grouse	FC, SC; G4/S4	C
White-faced ibis	BLM-S; G5/S2B	U	Columbian sharp-tailed grouse	BLM-S, SC; G4/S3	S
Barrow's goldeneye	BLM-S; G5/S2B	S	Greater sandhill crane	SC; G5/S2B,S4N	S
Northern goshawk	BLM-S; G5/S3B	C	Western yellow-billed cuckoo	FC, BLM-S, SC; G5/SNA	U
Bald eagle	BLM-S; G5/G	C	Burrowing owl	BLM-S, ST; G4/S4B	S
Ferruginous hawk	BLM-S, SC; G4/S3B, S4N	S	Mexican spotted owl	FT, ST; G3/S1B	S
Peregrine falcon	BLM-S, SC; G4/S2B	C	Southwestern willow flycatcher	FE, SE; G5/SNA	U
Gunnison sage-grouse	FC, SC; G1/S1	U			
AMPHIBIANS					
Boreal toad	BLM-S, SE; G4/S1	C	Northern leopard frog	BLM-S, SC; G5/S3	C
Great Basin spadefoot toad	BLM-S, G5/S3	S			
REPTILES					
Midget faded rattlesnake	BLM-S, SC; G5/S3	S	Utah milk snake	BLM-S	S

Table 3.2.7-1 *(continued)*
Special Status Fish, Wildlife, and Plant Species

Species	Status	Likelihood of Occurrence	Species	Status	Likelihood of Occurrence
FISH					
Bonytail*	FE, SE; G1/SX	S	Colorado River cutthroat trout	BLM-S, SC; G4/S3	C
Colorado pikeminnow*	FE, SE; G1/S1	C	Roundtail chub	BLM-S, SC; G3/S2	C
Razorback sucker*	FE, SE; G1/S1	C	Flannelmouth sucker	BLM-S; G3G4/S3	C
Humpback chub*	FE,SE; G1/S1	S	Bluehead sucker	BLM-S	C
Greenback cutthroat trout	FT,ST;G4/S2	C			
MAMMALS					
Black-footed ferret	FE, SE; G1/S1	S	Big free-tailed bat	BLM-S; G5/S1	S
Canada lynx	FT, SE; G5/S1	C	Spotted bat	BLM-S; G4/S2	S
Townsend's big-eared bat	BLM-S, SC; G4/S2	C	River otter	ST	C
Fringed myotis	BLM-S; G4G5/S3	C			

Source: CNHP 20010
* Water depletions in the Upper Colorado River and San Juan River Basins may affect the species and/or critical habitat in downstream reaches and in other states.
BLM-S = BLM sensitive species, SC = state species of concern, FE = federal endangered species, SE = state endangered species, FT = federal threatened species, ST = state threatened species, FP = federal proposed for listing as threatened or endangered, FC = federal candidate for listing as threatened or endangered.
CNHP: G = global ranking; S = subnational ranking; G1/S1 = critically imperiled; usually five or fewer known occurrences or few remaining individuals; G2/S2 = imperiled, usually 20 or fewer occurrences or with many individuals in fewer occurrences; G3/S3 = vulnerable, usually 80 or fewer occurrences, may have fewer occurrences but with many individuals; G4/S4 = apparently secure, uncommon but not rare; G5/S5 = secure, common widespread and abundant.
U = unrankable, unrankable due to lack of information; B = conservation status refers to the breeding population;
N = conservation status refers to nonbreeding population; NA = not applicable; X = Presumed extirpated.
C = confirmed populations of species in the planning area.
S: suitable habitat found in the planning area, however, no populations have been documented; U = species is unlikely to be found in the planning area.

Colorado hookless cactus. The Uinta Basin hookless cactus was the former name of a "complex" of cactus species with a species range from western Colorado and into portions of eastern Utah. A taxonomic review of the species in 2007 determined that *Sclerocactus glaucus* is actually three separate species: *S. glaucus, S. wetlandicus,* and *S. brevispinus* (USFWS 2007a). *S. glaucus* occurs only in Colorado and has been renamed Colorado hookless cactus. *S. wetlandicus* and *S. brevispinus* occur only in Utah.

The Colorado hookless cactus is a federally listed threatened plant typically found on rocky hills and alluvial benches in xeric fine-textured soils overlain with cobbles and pebbles. It grows in salt desert shrub and pinyon-juniper communities at elevations ranging from approximately 4,500 to 6,600 feet. There are 18 currently or historically occupied hookless cactus sites in the CRVFO.

Ute ladies'-tresses. The Ute ladies'-tresses is a federally listed threatened plant with a CNHP Rank of G2/S2. Habitat for this rare orchid includes seasonally flooded river terraces, subirrigated or spring-fed abandoned stream channels, and lakeshores. In addition, some populations have been discovered along irrigation canals, berms, levees, irrigated meadows, excavated gravel pits, reservoirs, and other human-modified wetlands. This orchid is known to occur in isolated populations in Colorado, Idaho, Montana, Nebraska, Nevada, Utah, Washington, and Wyoming (Natureserve 2010).

The orchid was first discovered within the CRVFO planning area in 2007 on both public and private lands near Carbondale, Colorado. Elevation at the sites ranges from 6,000 to 6,300 feet. The species and habitat are vulnerable to changes in water management for municipal, agricultural, and recreational uses; loss of habitat due to residential and commercial development; competition from noxious weeds; and trampling by humans and livestock.

Parachute penstemon. Parachute penstemon is a rare plant, endemic to steep talus slopes on the southern escarpment of the Roan Plateau in Garfield County, Colorado. The plants are found only on the oil-shale rich Parachute Creek Member of the Green River Formation between 8,000 and 9,000 feet in elevation.

Parachute penstemon is uniquely adapted to steep and constantly moving talus slopes. The stems of Parachute penstemon elongate downslope from their initial rooting point as the leaves become buried by shifting shale shards. When these stems encounter a surface sufficiently stable, they may develop a new tuft of leaves, flower, and set seed. Vegetation on these talus slopes is generally quite sparse (less than 20 percent canopy cover), providing little competition for the Parachute penstemon.

Parachute penstemon is known from only seven occurrences covering an area of about 56 acres. Four of the occurrences are rated by CNHP as having "good to excellent" estimated viability based on population size, individual plant sizes, and site ecology. The other three occurrences have very low numbers. The total estimated number of known plants is approximately 4,000 individuals (USFWS 2010a). Approximately 82 percent of the plants are on private land owned by a natural gas production company. Most of the remaining 18 percent occur on one site on BLM-administered land.

The species is considered critically imperiled (G1/S1) by the CNHP, based on its very few occurrences, narrow global distribution, and current and potential threats to its known populations. Threats to the species and its habitat include oil shale mining, natural gas development, mine reclamation activities, and road maintenance. Due to the increase in these activities throughout the range of the species, the USFWS proposed to list Parachute penstemon as a threatened species in the June 23, 2010 Federal Register (75 FR 35721).

DeBeque phacelia. DeBeque phacelia is a rare annual plant endemic to nearly barren, clay soils derived from the Atwell Gulch and Shire members of the Wasatch Formation in Mesa and Garfield Counties, Colorado. These clay soils are found on moderately steep slopes, benches, and ridge tops adjacent to valley floors of the southern Piceance Basin in Mesa and Garfield Counties, Colorado. The 25 known occurrences of the plant occupy a total of 104 acres (USFWS 2010a). DeBeque phacelia seeds usually germinate in early April and finish their life cycle by late June to early July, after which time they dry up and disintegrate or blow away, leaving no indication that the plants were present (Burt and Spackman 1995). The seed bank is the mechanism by which the populations survive. The seeds can remain dormant for 5 years (and probably longer) until the combination and timing of temperature and precipitation are optimal (USFWS 2010a).

DeBeque phacelia is known from only three small sites within the CRVFO. DeBeque phacelia is threatened with destruction and modification of its seed bank and habitat due to ground disturbance from natural gas exploration, production and pipelines, expansion of roads and utilities, the Westwide Energy Corridor, increased access to the habitat by off-road vehicles (ORVs), soil compaction by cattle, and proposed water reservoir projects. Due to the recent increase in these activities within the range of the species, the USFWS has proposed to list DeBeque phacelia as a threatened species in the June 23, 2010 Federal Register (75 FR 35721).

BLM Sensitive Species

Five BLM sensitive species have been recorded within the CRVFO: Cathedral Bluffs meadowrue (*Thalictrum heliophilum*), DeBeque milkvetch (*Astragalus debequaeus*), Harrington's penstemon (*Penstemon harringtonii*), Naturita milkvetch (*Astragalus naturitensis*), and Roan Cliffs blazing star (*Mentzelia rhizomata*). One additional species, Piceance bladderpod (*Lesquerella parviflora*), occurs near the CRVFO, but has not yet been documented within the planning area. Because this species has potential habitat within the CRVFO, it could be affected by actions proposed within the RMP.

Cathedral Bluffs meadowrue. The Cathedral Bluffs meadowrue is a narrowly restricted endemic plant found in dry shale barren communities between 6,200 and 8,800 feet in elevation. This species is currently known from 18 occurrences in Garfield, Mesa and Rio Blanco Counties in northwestern Colorado. The only known occurrences within the CRVFO are found in the Roan Plateau RMP Amendment planning area. Although it is likely that more occurrences will be found by additional inventories, it is not likely that the species will be found to be common, even within its narrow range (Panjabi and Anderson 2007). There are several threats to the persistence of the species including oil shale mining, natural gas development, exotic plant species invasion, small population size, and grazing and trampling.

DeBeque milkvetch. DeBeque milkvetch is a BLM sensitive species that occupies a very small geographic range on a very specific geologic formation (Spackman et al. 1997). DeBeque milkvetch is found only on the Wasatch Formation in the vicinity of DeBeque and in a satellite population near Rulison, Colorado. The CNHP gives this species a rank of G2/S2, which means it is considered imperiled, with fewer than 20 known occurrences. Plants are common on the Atwell Gulch Member of the Wasatch Formation but are rare elsewhere. Although suitable habitat for this species is present in various places within the CRVFO between Rifle and DeBeque, Colorado, the only known occurrences within the CRVFO are in the Roan Plateau RMP Amendment planning area.

Potential threats to the species include natural gas development, agricultural uses, residential development, and OHV activity. Natural gas development is increasing dramatically within the range of DeBeque milkvetch, and most of the habitat for this species is already leased for natural gas exploration and development.

Harrington's penstemon. Harrington's penstemon is a northwestern Colorado endemic plant. Its population is concentrated in Eagle and Pitkin Counties with fewer satellite populations in Garfield, Grand, Summit, and Routt Counties. Although its global distribution is fairly limited, it is locally common within its range. The plant is typically found in open sagebrush slopes (*Artemisia tridentata ssp. pauciflora* or *A. tridentata ssp. wyomingensis*) on the edges of pinyon-juniper or oakbrush habitats, but is rarely found in the deeper-soiled sagebrush (*A. tridentata ssp. tridentata*) along drainages. Harrington's penstemon occurs on rocky clay loams derived from calcareous materials between the elevations of 6,400 and 9,400 feet (Panjabi and Anderson

2006). New surveys have since found Harrington's penstemon in elevations as low as 6,100 feet and as high as 10,000 feet. Within the planning area, Harrington's penstemon is known to occur in numerous locations in Eagle County, in northwestern Pitkin County, on the eastern edge of Garfield County, near Flatiron Mesa in central Garfield County, and along the southern boundary of Routt County.

Naturita milkvetch. Naturita milkvetch occurs on sandstone mesas, ledges, crevices, and slopes in pinyon-juniper woodlands at elevations from 5,000 to 7,000 feet. It grows in areas of shallow soils over exposed bedrock. Although this species is fairly widespread in southwestern Colorado, it is considered rare because of the sporadic distribution of its small populations. Naturita milkvetch has been found in several locations in the western end of the planning area. Potential threats to the species include natural gas development, rights-of-way, and noxious weed invasion.

Roan Cliffs blazing star. The Roan Cliffs blazing star is a recently identified species endemic to steep talus slopes of the Green River Formation in Garfield County. The species occurs on eroding oil shale at elevations from 5,800 to 9,000 feet. Constantly shifting talus slopes are necessary to maintain the populations; other plants take over if slopes become stabilized. In the CRVFO, the Roan Cliffs blazing star is known to occur in Main Elk Creek, along the Anvil Points Mine Road, and along the Parachute Creek drainage.

Piceance bladderpod. The Piceance bladderpod is a Colorado endemic known only in Garfield, Mesa, and Rio Blanco Counties. It occurs on shale outcrops of the Green River Formation, on ledges and slopes of canyons in open areas at elevations ranging from 6,200 to 8,600 feet. The species has not yet been documented within the planning area, but it does occur just south of the planning area on south-facing outcrops of the Green River formation on Battlement Mesa and just west of the planning area in the Roan Creek watershed.

Special Status Fish

Native Cutthroat Trout Species - Background

The cutthroat trout is the most diverse trout species in North America, and its historical distribution covers the broadest range of any stream dwelling trout in the Western Hemisphere. The rugged topography of their range has lead to isolation, which in turn has given rise to 14 recognized subspecies. Four of these evolved in Colorado: the Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) in drainages west of the Continental Divide, greenback cutthroat trout (*Oncorhynchus clarki stomias*) in the South Platte and Arkansas River drainages, the Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*) in streams that drain into the San Luis Valley, and the extinct yellowfin cutthroat trout (*Oncorhynchus clarki macdonaldi*) that was historically found in Twin Lakes at the headwaters of the Arkansas drainage.

The three remaining subspecies in Colorado have seen dramatic reductions in their range, precipitated primarily by the introduction of non-native salmonids. Rainbow trout hybridize with native cutthroat trout, and brook and brown trout tend to outcompete them in streams and rivers. In an effort to preserve the legacy of these fish, multi-agency conservation teams have been established for each subspecies. All three Colorado subspecies look very similar and all three are special status species. Greenback cutthroat are federally listed as threatened, Rio Grande cutthroat are candidates for listing under ESA, and Colorado River cutthroat are BLM sensitive species.

As these three cutthroat subspecies could not be reliably identified visually or with traditional genetic techniques, their historic range had been used to distinguish them. Colorado River cutthroat trout were considered to inhabit streams located on the west slope of the Continental Divide and greenback cutthroat trout to inhabit the east slope of the Continental Divide. Recent advances in genetic techniques have allowed biologists to confidently identify the three subspecies. However, the new genetic findings are challenging the current paradigm on the heritage of cutthroat trout in the state. The studies confirm the existence of three genetically distinct subspecies in Colorado, but they also suggest that some key greenback cutthroat trout populations in eastern Colorado may actually be descendents of Colorado River cutthroat trout, possibly stocked east of the Continental Divide in the late 1800s. Conversely, several core conservation populations of Colorado River cutthroat trout on the west side of the Divide appear to be more closely related to greenback cutthroat trout.

Deoxyribonucleic acid (DNA) isolated from museum specimens, collected between 1860 and 1890, is currently being evaluated in hopes of accurately delineating historic ranges of the Colorado subspecies of cutthroat trout. Comprehensive genetic assessments of current populations in Colorado are also underway to relate current distributions to historic ranges, to possibly infer the influence of historic undocumented stocking on present distribution.

Until additional information clarifies the relationship between the two subspecies, biologists are recognizing two distinct lineages of cutthroat trout within the range of Colorado River and greenback cutthroat trout. These lineages have been tentatively called lineage CR (for Colorado River cutthroat trout) and lineage GB (for greenback cutthroat trout). To date, 37 populations of lineage GB fish have been identified west of the Continental Divide.

Within the CRVFO planning area, one stream is currently identified as being lineage GB, Cache Creek. Although outside of what is considered their "native range," based on the best available science, these lineage GB populations are considered greenback cutthroat for the purposes of ESA compliance. Further genetic testing on existing populations and results from genetic tests on historic museum specimens will hopefully help clarify the relationship between the two subspecies.

Greenback cutthroat trout. The greenback cutthroat trout is a small salmonid (trout and salmon) fish native to the headwaters of the South Platte and Arkansas River drainages and a small segment of the South Platte drainage in Wyoming. It is one of three subspecies of cutthroat that currently reside in Colorado. Adult greenbacks are greenish brown to olive-colored on the back with silvery to yellow sides and a white belly (red during spawning). They have a crimson slash under each side of the lower jaw and low numbers of large spots concentrated toward the caudal fin.

Greenback, like all cutthroat subspecies, inhabit cold-water streams and lakes with adequate spawning habitat present in the spring of the year. Spawning generally occurs when water temperatures reach 5- to-8 degrees Centigrade (C). Greenback feed on a wide variety of organisms but their primary source of food is aquatic and terrestrial insects. Size and growth of greenbacks vary, based upon elevation and population size, typically 1 to 2 pounds maximum.

Greenback distribution and numbers of fish declined rapidly beginning in the 1800s. By 1973, when the ESA was passed into law, greenback were believed to only exist in two small headwater streams (Como Creek and South Fork, Cache La Poudre River). The subspecies was listed under the ESA as endangered in 1973 and

downlisted to threatened in 1978. Cooperative efforts between the CDOW, USFS, BLM, USFWS, and Rocky Mountain National Park have led to a large recovery effort for the greenback cutthroat trout. This recovery effort has started a hatchery-based restoration stocking program for the greenback cutthroat trout. Stocking of adult and juvenile greenback cutthroat trout has occurred since the 1960s in alpine and montane lakes, as well as many streams throughout the South Platte and Arkansas River basins.

One population of greenbacks is known within the CRVFO planning area—in Cache Creek located on USFS and private lands south of Rifle.

Colorado River cutthroat trout. The Colorado River cutthroat trout (CRCT) is a native trout species of the Colorado River Basin. It is one of three subspecies of cutthroat that currently reside in Colorado. Adult CRCT, like the greenback, are greenish brown to olive-colored on the back with silvery to yellow sides and a white belly (red during spawning). They have a crimson slash under each side of the lower jaw and low numbers of large spots concentrated toward the caudal fin. They are very hard to distinguish visually from the greenback.

CRCT, like all cutthroat subspecies, inhabit cold-water streams and lakes with adequate spawning habitat present in the spring of the year. Spawning generally occurs when water temperatures reach 5- to 8- degrees C. CRCT feed on a wide variety of organisms but their primary source of food is aquatic and terrestrial insects. Size and growth of greenbacks varies, based upon elevation and population size. This species typically does not reach a large size, generally 5 pounds maximum.

The CRCT is designated as a species of concern by the CDOW. In addition, the Colorado River cutthroat trout is classified as a sensitive species by the BLM in Colorado. This fish historically occurred in portions of the Colorado River drainage in the states of Wyoming, Colorado, Utah, Arizona, and New Mexico (Behnke 1992). In Colorado, this species was found in most of the larger rivers including the White, Yampa, Colorado, Gunnison, and San Juan. Today, remaining Colorado River cutthroat trout populations are primarily limited to small headwater streams and lakes within their historic range. Declines in Colorado River cutthroat trout distribution have been documented in a number of reports (Behnke and Zarn 1976; Binns 1977; Martinez 1988; Young 1995). Young (1995) determined most lotic populations reside in streams with average daily flows less than 0.85 m^3/s (30 cubic feet per second [cfs]). Stream gradients usually exceeded 4 percent, and all populations were found above 2,290 m (7,500 ft). Behnke (1979) stated that Colorado River cutthroat trout occupy less than one percent of their historical range, though a more rigorous assessment indicates that the true number is closer to 14 percent (Hirsch et al. 2005).

Within the CRVFO there are 15 streams known to harbor this species. At this time, at least eight of these streams contain core conservation populations (99 percent genetically pure or better). Genetic analysis is ongoing for several streams. All of these streams are important for conservation of the species. Threats to this species include introduction of non-native trout species, poor livestock grazing practices, natural gas development, and water diversions.

Colorado River Endangered Fishes

Bonytail (*Gila elegans*). The bonytail is a large cyprinid fish (minnow family) endemic to the Colorado River Basin (Valdez and Clemmer 1982). Bonytail are medium-sized (less than 600 mm long). Adult bonytail are gray or olive-colored on the back with silvery sides and a white belly. The adult bonytail has an elongated body with a long, thin caudal peduncle. The head is small and compressed compared to the rest of the body.

The mouth is slightly overhung by the snout and there is a smooth low hump behind the head that is not as pronounced as the hump on a humpback chub. Adults attain a maximum size of about 550 mm (Bozek et al. 1984) and 1.1 kg (Vanicek 1967). The bonytail is currently listed as endangered under the ESA, as amended (ESA; 16 U.S.C. 1531 et seq.), under a final rule published on April 23, 1980 (45 FR 27710). A recovery plan was approved on September 4, 1990 (USFWS 1990). The final rule for determination of critical habitat was published on March 21, 1994 (59 FR 13374), and the final designation became effective on April 20, 1994.

The bonytail is the rarest native fish in the Colorado River. Little is known about its specific habitat requirements or cause of decline because the bonytail was extirpated from most of its historic range before extensive fishery surveys. It was listed as endangered on April 23, 1980. No documented self-sustaining populations exist in the wild. Formerly reported as widespread and abundant in mainstream rivers (Jordan and Evermann 1896), its populations have been greatly reduced. Remnant populations currently occur in the wild in low numbers in Lake Mohave, and several fish have been captured in Lake Powell and Lake Havasu (USFWS 2002a). These native fish are threatened by large mainstem dams, water diversions, habitat modification, non-native fish species, and degraded water quality (Miller 1961; Minckley and Deacon 1968).

This species is not known to occur in the CRVFO planning area. These fish reside far downstream in the mainstem Colorado River near the Colorado-Utah border in the Black Rocks area. Designated Critical Habitat for these fish is located outside of the CRVFO planning area. Within the Colorado River, Designated Critical Habitat is located in the Colorado River from Black Rocks (river mile 137) in T. 10 S., R. 104 W., section 25 (Sixth Principal Meridian) to Fish Ford in T. 21 S., R. 24 E., section 35 (Salt Lake Meridian).

Colorado pikeminnow (*Ptychocheilus lucius*). The Colorado pikeminnow (*Ptychocheilus lucius*) is the largest cyprinid fish endemic to the Colorado River Basin (Tyus 1991). The common name for this species was changed from Colorado squawfish by the American Fisheries Society (Nelson et al. 1998). Adults attain a maximum size of about 1.8 m and 36 kg (Miller 1961). The Colorado pikeminnow is currently listed as endangered under the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.). It was first included in the List of Endangered Species issued by the Office of Endangered Species on March 11, 1967 (32 FR 4001), and was considered endangered under provisions of the Endangered Species Conservation Act of 1969 (16 U.S.C. 668aa). The Colorado squawfish (pikeminnow) was included in the United States List of Endangered Native Fish and Wildlife issued on June 4, 1973 (38 FR No. 106), and it received protection as endangered under Section 4(c)(3) of the original ESA of 1973. The latest revised Colorado squawfish (pikeminnow) recovery plan was approved on August 6, 1991 (USFWS 1991). The final rule for determination of critical habitat was published on March 21, 1994 (59 FR 13374), and the final designation became effective on April 20, 1994.

Colorado pikeminnow live in warm-water reaches of the Colorado River mainstem and larger tributaries, and require uninterrupted stream passage for spawning migrations and dispersal of young. The species is adapted to a hydrologic cycle characterized by large spring peaks of snowmelt runoff, and low, relatively stable base flows. High spring flows create and maintain in-channel habitats, and reconnect floodplain and riverine habitats, a phenomenon described as the spring flood-pulse (Junk et al. 1989; Johnson et al. 1995). Throughout most of the year, juvenile, subadult, and adult Colorado pikeminnow use relatively deep, low-velocity eddies, pools, and runs that occur in nearshore areas of main river channels (Tyus and McAda 1984; Valdez and Masslich 1989; Tyus and Karp 1990; Tyus 1991; Osmundson et al. 1995). In the spring, Colorado pikeminnow adults use floodplain habitats, flooded tributary mouths, flooded side canyons, and eddies that are available only during high flows (Tyus and Karp 1990; Tyus 1991; Osmundson et al. 1995). Such

environments may be particularly beneficial for Colorado pikeminnow because other riverine fishes gather in floodplain habitats to exploit food and temperature resources, and may serve as prey. Such low-velocity environments also may serve as resting areas for Colorado pikeminnow. River reaches of high habitat complexity appear to be preferred. These native fish are threatened by large mainstem dams, water diversions, habitat modification, non-native fish species, and degraded water quality (Miller 1961; Minckley and Deacon 1968).

Colorado pikeminnow are currently restricted to the Upper Colorado River Basin and inhabit warm water reaches of the Colorado, Green, and San Juan Rivers and associated tributaries. Most of Lake Powell is not suitable habitat for Colorado pikeminnow and is not designated critical habitat. The 1,148 designated miles represent 29 percent of the historical habitat for the species.

This species may reside in the CRVFO planning area since downstream movement barriers have recently been modified to allow for greater fish passage potential. Within the CRVFO planning area, the Colorado River and its 100-year floodplain is identified as Designated Critical Habitat for this species from the Highway 13 Bridge crossing in Rifle, Colorado to Lake Powell.

Razorback sucker (*Xyrauchen texanus*). The razorback sucker (*Xyrauchen texanus*) is a large catostomid fish endemic to the Colorado River Basin (Minckley et al. 1991). Adults attain a maximum size of about 1 m and 5 to 6 kg (Minckley 1973). The razorback sucker is currently listed as endangered under the ESA, under a final rule published on October 23, 1991 (56 FR 54957). A recovery plan was approved on December 23, 1998 (USFWS 1998). The final rule for determination of critical habitat was published on March 21, 1994 (59 FR 13374), and the final designation became effective on April 20, 1994.

Historically, razorback suckers were found in the mainstem Colorado River and major tributaries in Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming, and Mexico (McKinley et al. 1991). Bestgen (1990) reported that this species was once so numerous that it was commonly used as food by early settlers and that commercially marketable quantities were caught in Arizona as recently as 1949. In the Upper Basin, razorback suckers were reported in the Green River to be very abundant near Green River, Utah, in the late 1800s (Jordan 1891; Tyus and Karp 1990).

In the Upper Colorado River Basin, above Glen Canyon Dam, razorback suckers are found in limited numbers in both lentic (lake-like) and riverine environments. The largest populations of razorback suckers in the upper basin are found in the upper Green and lower Yampa Rivers (Tyus 1987). In the Colorado River, most razorback suckers occur in the Grand Valley area near Grand Junction, Colorado, but they are increasingly rare.

This species may reside in the CRVFO planning area since downstream movement barriers have recently been modified to allow for greater fish passage potential. Within the CRVFO planning area, the Colorado River and its 100-year floodplain is identified as Designated Critical Habitat for this species from the Highway 13 Bridge crossing in Rifle, Colorado to Lake Powell.

Humpback chub (*Gila cypha*). The humpback chub (*Gila cypha*) is a large cyprinid fish endemic to the Colorado River Basin (Miller 1946). Adults attain a maximum size of about 480 mm and 1.2 kg (Valdez and Ryel 1997). The humpback chub is currently listed as endangered under the ESA. It was first included in the List of Endangered Species issued by the Office of Endangered Species on March 11, 1967 (32 FR 4001) and

was considered endangered under provisions of the Endangered Species Conservation Act of 1969 (16 U.S.C. 668aa). The humpback chub was included in the United States List of Endangered Native Fish and Wildlife issued on June 4, 1973 (38 FR No. 106), and it received protection as endangered under Section 4(c)(3) of the original ESA of 1973. The latest revised humpback chub recovery plan was approved on September 19, 1990 (USFWS 1990). The final rule for determination of critical habitat was published on March 21, 1994 (59 FR 13374), and the final designation became effective on April 20, 1994.

Today the largest populations of this species occur in the Little Colorado and Colorado Rivers in the Grand Canyon, and in Black Rocks and Westwater Canyon in the upper Colorado River. Hybridization with roundtail chub (*Gila robusta*) and bonytail, where they occur with humpback chub, is recognized as a threat to humpback chub. A larger proportion of roundtail chub has been found in Black Rocks and Westwater Canyon during low flow years (Kaeding et al. 1990; Chart and Lentsch 2000), which increases the chances for hybridization.

This species is not known to occur in the CRVFO planning area. These fish reside far downstream in the mainstem Colorado River near the Colorado-Utah border in the Black Rocks area. Designated Critical Habitat for these fish is located outside of the CRVFO planning area. Within the mainstem Colorado River, Designated Critical Habitat is located from Black Rocks (river mile 137) in T 10 S, R 104 W, Section 25 (Sixth Principal Meridian) to Fish Ford in T 21 S, R 24 E, Section 35 (Salt Lake Meridian).

BLM Sensitive Minnow Family Fishes

Flannelmouth sucker (*Catostomus latipinnis*). Flannelmouth sucker reside in mainstem and tributary streams. Elements of flannelmouth habitat include 0.9 to 6.1 m deep murky pools with little to no vegetation, and deep runs and riffles (McAda 1977; Sigler and Sigler 1996; Bezzerides and Bestgen 2002). Substrates used consist of gravel, rock, sand, or mud (McAda 1977; Sigler and Sigler 1996). Flannelmouth sucker partition habitat use by life stage, with young fish occupying quiet, shallow riffles and near-shore eddies (Childs et al. 1998), and adults occupying deep riffles and runs. Many authors report that flannelmouth sucker do not prosper in impoundments (McAda 1977; Sigler and Sigler 1996; Bezzerides and Bestgen 2002); however, some lakes in the Upper Green River drainage in Wyoming supported large flannelmouth sucker populations historically (Baxter and Stone 1995; Cavalli 2004). Flannelmouth sucker are opportunistic, benthic omnivores consuming algae, detritus, plant debris, and aquatic invertebrates (McAda 1977; Sigler and Sigler 1996; Osmundson 1999; Bezzerides and Bestgen 2002). Food consumed depends on availability, season, and age class (McAda 1977; Sigler and Sigler 1996). Larval and early juveniles consume mostly invertebrates (Childs et al. 1998).

Flannelmouth suckers mature at 4 to 5 years old. Males mature earliest (McAda 1977; Sigler and Sigler 1996). Females ripen at water temperatures of 10 °C, whereas males ripen earlier in the spring (6.1 to 6.7 °C) and remain fertile for longer periods than females (McAda 1977; Sigler and Sigler 1996). Seasonal migrations are made in the spring to suitable spawning habitat (Suttkus and Clemmer 1979; Sigler and Sigler 1996). McKinney et al. (1999; see also Chart 1987; Chart and Bergersen 1992) documented long-range movements (ca. 98 to 231 km) among adult and subadult fish, although the roles these movements play in life history are unclear and need further investigation. Obstructions to movements such as dams may also be an important consideration in the conservation of flannelmouth suckers. Flannelmouth suckers generally spawn over gravel for 2 to 5 weeks. A female produces 9,000 to 23,000 adhesive, demersal (sinking) eggs. After fertilization, the eggs sink to the bottom of the stream, and attach to substrate or drift between crevices (Sigler and Sigler

1996). After hatching, larvae drift downstream and seek out near-shore, low-velocity areas (Robinson et al. 1998).

The flannelmouth sucker is on the Colorado BLM Director's Sensitive Species List and the CDOW list as a species of concern. Threats to the flannelmouth sucker include water quality impairment, disease, competition and predation by non-native fishes, hybridization with other *Catostomid* sp., flow reductions, physical changes, and losses of important habitats.

This species is found primarily in the CRVFO in the mainstem Colorado River. However, it has been documented in the lower Eagle River, Roaring Fork River and the larger tributaries to the Colorado River both above and below Glenwood Springs, Colorado. Flannelmouth suckers generally use these tributary streams in the spring as spawning sites but may reside full time in appropriate habitats.

Bluehead sucker (*Catostomus discobulus*). Bluehead sucker tend to use swifter velocity, higher gradient streams than those occupied by either flannelmouth sucker or roundtail chub. These fish are found in warm to cool streams (20 °C) with rocky substrates (Sigler and Sigler 1996; Bestgen 2000). Bluehead sucker do not do well in impoundments (Sigler and Sigler 1996; Bezzerides and Bestgen 2002). Bluehead sucker partition habitat use by life stage (adult, juvenile, young-of-year [YOY]). Larval fish inhabit near-shore, low velocity habitats (Childs et al. 1998). As they age, they move to deeper habitats farther away from shore, and with more cover (Childs et al. 1998).

Larval and early juvenile bluehead sucker eat mostly invertebrates (Childs et al. 1998). At later lifestages, they are more opportunistic omnivores, consuming algae, detritus, plant debris, and occasionally aquatic invertebrates (Sigler and Sigler 1996; Osmundson 1999; and Bestgen 2000). This species feeds in riffles or deep rocky pools (McAda 1977; Sigler and Sigler 1996).

Bluehead sucker mature at 2 years old or at 127 to 179 mm long. Spawning occurs in shallow areas when water temperatures reach 15.6 °C. Time of spawning varies by elevation, i.e., spring and early summer at low elevations and warm water temperatures, and mid- to late summer at higher elevations and cooler temperatures (Sigler and Sigler 1996). Fecundity is related to length, body weight (Holden 1973), and water temperature (McAda 1977). A 38 to 44 cm female may produce over 20,000 eggs (Andreason 1973). Eggs hatch in 7 days at water temperatures of 18 to 21 °C (Holden 1973). Bluehead sucker, when disturbed during spawning, will compress to the bottom of the stream and can be captured by hand (Sigler and Sigler 1996). After hatching, larval fish drift downstream and seek out near-shore, slow-velocity habitats (Robinson et al. 1998).

The bluehead sucker is on the Colorado BLM Director's Sensitive Species List and the CDOW list as a species of concern. Threats to the bluehead sucker include water quality impairment, disease, competition and predation by non-native fishes, hybridization with other *Catostomid* sp., flow reductions, and physical changes and losses of important habitats.

This species is found primarily in the CRVFO in the mainstem Colorado River. However, it has been documented in the lower Eagle River, Roaring Fork River and the larger tributaries to the Colorado River both above and below Glenwood Springs, Colorado. Bluehead suckers generally use these tributary streams in the spring as spawning sites but may reside full time in appropriate habitats.

Roundtail chub (*Gila robusta*). Roundtail chub utilize slow moving, deep pools for cover and feeding. These fish are found in the mainstem of major rivers and smaller tributary streams. Roundtail chub use a variety of substrate types (silt, sand, gravel and rocks) and prefer murky water to clear (Sigler and Sigler 1996; Brouder et al. 2000). Roundtail chub partition habitat use by life stage (adult, juvenile, YOY).

Juveniles and YOY are found in quiet water near the shore or backwaters with low velocity and frequent pools rather than glides and riffles. Juveniles avoid depths over 100 cm and YOY avoid depths over 50 cm. Juveniles use instream boulders for cover, while YOY are found in interstices (small spaces) between and under boulders or the slack-water area behind boulders (Brouder et al. 2000).

Adults generally do not frequent vegetation and avoid shallow water cover types (overhanging and shoreline vegetation) (Sigler and Sigler 1996; Brouder et al. 2000). Adults are found in eddies and pools adjacent to strong current and use instream boulders as cover (Sigler and Sigler 1996; Brouder et al. 2000). Adults occupy depths over 20 cm and select for velocities less than 20 cm/s. Adults may range 100 m or less over the course of a year, often in search of pool habitats (Siebert 1980; Brouder et al. 2000).

Sigler and Sigler (1996) report that roundtail chub mature at 5 years old or 254 mm to 305 mm long, and that spawning begins in June to early July when water temperatures reach 18.3 °C. However, Peter Cavalli, Wyoming Fish and Game Department, has collected unpublished data (Cavalli 2004) indicating that roundtail chub in Upper Green River drainage lakes may mature at sizes as small as 150 mm in water temperatures of 14.4 °C. Eggs from one female may be fertilized by three to five males over gravel in water up to 9.1 m. A 305 mm female can produce 10,000 eggs, 0.7 mm in diameter. The eggs are pasty white and adhesive, sticking to rocks and other substrate or falling into crevices (Sigler and Sigler 1996).

Roundtail chub are carnivorous, opportunistic feeders. Documented food items include aquatic and terrestrial insects, fish, snails, crustaceans, algae, and occasionally lizards (Sigler and Sigler 1996; Osmundson 1999; Bestgen 2000; Brouder 2001).

The roundtail chub is on the Colorado BLM Director's Sensitive Species List and the CDOW list as a species of concern. Threats to the roundtail chub include interactions of watershed changes, such as reductions in suitable habitat due to impoundment, channel downcutting, water diversion, and groundwater pumping, with the invasion of non-native predatory and competitive species (NatureServe 2008).

This species is found primarily in the CRVFO in the mainstem Colorado River up to and just above Dotsero, Colorado. However, it has been documented in the lower Roaring Fork River and the larger tributaries to the Colorado River below Glenwood Springs, Colorado. Roundtails generally use these tributary streams as spawning areas in the spring.

Special Status Amphibians

Boreal toad (***Bufo boreas boreas***)**.** The boreal toad is a Colorado threatened species that was once common in montane habitats between 7,000 and 12,000 feet in the southern Rocky Mountains. It has experienced dramatic population declines over the past two decades and is listed as a state endangered species in Colorado. The USFWS had classified the southern Rocky Mountain population of the boreal toad in 1995 as a candidate species and found it to be "warranted but precluded" for federal listing. In 2006, this designation was removed while the distinctness of the southern Rocky Mountain population is reevaluated. This species is not

known on any BLM land within the CRVFO, but has been recorded on USFS lands within the planning area. There is suitable habitat on BLM lands within the CRVFO.

Northern leopard frog (*Rana pipiens*). The northern leopard frog is on the Colorado BLM Director's sensitive species list and the CDOW list as a state species of concern. Typical habitats include wet meadows and the banks and shallows of marshes, ponds, beaver ponds, lakes, reservoirs, streams, and irrigation ditches (NatureServe 2008). This frog species typically takes cover in damp niches or in caves when inactive. Habitat for this species exists throughout the CRVFO.

Great Basin spadefoot toad (*Spea hammondii*). The Great Basin spadefoot toad is on the Colorado BLM Director's sensitive species list. This toad is known to occupy a wide variety of habitats including lowlands, foothills, and shortgrass plain. Breeding typically occurs in temporary rain pools. This species is inactive underground for a large portion of the year (NatureServe 2008).

Special Status Aquatic Wildlife

River otter (***Lontra canadensis*).** The river otter, a Colorado threatened species, requires water year-round and feeds on fish and crustaceans. It historically occupied every major river drainage in Colorado, but by the early twentieth century had been extirpated from the state due to trapping, water pollution, and farming activity. In 1976, the CDOW began to reintroduce populations to several drainages, including the Upper Colorado River (Rocky Mountain National Park), the Gunnison River, the Piedra River, and the Dolores River (CDOW 2003).

In 2003, CDOW released a River Otter Recovery Plan that provides protocols for population surveys and additional reintroductions. Recent surveys have found signs of otters in both the Colorado and Roaring Fork Rivers within the CRVFO planning area (BLM 2007j; CDOW 2003).

Special Status Terrestrial Wildlife

Species discussed in this section have been listed by USFWS under the ESA or the State of Colorado or have been placed on the Colorado BLM State Director's Sensitive Species List (Table 3.2.7-1). 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, the BLM cooperates with USFWS to determine and manage habitats to support the species. Candidate species are managed to maintain viable populations, thereby preventing them from federal listing. Species identified by the State of Colorado and Colorado BLM are treated similarly. The BLM, USFWS, and the State of Colorado have developed formal and informal agreements to manage species within the RMP planning area. Consultation is required on any action proposed by the BLM or another federal agency that affects a listed species or that jeopardizes or modifies critical habitat.

Within the CRVFO planning area, the distribution of most of the special status wildlife species is generally known from land health assessment comments, CDOW GIS data, and CNHP GIS data. Limited inventories and surveys have been conducted for special status wildlife species.

Birds

American white pelican (*Pelecanus erythrorhynchos*). The American white pelican is a Colorado BLM sensitive species whose habitat consists of rivers, lakes, and reservoirs. It commonly nests on islands or peninsulas in brackish or freshwater lakes, isolated from mammalian predators. This species usually nests in

open areas, but often near vegetation, driftwood, or large rocks. The American white pelican feeds on fish of little commercial value (e.g., carp, perch catfish, suckers) but may also eat tiger salamanders or crawfish. Breeding colonies have a low tolerance of disturbance and are highly susceptible to predation and pesticide contamination. This species is threatened by loss of breeding and feeding areas. Other threats include consecutive years of drought, which may lower water levels and allow predators access to breeding areas, as well as disturbance, and shooting by humans.

White-faced ibis (***Plegadis chihi***)**.** This species prefers large freshwater marshes and typically nests in colonies in the northern states of Montana, Oregon, Idaho, and Minnesota. This species forages in wet hay meadows, flooded agricultural croplands, marshes, and the shallow waters of ponds, lakes, and reservoirs (Ryder and Manry 1994). Threats to nests, eggs, and young include human disturbances, overgrazing, pesticides, and heavy predation from magpies, ravens, and raccoons (Kingery 1998). Very little habitat occurs within the CRVFO planning area, and few occurrences have been recorded. The white-faced ibis is a Colorado BLM sensitive species.

Barrow's goldeneye (***Bucephala islandica***)**.** The Colorado BLM lists Barrow's goldeneye, a species of duck, as a sensitive species. Habitat includes wooded lakes and beaver ponds in the northwest. Colorado is in the extreme southern portion of its range. This species is a cavity nester and uses nest holes among beetle-killed trees near montane lakes (Kingery 1998). Kingery lists breeding habitat alterations from logging as the major threat to this species. In Colorado, Barrow's goldeneye is known to inhabit and nest in the Flat Tops area. Several occurrences are recorded in the CRVFO.

Northern goshawk (***Accipiter gentilis***)**.** The northern goshawk is a Colorado BLM sensitive species whose habitat consists of large old-growth or mature conifer stands with small openings. In Colorado, northern goshawks prefer coniferous forests for nesting but also use aspen stands (Kingery 1998). Several goshawks are in the CRVFO. Habitat fragmentation from logging is their greatest threat (Kingery 1998).

Bald eagle (***Haliaeetus leucocephalus***)**.** Bald eagles both nest and winter along portions of the Colorado River and its major tributaries within the CRVFO planning area. Wintering bald eagles are generally present from mid-November to mid-April. Large cottonwood trees along the Colorado, Eagle, and Roaring Fork Rivers and major tributaries are used as roosting and perching sites, and these waterways provide the main food sources of fish (self-caught or stolen from other birds) and waterfowl. Upland habitats adjacent to these waterways are used as scavenging areas primarily for winter killed mule deer and elk (USFWS 2006). Other food sources include muskrats, squirrels, rabbits, prairie dogs, and road-killed animals (CDOW 2010d).

Bald eagle nests can be 7 to 8 feet across, in tall trees high above the ground. Nests are typically constructed on dead limbs, and are usually found near water. Females lay one to three eggs, off-white in color. The incubation period is about 35 days (CDOW 2010d). Colorado is a very popular wintering area for bald eagles. In 2001, there were an estimated 51 breeding pairs in the state. The annual midwinter state count shows a stable population of up to 800 eagles (CDOW 2010d).

In the last century, eagle abundance declined nationally due to increased human impacts in primary nesting areas. These impacts included habitat destruction and loss, human disturbance, biocide contamination (dichloro-diphenyl-trichloroethane [DDT]), and illegal shooting (USFWS 2006; CDOW 2010d). Listing under the ESA and banning of DDT and other harmful organochlorine chemicals resulted in significant increases in the breeding population of bald eagles throughout the contiguous 48 States. On February 7, 1990, the

USFWS published an advance notice of a proposed rule to reclassify the bald eagle from endangered to threatened in 43 States where it was classified endangered, and to retain threatened status for the remaining five States (55 FR 4209). On July 12, 1994, the USFWS published the proposed rule for this reclassification (59 FR 35584), and the final rule was published on July 12, 1995 (60 FR 36000). After reclassification, bald eagles continued to improve. On July 6, 1999, the Service published a proposed rule (64 FR 36454) to delist the bald eagle in the contiguous 48 States, and requested public comments (USFWS 2007b). The comment period on the proposal to delist was reopened on February 16, 2006. The final rule on delisting and the Notice of Availability of the draft monitoring plan were published simultaneously in the Federal Register on July 9, 2007 (Volume 72, Number 130). Two other federal laws protect the bald eagle: the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Both laws prohibit killing or otherwise harming eagles, their nests, or eggs. The bald eagle was removed for the Colorado list of threatened and endangered species in 2009 but is currently listed as a BLM sensitive species in Colorado.

Ferruginous hawk (***Buteo regalis***)**.** The ferruginous hawk is common during winter throughout the eastern half of Colorado, with the northern extent of its range limited by the severity of the winter (Andrews and Righter 1992). Ferruginous hawk habitat consists of both grassland and shrubland ecosystems. Primary prey items include rabbits, prairie dogs, and ground squirrels (Kingery 1998).

Nest sites, or the actual physical location of nests chosen by ferruginous hawks, vary throughout the breeding range. Of 2,119 nests described throughout the species' range, the most (49 percent) were located in trees and shrubs, followed by cliffs (21 percent), utility structures (12 percent), on the ground or dirt outcrops (15 percent), haystacks (3 percent), and buildings (less than 1 percent) (Olendorff 1993). Theseestimates did not include studies where artificial nest structures designed specifically for raptors were used.

Junipers are the most commonly used trees for nesting, especially in the juniper forest/shrub-steppe interface in states west of the Continental Divide. Ferruginous hawks have also used pine, willow, cottonwood, and sagebrush (Collins and Reynolds 2005). There are no recorded ferruginous hawk nests in the CRVFO; they are more likely to inhabit the western portion of the planning area.

Habitat loss, decline in prey species, and disturbances during the breeding season are threats to this species (Andrews and Righter 1992). The ferruginous hawk is currently listed as a sensitive species by the USFS and the BLM wherever the species occurs on lands administered by these agencies. The CDOW lists the ferruginous hawk as a species of special concern (CDOW 2002). The ferruginous hawk is protected under the Migratory Bird Treaty Act (MBTA) and is managed as a nongame species by states.

Peregrine falcon (***Falco peregrinus anatum***)**.** The peregrine falcon was removed from the federal list of threatened and endangered species in 1999 and has steadily increased in numbers throughout its range. It is listed as a state species of concern. This species was originally listed due to population declines from DDT-related reproductive failure. It primarily nests within the planning area on cliff ledges, along portions of the Colorado River. At least four known nesting pairs have been noted within the CRVFO planning area.

Sage-grouse (*Centrocercus* spp.). Sage-grouse are considered a sagebrush ecosystem obligate species. Obligate species are those species that are restricted to certain habitats or to limited conditions during one or more seasons of the year to fulfill their life requirements. Sage-grouse are only found where species of sagebrush exist. Sagebrush species provide nesting, brooding, and fall and winter cover as well as forage throughout the year (BLM 2004b).

Each year, male sage-grouse congregate in late winter through spring on leks to display their breeding plumage and to attract hens for mating. A lek is a traditional display area where two or more male sage-grouse have attended in 2 or more of the previous 5 years. The area is normally located in a very open site in or adjacent to sagebrush-dominated habitats. Generally, lek sites are traditional, with the same lek sites used year after year. Taller sagebrush on the outskirts of the leks is necessary as a food source, escape cover, nesting cover for females, and loafing cover during the day. Leks generally occur in sagebrush habitats on slopes (less than 15 per cent) with a south- to east-facing aspect (BLM 2004b). Because leks are typically positioned within proximity of nesting and brood-rearing habitat, they are often considered an excellent reference point for monitoring and habitat protection measures.

Nesting habitat is primarily characterized by big sagebrush communities that have 15 to 38 percent canopy cover and a grass and forb understory. Residual cover of grasses is also important for nesting cover. Most nesting occurs within 2 miles of leks (BLM 2004b).

Habitat loss and fragmentation resulting from wildfire, energy development, urbanization, agricultural conversion, conversion of sagebrush to other vegetation types (e.g., pinyon-juniper woodlands), and infrastructure development are threats to the species (USFWS 2010b).

The negative effects of fragmentation on sage-grouse are diverse and include reduced courtship site persistence, courtship site attendance, winter habitat use, recruitment, yearling annual survival, and female nest site choice (USFWS 2010b).

Invasive plants are also a serious range-wide threat to sage-grouse habitat because they can out-compete sagebrush and are increasing wildfire frequencies, further contributing to direct loss of habitat. Once established, invasive plants reduce and eliminate vegetation essential for sage-grouse food and cover. Sagebrush restoration techniques are limited and have generally been ineffective (USFWS 2010b).

The historic distribution of these species generally coincides with the sagebrush cover type throughout western North America. The trends within the CRVFO planning area for sage-grouse are likely to be decreasing also.

A species-specific account of the two species of sage-grouse within the planning area follows:

Gunnison sage-grouse (***Centrocercus minimus***)**.** The Gunnison sage-grouse is a recently delineated species of grouse that is known to reside in portions of southwestern Colorado and southeastern Utah. This species requires a diverse age-class of sagebrush, as well as open grassland habitats with a diverse forb component. Historical habitat for Gunnison sage-grouse within the CRVFO planning area is sagebrush stands south of the Eagle River. Under the Gunnison Sage-Grouse Range-Wide Conservation Plan (Gunnison Sage-Grouse Range-Wide Steering Committee 2005), which the BLM signed, it shows that sage-grouse, which may or may not be Gunnison sage-grouse, have been collected within the CRVFO planning area (Gunnison Sage-Grouse Range-Wide Steering Committee 2005). Until those specimens are confirmed to be Gunnison sage-grouse, the Range-Wide Conservation Plan does not intend for those areas to be managed as Gunnison sage-grouse habitat. Population declines of this species are due to loss of habitat and habitat fragmentation and degradation from urbanization, agriculture, energy development, and sagebrush control (NatureServe 2006). The Gunnison sage-grouse is listed as a BLM sensitive species and a state species of special concern.

Greater sage-grouse (***C. urophasianus***)**.** The greater sage-grouse is a federal candidate species for listing under the ESA, a Colorado BLM sensitive species, and a Colorado species of concern. Sage-grouse require a diverse age-class of sagebrush and open grassland habitats. Greater sage-grouse have declined dramatically within the past 20 years in large portions of its overall range. This species historically occurred in the larger sagebrush habitats west of Glenwood Springs, between New Castle and Rifle, and south of Interstate 70 near Eagle. Current populations within the CRVFO planning area are north of Eagle, Gypsum, and Wolcott on scattered BLM and private lands (Figure 3.2.7-1, Greater Sage-grouse Habitat). Based on 2004 lek counts, this population of sage-grouse numbers from 304 to 489 (CDOW 2004). Habitat loss and fragmentation from agricultural encroachment, urbanization, lack of fire (which rejuvenates native habitat), and overgrazing are the primary threats to the greater sage-grouse.

Considerable attention has been given to this species since the 1980s, as evidenced by the National Sage-Grouse Habitat Conservation Strategy, released by the BLM in November 2004 (BLM 2004). This conservation strategy provides national sage-grouse habitat conservation guidance for BLM. The plan identifies potential conservation actions that might be implemented in order to maintain and enhance greater sage-grouse populations and habitat (CDOW 2004).

The CRVFO participated in the Northern Eagle/Southern Routt Greater Sage-Grouse Workgroup. The Workgroup completed a population-specific plan, the Northern Eagle/Southern Routt Greater Sage-Grouse Conservation Plan (CDOW 2004), in September 2004. The Northern Eagle/Southern Routt greater sage-grouse population is one of the smaller populations in Colorado, and the portion of the population within the CRVFO is vulnerable to local extirpation. A significant portion of remaining greater sage-grouse habitat in the Northern Eagle portion of the population is managed by the CRVFO. Maintaining the current greater sage-grouse habitat on BLM lands is critical to conserving the population (Rossi 2011) and maintaining range-wide connectivity and genetic diversity. The CRVFO performs habitat treatments to conserve and improve sage-grouse habitat and monitors the population in cooperation with CDOW.

Columbian sharp-tailed grouse (***Tympanuchus phasianellus columbianus***)**.** Columbian sharp-tailed grouse, a BLM sensitive species and a Colorado species of concern, is one of two races of sharp-tailed grouse found in Colorado, the plains sharp-tail and the Columbian. The Columbian uses the high mountain shrub-grassland community and associated edges. Sharptails are most commonly found in high elevation grassland areas interspersed with serviceberry, chokecherry, oakbrush, sagebrush, snowberry, and aspen. Shrubs and small trees play an important role in sharp-tailed grouse ecology, especially in winter when they provide both food and cover. Like sage-grouse, sharp-tailed grouse breed on leks or traditional strutting grounds. Sharptail leks are typically located on knolls or ridge-tops. Males begin displaying in late March or April. After breeding, females build a ground nest in grass or near shrubs. Broods are largely dependent for 6-8 weeks and then disperse. In late fall and winter, the birds form small flocks and are dependent on shrubs for food and cover. In spring the males head toward the leks and the cycle begins again (CDOW 2008a).

Although some limited potential habitat may exist within the CRVFO planning area, only one unconfirmed record exists. Portions of the CRVFO are within the historic range of the species, but populations are now limited to the extreme northwest Colorado. This population of Columbian sharp-tailed grouse was estimated to be a minimum of 6,080 birds in 2001. At the end of 2006, there were 250 known leks, 89 percent of which are on private land. Of the remaining 28 leks on public land, only four occur on BLM-administered land (Hoffman and Thomas 2007), none of which occur within the CRVFO. Within the CRVFO planning area,

mixed mountain shrub habitats are generally associated with steep rugged slopes with few open grassy areas. Thus, important breeding habitat is the main limiting factor for this species in the planning area.

Greater sandhill crane (***Grus canadensis tabida***). Greater sandhill cranes, a Colorado species of concern, from the Rocky Mountain population, winter in Arizona and New Mexico and summer on breeding and nesting habitats in northwest Colorado, Wyoming, Idaho, and Montana. This population of sandhill cranes was estimated at 18,510 birds in 2004 (Sharp et al. 2005). Greater sandhill cranes from the Rocky Mountain population migrate through the CRVFO planning area in the spring and fall. Migrating birds occur on mudflats around reservoirs, in moist meadows, and in agricultural areas. Habitat loss from human development is the major threat to this species. There are no known breeding or nesting grounds in the CRVFO, but cranes are known to nest in Moffat, Routt, Jackson, Grand, and Rio Blanco Counties (Andrews and Righter 1992).

Western yellow-billed cuckoo (***Coccyzus americanus***)**.** The western yellow-billed cuckoo is a federal candidate species that has declined due to loss of riparian habitat from agricultural and water use and road and urban development. Western cuckoos breed in large blocks of riparian habitats (particularly woodlands with cottonwoods (*Populus fremontii*) and willows (*Salix sp.*)). Dense understory foliage appears to be an important factor in nest site selection, while cottonwood trees are an important foraging habitat in areas where the species has been studied in California. In Colorado west of the Continental Divide, the species was probably never common (Bailey and Niedrach 1965; Kingery 1998) and is now extremely rare (Kingery 1998). The yellow-billed cuckoo is an uncommon summer resident of Colorado. The available data indicate that cuckoos do not nest within this broad highlands region, and reveal few records of cuckoos at all in the mountainous region of the state. The MBTA is the only current Federal protection provided for the yellow-billed cuckoo. The MBTA prohibits "take" of any migratory bird, which is defined as: "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect." However, there are no provisions in the MBTA preventing habitat destruction unless direct mortality or destruction of active nests occurs (USFWS 2008b).

No individuals have been recorded or confirmed to nest on BLM lands within the planning area. Limited potential exists for western yellow-billed cuckoo habitat within the CRVFO. Habitat analysis reveals that potentially suitable habitat is predicted at two locations along the Colorado River and one location along the Eagle River in the CRVFO, totaling 197 acres of riparian habitat.

Burrowing owl (***Athene cunicularia***)**.** Burrowing owls, a Colorado state threatened species, are found primarily in short grass prairie and shrubland habitats. This species nests in rodent burrows, and it is most often associated with prairie dog colonies. Primary threats include habitat loss and fragmentation (NatureServe 2006). In Colorado, burrowing owls are considered locally uncommon to fairly common on the eastern plains, and rare to uncommon in mountain parks and on the western slope (Andrews and Righter 1992). Burrowing owl average diurnal (day time) range has been estimated at 3.5 miles for individuals in Wyoming (Thompson 1984). The CRVFO planning area has limited white-tailed prairie dog colonies, so it is unlikely that high numbers of burrowing owls would inhabit the area. However, there is a possibility that they would use ground squirrel burrows, which are found in the CRVFO planning area.

Mexican spotted owl (***Strix occidentalis lucida***)**.** Mexican spotted owls, a state and federally listed species, inhabit dense, mixed-age fir and pine forests in steep, rocky canyons with exposed cliffs. This species also uses canyons in pinyon-juniper woodlands with patches of Douglas-fir (Reynolds 1990). In Colorado, they

occur in lower-elevation forests, usually in deeply incised, rocky canyons in southern Colorado and along the Front Range. The species' core range occurs in central Arizona and New Mexico. They eat a variety of prey, including small- to medium-sized rodents (such as wood rats, mice and voles), bats, birds, lizards, snakes, and spiders (CDOW 2008b)

Threats include habitat loss and disturbance from recreation, overgrazing, road development, catastrophic fire, timber harvest, and mineral development. The highest number of owls ever counted in the state was 20, with seven breeding pairs in 1993. The owl's extremely low numbers, exacting habitat requirements, and low productivity makes them susceptible to extirpation from the state (CDOW 2008b). Limited potential exists for Mexican spotted owl habitat within the CRVFO. Habitat analysis reveals that potentially suitable habitat is predicted at seven locations within the CRVFO planning area, but the planning area is relatively distant from any known active territories. Critical habitat has been designated for Mexican spotted owls within the state of Colorado, although none exists within the CRVFO planning area.

Southwestern willow flycatcher (***Empidonax traillii extimus***). The southwestern willow flycatcher is endangered under ESA and in Colorado. Approximately 900 to 1100 pairs are thought to exist. Extensive loss of breeding habitat led to this species' decline, caused by reduction of surface water from groundwater pumping, changes in flood and fire regimes due to dams, clearing of vegetation, livestock grazing, changes in soil chemistry, and establishment of non-native plants (USFWS 2002b). The species breeds in dense riparian tree and shrub communities associated with wetlands in southwestern North America. Critical habitat was designated in October 2005 for 737 river miles in California, Arizona, Nevada, Utah, and New Mexico within the 100-year floodplain. Southwestern Colorado is included in its breeding range. It is not known or believed to be in the CRVFO.

Mammals

Canada lynx (***Lynx canadensis***). Canada lynx are a federally threatened and Colorado endangered species. In 2000 the Canada lynx was listed under the ESA as a threatened species throughout its range in the contiguous United States. In February 2008 the USFWS proposed to revise the amount of critical habitat designated under the ESA (USFWS 2008c). None of the existing or proposed critical habitat is within the planning area. The reintroduction of the animals in Colorado started in 1999. Lynx from Alaska and Canada were released in Colorado's southern mountains in 1999, 2000, 2003, 2004, 2005, and 2006. A total of 116 lynx kittens are known to have been born in Colorado: 16 kittens in 2003; 39 kittens in 2004; 50 kittens in 2005; 11 kittens in 2006 (CDOW 2010). No dens were found in 2007 or 2008 (CDOW 2010e).

The lynx is found in dense subalpine forest and willow-choked corridors along mountain streams and avalanche chutes, and in areas with deep snow and a high density population of snowshoe hares, its primary prey species (CDOW 2010f; USFWS 2010c). When snowshoe hare populations are low, lynx use a multitude of other prey species, including shrews, mice, voles, tree squirrels, ground squirrels, porcupines, beavers, grouse, and fish. Ungulate carrion (carcasses) may also be consumed (USFWS 2010c).

Lynx are active throughout the year; their large hind feet help them move across heavy snow (CDOW 2010f). Individual lynx maintain large home ranges, generally between 12 to 83 square miles. The size of lynx home ranges varies depending on abundance of prey, the animal's gender and age, season, and the density of lynx populations. When densities of snowshoe hares decline, for example, lynx enlarge their home ranges to obtain sufficient amounts of food to survive and reproduce (USFWS 2010c).

Lynx breed in late winter, and after a gestation period of about 9 weeks, females produce a litter of about four kittens in April or May (CDOW 2010f). The male lynx does not assist with rearing young (USFWS 2010c). CDOW conducts an annual search for lynx kittens. Successful reproduction was documented in 2004, 2005, 2006, and 2009. No dens were documented in 2007 or 2008. Researchers believe that the lack of lynx reproduction in 2007 and 2008 could be related to a decline in the snowshoe hare population (CDOW 2010e).

Timber harvest, recreation, and their related activities, such as road construction, are the predominant land uses affecting lynx habitat. Lynx movements may be restricted by high traffic volume on roads that bisect suitable lynx habitat, and in some areas, mortalities due to road kill are high (USFWS 2010c). Current habitat quantity and quality trends throughout the species range are generally declining, which is likely the trend in Colorado. The viability of this species is of concern because (1) population structure and distribution of the species is poorly understood, (2) populations throughout its range are generally decreasing, and (3) the species is extremely rare in Colorado (USFS 2002).

Within the CRVFO planning area, potential lynx habitat is associated mainly with lodgepole pine, subalpine fir, Engelmann and blue spruce, and aspen cover types. Potential lynx habitat is found in the subalpine and upper montane forest zone, between approximately 8,000 and 11,300 feet elevation. Lower montane forests are likely to be important for movement and dispersal. Most potential lynx habitat within the planning area is of marginal quality, with the best habitats abutting the White River and Routt National Forests. Winter foraging and denning habitat for lynx includes subalpine fir, lodgepole pine, and Engelmann and blue spruce cover types, with abundant prey species or dense woody debris. Conifer-aspen forests with dense regeneration or with an extensive shrub and woody debris understory may be important for snowshoe hare or other prey species (Lynx Biology Team 2000). Extensive stands of pure aspen with shrub and grass understory species may provide some summer foraging habitat, but are generally poor as winter foraging areas unless they are mixed with spruce-fir or young lodgepole pine stands.

Four landscape linkage areas comprised of USFS, BLM, private, and state lands are located within the CRVFO planning area. Acres of BLM lands within these four linkages are as follows: Castle Peak – 46,700 acres, Egeria – 12,850 acres, Glenwood – 5,850 acres, and State Bridge – 11,650 acres. These linkages may serve as travel corridors for lynx during dispersal movements, and can be maintained by management activities or lost to developments. They are not "corridors" in the limited sense of travel routes, but are broad areas of habitat where animals can find food, shelter, and security (USFS 2008a). The corridors link larger forested landscapes located on adjacent White River and Routt National Forest lands. Portions of each linkage offer the components necessary to support and possibly sustain lynx; however, the majority of vegetation within these linkages is not lynx habitat. These plant communities provide habitat for alternative prey species and cover for movement and dispersal.

The CRVFO also contains small portions of several lynx analysis units (LAUs). An LAU includes at least as much area as required by an individual lynx, from about 25 to 50 square miles, and is a unit for which the effects of a project would be analyzed (Ruediger et al. 2000). Acres of BLM lands within the LAUs in the CRVFO area are Battlement – 350 acres, Clinetop – 350 acres, Coffee Pot – 2,350 acres, Divide Creek – 1,300 acres, and Quartzite – 950 acres (Figure 3.2.7-2, Canada Lynx LAUs and Linkages).

Bats (Townsend's big-eared bat [*Corynorhinus townsendii*], fringed myotis [*Myotis thysanodes*], big free-tailed bat [*Nyctinomops macrotis*], and spotted bat [*Euderma maculatum*]). Natural caves, abandoned mines, and adits (mine entrances) provide bat habitat (e.g., winter, summer, day, swarming,

hibernacula and maternal roost). Bats typically forage on a variety of insects and may use a variety of habitats, including pinyon-juniper woodlands, riparian areas, montane forests, and semidesert shrublands. Little is known about the population sizes and distribution of bats within the CRVFO planning area. All of the bats listed above are BLM sensitive species, and the Townsend's big-eared bat is also a Colorado species of concern.

White-nose Syndrome (WNS) is a fungal disease that has killed more than one million hibernating bats in the US (USFWS 2011). First documented in eastern New York in 2006, it has spread across the northeast and mid-Atlantic United States during the past 4 years and continues unchecked. This disease is named for the white fungus evident on the muzzles and wings of affected bats. Bats affected by WNS eventually die from starvation; however, the factors causing this starvation are unknown.

WNS is believed to be transmitted primarily between bats; however, aspects of the geographic spread suggest that humans may transmit WNS from infected sites to clean sites. Laboratory tests performed at the USGS National Health Center in Madison, Wisconsin, have confirmed that a cave myotis (*Myotis velifer*) collected alive on May 3, 2010, from a cave in northwestern Oklahoma has tested positive for the fungus *Geomyces destructans* (USFWS 2010b). The cave myotis is the first uniquely western bat species to be infected by the fungus. This indicates that WNS is not isolated to bat species found only in the eastern US and will likely spread to other western states. The potential impact of WNS is considered to be significant due to the highly beneficial ecological and economic roles played by bats.

In an effort to stay ahead of this serious issue, the BLM has provided interim direction to Field Offices on how to prepare for the anticipated occurrence of WNS on BLM-administered lands nationwide. As of July 2010, the USFS indicated that it would close caves on federal forests and grassland in Colorado, Kansas, Nebraska, and most of Wyoming and South Dakota. This would limit human access to caves, which would hopefully prevent further spread of the disease, as scientists believe it can be transported from cave to cave on clothing, boots, cave gear, and other equipment. The closure is expected to be in effect for 12 months (USFS 2010).

Gray wolf (***Canis lupus***)**.** Gray wolves once inhabited Colorado but were eradicated by the mid-1930s. Over the past decade, USFWS has reintroduced gray wolves into Wyoming, Idaho, Montana, New Mexico, and Arizona. Wolves can disperse over long distances, and some observers believe it is only a matter of time before wolves start migrating into Colorado from the north and south. In fall 2008, a radio-collared female dispersed from a pack in southwest Montana through Wyoming, Idaho, and northern Utah. In spring 2009 she traveled near Vail, Colorado, and was found dead in northwest Colorado soon after (USFWS 2010e.

Gray wolves within the Northern Rocky Mountain Distinct Population Segment (NRM DPS), which includes Idaho, Montana, Wyoming, and parts of Washington, Oregon, and Utah, were delisted in 2009, put back on the list in 2010 by court order, and delisted again in 2011, with the exception of wolves occurring in Wyoming. Because Wyoming does not have an approved state management plan, wolves there remain regulated under ESA as an "experimental population". Gray wolves that may occur within the planning area would likely be individuals from the delisted areas. Outside the NRM DPS, the wolves are still protected by the ESA and by the state (they are state listed endangered). No critical habitat has been designated for the endangered population of gray wolves that may occur in Colorado (USFWS 2010e).

Black-footed ferret (***Mustela nigripes***)**.** Black-footed ferrets, a state and federally endangered species, historically occurred throughout much of the western US, where large colonies of prairie dog towns were present. This species was likely never common within the CRVFO planning area due to the lack of suitable habitat. No black-footed ferrets have been documented in the CRVFO planning area, and the only known ferret population in Colorado is a recently reintroduced population in Moffat County. The CDOW's 1988 surveys identified six prairie dog colonies within the CRVFO planning area. Historic data and records indicated that 12 prairie dog colonies may have existed within the CRVFO planning area boundary. The largest known site is approximately 150 acres of mostly private land near Interstate 70 at DeBeque. Five smaller towns, all approximately 20 acres in size, are north of Rifle, north of Gypsum on private lands, east of the Eagle airport on private lands, and south of the Eagle airport on BLM lands. The USFWS has determined that, at a minimum, potential habitat for black-footed ferrets must include one white-tailed prairie dog colony of greater than 200 acres or a complex of smaller colonies within a 4.3-mile radius (USFWS 1989). None of the prairie dog colonies within the CRVFO planning area is of a size or prairie dog density sufficient to sustain black-footed ferrets. To date, no critical habitat has been designated for the black-footed ferret.

Reptiles

Midget faded rattlesnake (***Crotalus viridis concolor***)**.** Little is known about the midget faded rattlesnake, particularly within the planning area. This snake ranges from across Utah and portions of Wyoming into west-central Colorado, which is the eastern margin of this species' range. Midget faded rattlesnakes are found within most habitat types in the range. This species is of concern in Colorado because of the small number of records and restricted range. Threats include development, outright killing, and illegal collection of individuals for commercial purposes. This species is listed by the Colorado BLM as a sensitive species and by the State of Colorado as a species of concern.

Utah milk snake (***Lampropeltis triangulum taylori***)**.** Little is known about the Utah milk snake, particularly within the planning area. This snake ranges from across Utah and portions of Wyoming into west-central Colorado, which is in the eastern margin of this species' range. Utah milk snakes occupy various habitats, but many records have been noted within and near floodplains. This species is of concern in Colorado because of the small number of recorded occurrences and restricted range. Threats to this species include development, outright killing, and illegal collection of individuals for commercial purposes. The Utah milk snake is listed by the Colorado BLM as a sensitive species.

Land Health Assessment Observations

As of the end of 2010, Land Health Assessments have been conducted on 12 of the 13 landscapes within the CRVFO. According to the assessment results, special status wildlife species habitat condition varies across the CRVFO planning area. Detailed Land Health Assessment results are described in the Analysis of the Management Situation (AMS) or are available from the CRVFO. Population numbers, occurrences, and habitat conditions for many species are lacking; Canada lynx, bald eagle, and greater sage-grouse are the three species with the most information collected. In general, habitats on BLM lands for both lynx and bald eagles are in good condition, providing productive habitat for these species. Although some areas are providing productive sage-grouse habitat, overall, sage-grouse habitat is in fair to poor condition. Habitat quality and quantity has been reduced by fragmentation, livestock and wild ungulate grazing, and pinyon-juniper encroachment.

Characterization

Indicators

Primary indicators for special status species are their population numbers, population viability, and habitat quality. According to the Colorado Standards for Public Land Health, Standard 4, special status species and their habitats are being maintained or enhanced when:

- All the indicators associated with the plant and animal communities standard apply, including:
    - Noxious weeds and undesirable species are minimal in the overall plant community.
    - Native plant and animal communities are spatially distributed across the landscape with a density, composition, and frequency of species suitable to ensure reproductive capability and sustainability.
    - Plants and animals are present in mixed age classes sufficient to sustain recruitment and mortality fluctuations.
    - Landscapes exhibit connectivity of habitat or presence of corridors to prevent habitat fragmentation.
    - Photosynthetic activity is evident throughout the growing season.
    - Diversity and density of plant and animal species are in balance with habitat or landscape potential and exhibit resilience to human activities.
    - Appropriate plant litter accumulates and is evenly distributed across the landscape.
    - Landscapes composed of several plant communities that may be in a variety of successional stages and patterns.
- There are stable and increasing populations of endemic and protected species in suitable habitat.
- Suitable habitat is available for recovery of endemic and protected species.

For most of the special status species, habitat loss, degradation, and fragmentation have been and remain the primary cause of their imperiled status. Some species suffer competition or predation from species that have expanded their range or that have been introduced. Some wildlife species have also suffered from historic efforts to extirpate them.

Trends

Special Status Plants

Many of the special status plants have suffered either declines in numbers of individuals or populations, or destruction or impairment of habitat, which puts the long-term viability of these species at risk. Loss of habitat or decline in habitat conditions have resulted from many management actions, such as historic overgrazing, exploration and development of natural gas and oil shale resources, unrestricted OHV activity, and residential development. Periodic drought has also contributed to mortality of some special status plants and reduced the quality of habitat in some areas, further stressing populations of these species. The BLM has implemented some management actions to protect or enhance existing habitat, but most special status plant species continue to remain at levels that are biologically unstable. Further inventory and monitoring of these populations will facilitate timely and focused management responses to factors that may affect them.

In 2002, the Glenwood Springs RMP Evaluation Report assessed the adequacy of the 1984 RMP (BLM 1984b) management guidelines with respect to current resource use. The conclusion reached in the later report was that current use and increases in land use demands, such as increases in OHV use, oil and gas development, urbanization, and habitat fragmentation, are not being adequately addressed. It also found that changes in laws, regulations, and BLM policies have resulted in the need to update planning guidelines and that most RMP amendments still have not addressed current management issues adequately. However, two plans have improved management guidance since the 1984 RMP. These include the CRVFO Oil and Gas Leasing and Development ROD and RMP Amendment (BLM 1999b), which included an NSO stipulation (GS-NSO-12) regarding habitat of federally listed, proposed or candidate plant and wildlife species. It also included a CSU stipulation (GS-CSU-3), which states that the BLM may require special design, construction, and implementation measures, including relocation of operations by more than 200 meters, for the protection of those plant and wildlife species listed as sensitive by the BLM and for significant natural plant communities. For plants, habitat areas include occupied habitat and habitat necessary for the maintenance or recovery of the species or communities. In addition, the CRVFO Fire Management Plan (FMP) (BLM 2004a) provided additional protection for the Colorado hookless cactus with respect to fire suppression.

Colorado hookless cactus. *Sclerocactus* inventories have been conducted in the CRVFO periodically since 1985. Intensive surveys conducted in 2009 and 2010 located several new cactus occurrences and expanded the areal extent of several previously known sites. As a result, the total number of *Sclerocactus* documented at 18 sites within the CRVFO is higher now than in previous years. Six sites have stable or increasing numbers with a variety of age-classes present. However, 11 of the 18 sites have declining numbers of cactus. This indicates that the overall population trend appears to be downward at most sites (BLM 2011). Most mortality appears to be caused by insects or disease. Domestic livestock grazing of the plant has not been observed, but incidental trampling of plants may contribute to some mortality.

At most sites, there is a trend toward older age-class plants with inadequate recruitment to sustain the population. Declining habitat conditions may be partly responsible for the lack of seedling recruitment. Invasion by cheatgrass seems to be the most detrimental habitat change affecting the cactus. Cheatgrass has been noted at many of the cactus sites and is the dominant vegetation at several sites. Cacti are long-lived plants, and the older individuals seem to be able to survive in a dense canopy of cheatgrass, but recruitment of seedlings and young in this environment is difficult.

Another significant concern for Colorado hookless cactus appears to be loss of habitat as suitable habitat is developed for oil and gas production and residences. Pipelines and well pads are within close proximity to several cactus sites which increases the risk of indirect impacts on the plants in the form of noxious weed invasions, reduction in suitable habitat for population expansion, and reduction in habitat for pollinators.

Although there is a minor amount of OHV activity near known locations of the cactus within the RMP planning area, more activity has been observed near cactus habitat outside of the planning area. Unrestricted, this OHV activity could destroy much of the occupied and potential habitat.

Ute ladies' tresses. Monitoring conducted annually since 2007 has found no human-caused alterations or impacts to the occurrences on BLM land. Population numbers at the BLM occurrence have fluctuated annually, but have generally been stable or increasing. The BLM occurrences are fairly small; however, they are adjacent to larger occurrences on private lands. Potential impacts to private lands include a proposed residential development plan. The development plan includes proposed new trails immediately adjacent to the

orchid population on public land. Impacts could include trampling from foot, horse, or bicycle traffic. Changes in hydrology may also be impacting the species as some landowners are changing irrigation practices from flood irrigation, which often leads to subirrigated soils, to sprinkler systems which use water more efficiently and tend to result in drier soil conditions not conducive to the orchid.

Parachute penstemon. The three populations of the species that occur wholly or largely on private land are fairly large (greater than 500 plants each). The largest population on BLM-administered land in the CRVFO was determined to support between 500 and 1,000 plants. Trend monitoring of this occurrence began in 2004. The data indicate that the population numbers at this site are relatively stable and plants are in a variety of age-classes, indicating recruitment is occurring. A portion of the habitat at this site is threatened by road maintenance activities.

The second largest population of Parachute penstemon on BLM-administered lands has declined from "hundreds of plants" in 1994 to two plants in 2010. The factors contributing to the decline of this population appear to be natural in origin as no human-caused factors have been observed. Livestock grazing is not thought to be a factor in the decline, as the area is too steep and sparsely vegetated to attract much livestock grazing. The steepness of the slope also restricts OHV use, and no noxious weeds or other invasive species have been documented at the site.

Natural gas production has become a significant threat to this species, with increased energy development underway in the region in which these plants occur. Oil shale development is also a serious threat (NatureServe 2006). Other possible threats include grazing, recreation, and habitat fragmentation from roads. Road and communication tower maintenance could also cause habitat degradation (USFWS 2005).

DeBeque phacelia. DeBeque phacelia is known from only three small sites within the CRVFO. At one site, a pipeline was installed immediately adjacent to the occupied habitat. The surface disturbance associated with the pipeline construction resulted in a dramatic increase in weedy species within the DeBeque phacelia habitat. DeBeque phacelia has not been found there since the pipeline was built. DeBeque phacelia is inherently vulnerable to habitat loss by virtue of it being restricted to barren and semibarren habitat on only specific members of the Wasatch geological Formation that has a limited distribution within the Piceance Basin (Ladyman 2003). The habitat coincides with high quality natural gas reserves and has historically been affected by activities associated with resource extraction. Current and future levels of resource extraction activity are likely to be substantial. Activities that lead to significant soil disturbance, or progressive soil erosion, would likely eliminate or sharply reduce the seed bank, which appears to be the mechanism by which populations survive. Therefore, all actions that cause significant disturbances, including mechanized vehicle traffic and intensive hoof action, are threats (Ladyman 2003).

Harrington's penstemon. Threats to the persistence of Harrington's penstemon include motorized recreation, exotic species invasion, oil and gas development, habitat conversion to cropland and pasture, residential development, grazing by domestic and wild ungulates, and climate change (Spackman et al. 2006). In addition, ROWs and some range development projects also pose a threat to occupied and potential habitat for Harringotn's penstemon. Some sites with Harrington's penstemon habitat are declining in condition due to plant succession resulting in increased density of sagebrush, fewer perennial grasses and forbs than expected, and widespread encroachment of pinyon pine and juniper trees, which eventually out-compete the sagebrush and its associated species, such as Harrington's penstemon.

Roan Cliffs blazing star. The primary threats to the species are oil and gas, and oil shale development. Livestock trampling has been observed at one atypical flatter site, but generally slopes are too steep and unstable for OHV activity.

Special Status Fish

The alteration of habitats due to construction and operation of large dams, which capture sediment, reduce water temperatures, change river morphology below the dams, and cut off migration corridors, is one of the major factors that have contributed to the decline of these special status species. Factors that have contributed to the decline of these species include water quality impairment, disease, non-native fishes, hybridization, flow reduction from water diversions and other water-depleting activities, physical changes and losses of important habitats, and introductions of non-native predatory sport fish species, such as smallmouth bass (*Micropterus dolomieu*), northern pike (*Esox lucius*), and channel catfish (*Ictalurus punctatus*), and various trout species, such as the brown, rainbow, and brook. A recovery program for the four Colorado River endangered fishes, managed by USFWS, has been underway for several years.

Special Status Wildlife

By definition, the populations of all special status wildlife species have historically suffered downward trends. Management efforts by the BLM, USFWS, CDOW, and others have reversed the downward trend for a number of these populations, but none of the populations is 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 wildlife species. For example, population viability for special status plant, fish, and amphibian species varies with hydrologic conditions. Drought conditions in the 1990s reduced the amount or quality of habitat in some areas, further stressing populations of these species.

3.2.8 Cultural Resources

Cultural resources are the material and physical remains of prehistoric and historic human activity, occupation, or endeavor. Natural features, such as mountains and rivers, of importance in human history may also be considered cultural resources. Overall, these resources, which are fragile and nonrenewable, embody characteristics and information specific to the cultural group who lived in the area and produced these resources, and to the period during which they were created. As such, each unique resource is important in and of itself.

The protection of cultural resources on BLM land is provided for by an extensive framework of laws, regulations, executive orders, and formal agreements. These laws and regulations have evolved over the past century to create a complex but strong policy for managing cultural resources for public benefit. Important pieces of cultural resources legislation and public directive are listed in Table 3.2.8-1, Cultural Resource Mandates and / or Authorities.

Particularly relevant pieces of legislation concerning BLM cultural resource management are Section 106 of the National Historic Preservation Act (NHPA) (16 USC 470f) and Section 110 of the NHPA (16 USC 470h2). Section 106 specifically requires Federal agencies, including the BLM, to take into account the effects of their activities on significant cultural properties, and specifies the procedures for meeting the statutory responsibilities. The NHPA also established the NRHP, which is a national program that coordinates and supports public and private sectors in the identification, evaluation, and protection of historic and archaeological resources. The NRHP provides an official listing of the nation's historic places deemed worthy of preservation.

The BLM has entered into a national Programmatic Agreement (PA) with the Advisory Council on Historic Preservation (ACHP) and the National Conference of State Historic Preservation Officers on planning for and managing historic properties under BLM's jurisdiction or control. In each state that was a party to the PA, the BLM has also developed protocol agreements with the state historic preservation office. The national PA and the Colorado Protocol provide alternative procedures for implementing 36 CFR 800 and substitutes for Sections 106, 110, 111(a) and 112 (a) of the NHPA. These procedures allow the BLM more flexibility in identifying those cultural resources that meet criteria listed in 36 CFR Part 60.4 for National Register eligibility and determining effects according to 36 CFR 800.9 without consulting SHPO for each routine undertaking. The protocol outlines how the BLM and SHPO would continue to interact, cooperate, and share information to ensure that the alternate procedures are consistent with the goals of the NHPA.

Section 110 (16 USC 470h-2) of the NHPA provides the legal basis for the historic component of BLM's cultural program. Section 110 prescribes to Federal agencies and initiates a preservation program for each agency, which is responsible for both collecting information about cultural resource sites in a particular planning area, as well as identifying sites eligible for nomination to the NRHP.

Based on Section 110 of the NHPA, Federal agencies, including the BLM, are required to identify, evaluate, and nominate to the NRHP significant cultural properties in Federal ownership or control. The significance of historic properties, the factor which determines whether management of a specific cultural resource site is mandated, is determined by evaluating the property against the guidelines set out in 36CFR 60. Historic properties are defined as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register. The term includes, for purposes of these regulations, artifacts,

Table 3.2.8-1
Cultural Resource Mandates and/or Authorities

Laws and Proclamations
Antiquities Act of 1906 (PL 59 – 209; 34 Stat. 225; 16 United States Code [USC] 431 – 433)
Historic Sites Act of 1935 (PL 74 – 292; 49 Stat. 666; 16 USC 461)
Reservoir Salvage Act of 1960, as amended by the Archaeological and Historic Preservation Act of 1974 (PL 86 – 523; 74 Stat. 220, 221; 16 USC 469; PL 93 – 291; 88 Stat. 174; 16 USC 469)
National Historic Preservation Act of 1966, as amended (NHPA) (PL 89 – 665; 80 Stat. 915; 16 USC 470)
National Environmental Policy Act of 1969 (NEPA) (PL 91 – 190; 83 Stat. 852; 42 USC 4321)
Archaeological and Historic Preservation Act of 1974 (AHPA) (16 USC 469 – 469C)
Federal Land Policy and Management Act of 1976 (FLPMA) (PL 94 – 579; 90 Stat. 2743; 43 USC 1701)
American Indian Religious Freedom Act of 1978 (PL 5 – 431; 92 Stat. 469; 42 USC 1996)
Archaeological Resources Protection Act of 1979 (ARPA) (PL 96 – 95; 93 Stat. 721; 16 USC 470AA et seq.), as amended (PL 100 – 555; PL 100 – 588)
Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) (PL 101 – 601; 104 Stat. 3048; 25 USC 3001)
Regulations
36CFR Part 7 – Special Regulations, Areas of the National Park System
36CFR Part 60 – National Register of Historic Places (NRHP)
36CFR Part 79 – Curation of Federally Owned and Administered Archaeological Collections
36CFR 800 – Protection of Historic Properties
43CFR Part 3 – Preservation of American Antiquities; implementing regulations for the Antiquities Act
43CFR Part 7 – Protection of Archaeological Resources
43CFR Part 10 – Native American Graves Protection and Repatriation Act [NAGPRA] Regulations; Final Rule
Executive Orders
Executive Order 11593 – Protection and Enhancement of the Cultural Environment
Executive Order 13007 – Providing for American Indian and Alaska Native Religious Freedom and Sacred Land Protections
Executive Order 13084 – Consultation and Coordination with Indian Tribal Governments
Executive Order 13195 – Trails for America in the 21st Century
Executive Order 13287 – Preserve America
BLM Cultural Resource Mandates
BLM Manual 8100 – The Foundation For Managing Cultural Resources
BLM Manual 8110 – Identifying and Evaluating Cultural Resources
BLM Manual 8120 – Tribal Consultation Under Cultural Resource
BLM Manual 8130 – Planning For Uses Of Cultural Resources
BLM Manual 8140 – Protecting Cultural Resources
BLM Manual 8150 – Permitting Uses of Cultural Resources
BLM Manual 8160 – Preserving Museum Collections
BLM Manual 8170 – Interpreting Cultural Resources for the Public
BLM Departmental Manual Part 411 – Museum Property Management
BLM Handbook H-8120-1 – General Procedural Guidance for Native American Consultation
BLM Emergency Fire Rehabilitation Handbook, H-1742
Agreements
Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers regarding the manner in which the BLM will meet its responsibilities under the NHPA (1997).
State Protocol Agreement between the Colorado State Director of BLM and the Colorado State Historic Preservation Officer (SHPO) regarding the manner in which BLM will meet its responsibilities under the NHPA and the National Programmatic Agreement (NPA) among the BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers (NCSHPO) (1998).

records, and remains that are related to and located within such properties. The term "eligible for inclusion in the National Register" includes properties formally determined as such by the Secretary of the Interior and all other properties that meet National Register listing criteria" (quoted from 36 CFR, 800.2[e]; compare National Historic Preservation Act, Section 301, Appendix 5). Significant cultural properties can also include Heritage Areas or Traditional Cultural Properties (TCP). TCPs are defined as cultural properties that are associated with cultural practices or beliefs of a living community that (a) are rooted in that community's history and (b) are important in maintaining the continuing cultural identity of the community. Also, "Culture (is) a system of behaviors, values, ideologies, and social arrangements. These features, in addition to tools and expressive elements such as graphic arts, help humans interpret their universe as well as deal with features of their environments, natural and social. Culture is learned, transmitted in a social context, and modifiable. Synonyms for culture include 'lifeways,' 'customs,' 'traditions,' 'social practices,' and 'folkways'" (quoted from Parker and King 1998). According to this code of regulations, a property is significant, and therefore eligible for nomination to the NRHP, if it possesses the following characteristics:

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that

a) Are associated with events that have made a significant contribution to the broad patterns of our history.

b) Are associated with the lives of persons significant in our past.

c) Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

d) Have yielded, or may be likely to yield, information important in prehistory or history.

Although typically only properties 50 years or older may be considered significant, a number of exceptions apply for properties of unusual or exceptional significance (36 CFR 60).

The determination of significance (i.e., NRHP eligibility) with regard to cultural resource sites is an exceedingly important process within the context of BLM cultural resource protection programs, as only sites identified as NRHP-eligible and sites that require additional data for significance evaluation as potentially eligible sites—are entitled to resource management considerations. Sites evaluated as eligible or potentially eligible are protected through site avoidance. If avoidance is not possible, a mitigation strategy is developed to mitigate adverse impacts to sites. Mitigation often involves data recovery excavations that can be very time consuming and expensive. Sites evaluated as not eligible for the NRHP after complete identification, description, and significance evaluation are eliminated from further resource management considerations. BLM has the responsibility to protect cultural resources on non-federal lands for certain Section 106 undertakings. However, BLM has no responsibility for their long term protection. Cultural resource sites are owned by the landowner.

Prehistoric cultural resources are generally evaluated with respect to criterion d, as set out by 36CFR 60. This evaluation criterion pertains to a site's potential for yielding scientifically valuable information. The measure of the importance of the scientific data is based on research questions widely recognized as appropriate by the scientific community. Sites most likely to yield these important data are those with intact cultural deposits,

where artifacts and features are relatively undisturbed. In addition to retaining contextual integrity, sites with the highest research value are those likely to contain cultural features. Hearths, storage, or habitation structures often yield charcoal for radiocarbon dating, in addition to macrobotanical remains (plant remains recovered from archaeological contexts that can be seen with the naked eye), palynological remains (pollens and spores), and faunal (or animal) remains that can provide information on subsistence practices. Associated datable artifact assemblages may also be obtained. Sites with artifacts diagnostic of a particular temporal period or cultural group are also generally regarded as having higher research potential than those lacking diagnostic artifacts. Sites attributable to a specific chronological unit can be used to address specific research questions and are regarded as important resources. Chronological units typically employed in the planning area include the Paleoindian era (11,400 to 7,400 B.C.), the Archaic era (7,400 to 250 B.C.), the Formative era (400 B.C. to A.D. 1300), and the Protohistoric era (A.D. 1300 to 1881). A more complete description of these prehistoric units is provided in Colorado Prehistory: A Context for the Northern Colorado River Basin (Reed and Metcalf 1999). Additionally, a complete analysis of the types of prehistoric sites present in the planning area is provided in a recent Class I cultural resource overview for the CRVFO (Reed et al. 2008).

Historic sites can meet any of the four criteria for eligibility to the NRHP. Frequently, however, the focus is on architectural significance or association with events or individuals of historical importance. Site-specific historical research is often warranted after a historic site is identified, to determine whether it was associated with an important individual or event. Additionally, the value of historic sites as archaeological resources should not be overlooked. When considering a historic site's archaeological value, the condition of structures or burial of cultural deposits are not as important as whether the site can answer questions of particular interest about the past. Sites that can be confidently ascribed to a particular historic theme and subtheme are generally regarded as having more research value than sites that cannot be ascribed to a theme. Themes are the most effective way of identifying and nominating properties because they provide a comparative analysis of properties associated with a specific area of history, such as transportation, water control, settlements, agriculture, industry, or recreation. In order to make the case for significance, organizing resources by themes provide a historic context so that significance may be judged for a number of related properties. Significant historic archaeological resources are those that are relatively undisturbed, that can be attributed to a specific theme, and that retain sufficient artifacts and features to permit further study. Linear cultural resources such as roads, trails, and ditches generally possess little archaeological value, though in some instances they may retain engineering significance or be associated with important historic events. They may, however, have other historic site types associated with them that are important archaeological resources, the proper interpretation of which may depend on identifying the linear site. Major historic themes employed in the analysis of historic site importance include mining, rural agriculture, settlements, industry, US government and military, transportation, public works, tourism and recreation, and ethnicity (Church et al. 2007). A comprehensive breakdown of historic site types within the planning area is provided in a Class I resource overview for the CRVFO planning area.

In addition to the protection of historic properties, Federal agencies, including the BLM, are also required to take into account the effects of federal undertakings on traditional cultural properties. Although there have been no comprehensive efforts to identify TCPs within the planning area, a number of resources of this type are known. Consultation with Native Americans has indicated that lands in the planning area include part of ancestral homelands, thereby increasing the potential of TCPs and sacred sites. A few cultural resource sites are known to have specific traditional cultural importance; known religious sites and culturally sensitive areas exist that are of interest to Native American Tribes.

Based on a series of amendments to the NHPA, TCPs must now be identified prior to commencement of potentially destructive federal undertakings, much as archaeological sites are, and their significance must be evaluated. TCPs may be eligible for nomination to the NRHP if there is reason to believe that they are significant to the cultural group with which they are associated; significance is usually assessed based on information obtained through consultations with elders and other knowledgeable individuals from within a particular cultural group. The tribal consultation process, although introduced by the 1966 NHPA, was substantially strengthened by the 1992 amendment to this act.

To aid the BLM in managing cultural resources under its jurisdiction, all sites on CRVFO land have been classified into one or more of BLM's cultural resource use categories (Reed et al. 2008). These use categories, which include scientific use, conservation for future use, traditional use, public use, and experimental use, are defined in BLM Manual Guidance 8110, Identifying and Evaluating Cultural Resources (BLM 2004c). Sites in the scientific use category have intact cultural deposits. The conservation for future use category is reserved for especially fragile and unique resources. Traditional cultural properties include human burials and sites identified by BLM archaeologists as having special value to Native American Tribes or other ethnic or social groups. Public use sites include prehistoric sites that have yielded particularly valuable information or that have features sufficiently suitable for public interpretation, whether or not they are NRHP eligible. The category also includes historic sites that have visual appeal or that are still in current use, such as ditches, bridges, and roads. Experimental use properties include sites well suited for controlled scientific study, even when such study results in substantial alteration to or loss of the site. Insignificant sites are classified for discharge from use. Use categories are a dynamic classification that can change for a specific site as additional cultural information is gathered.

The sites in the various use categories are subjected to a variety of threats. Human activities involving ground disturbances comprise a major threat to sites in all categories except the "discharge from use" category. When sites are on BLM lands or are associated with a federal undertaking, the Section 106 process requires consideration of the effects of the action on the integrity of the site, but not necessarily prescribing preservation or archaeological data recovery excavations. All forms of development, grazing, OHV use, wildfires, and vegetation treatments can have impacts on sites through direct disturbance, access leading to vandalism or inadvertent damage, and the acceleration of natural processes such as erosion. Natural soil erosion is also a great threat to sites, but generally is too pervasive to treat.

Particularly fragile sites in the "conservation for future use" category include perishable structures such as wickiups and tree platforms. Brush structures may be destroyed by burning, vegetation treatments, cattle, vehicle use, and natural deterioration. Brush structures are unlikely to last very long in the archaeological record and are important for understanding prehistoric sites where traces of perishable structures have disappeared. Preservation is important as scientific approaches focusing on the structures and their associated activity areas continue to evolve. Some degree of protection can be ensured if cultural resources in areas of old growth pinyon and juniper forest are inventoried and mapped for avoidance.

Traditional cultural properties can include landmarks, vegetation communities, archaeological sites, wickiups, burials, rock art, burials, vision quest, and the locations of important events for Native American Tribes. Maintaining the integrity of site setting for Native American uses, including reducing visual impacts and noise, is often more important for these resources than for other property types.

Sites in the "public use" category range from historic ditches, roads, and railroads to prehistoric sites and standing historic architecture. While these sites are often avoidable when planning ground-disturbing activities, they are more susceptible to inadvertent impacts from public use, accelerated natural processes, other inadvertent impacts, fire, and damage by vandals. Vandalism can be reduced through education, discouraging vehicular access, and by monitoring site conditions.

Sites on private lands, where no federal undertakings occur, are not protected. Agricultural developments, urban expansion, and other ground-disturbing activities commonly occur on private lands without regard to significant archaeological resources.

Current Conditions

The cultural resource base managed by the CRVFO consists of a collection of sites identified through cultural resource inventories over the last 30 years, since the cultural resource program was created. In large part, these resource inventories have been conducted in order to fulfill National Environmental Policy Act (NEPA) and Section 106 requirements for land management projects. During each inventory, each cultural resource site encountered is described and evaluated for significance.

Data from the Colorado Historical Society's Office of Archaeology and Historic Preservation and the CRVFO site databases as of June 2007 were recently used to compile a Class I cultural resources overview of the CRVFO planning area (Reed et al. 2008). The Class I inventory was assembled to define the types of sites present within the CRVFO, to create a database for site-specific GIS data, and to separate CRVFO land into areas of high, medium, and low sensitivity for cultural resources. Based on information compiled during the Class I inventory, the CRVFO planning area is known to contain 3,930 documented cultural resources, representing a wide variety of site types and chronological periods. Known cultural resources include 985 sites with prehistoric components and 1,389 sites with historic components. A total of 651 sites within the planning area are listed on, or are eligible for listing on, the NRHP, while another 397 sites are considered "need data" sites. Cultural resources on BLM land within the CRVFO planning area total 1,196 sites. Of these sites, 99 are listed as NRHP-"eligible" and 293 are potentially eligible sites. Overall, the density of cultural resource sites on BLM land within the CRVFO is moderately high, comprising 0.65 sites per square mile.

Prehistoric site distribution trends were analyzed based on such factors as elevation, slope, aspect, vegetation community, deer populations, distance to water, and soil type. Estimated historic site sensitivity is based on such factors as known transportation corridors and proximity of BLM lands to private land (Reed et al. 2008). Using these factors, the relative sensitivity (i.e., likelihood to contain cultural resource sites) of the CRVFO was calculated and mapped using GIS, and submitted to the CRVFO (Reed et al. 2008).

Characterization

Trends and Indicators

The CRVFO cultural resource program continues to be driven primarily by project-related cultural resource inventory, as well as proactive Section 110 inventories. As a result cultural resource sites are being recorded and added to the site database. Significant sites are selected for protection or mitigation prior to project implementation. Cumulative impacts to sites are tracked when sites are reevaluated during subsequent inventories of a particular area, or when cultural resources staff members are alerted to impacts. Due to the unique nature of each site, it is not possible to evaluate quantitatively the condition of CRVFO cultural resources as a whole. However, it is possible to identify some trends within the CRVFO planning area by

looking at factors that have caused significant impacts to the cultural resource base and are likely to continue to affect these resources in the future. Trends within the CRVFO that have significant effects on cultural resources are generally related to increases in the level of development in the region, including both energy development and urban development. Important trends, which are discussed below, include the expansion of oil and gas development, increases in OHV use and other recreational activities, and increases in the frequency of mechanical and prescribed fire vegetation treatments. Livestock grazing and land exchanges, while remaining relatively stable in terms of impacts to cultural resources, nevertheless also have the potential to affect the condition of cultural resource sites.

Over the past 10 years, the CRVFO has experienced a significant expansion in oil and gas development, particularly in the high-potential area west of Glenwood Springs. Approximately 875 wells have been opened since 1999, with 5,768 wells on 824 pads expected over the next 20 years. Oil and gas development within the CRVFO has had a significant impact on cultural resources. Although multi-well drilling, where multiple wells are drilled from a single pad, is common throughout the leased areas, well pad construction is still associated with a high level of soil disturbance covering 5 to 8 acres for each pad. While areas slated for ground disturbance associated with oil and gas development (i.e., well pads and access roads) are inventoried for cultural resources, and effects to significant sites are mitigated prior to project implementation, well pad construction can result in the total destruction of any cultural resources within or near the boundary of the pad. The construction of access roads and pipelines also has the potential to affect many sites, as linear developments commonly affect more sites per acre of actual ground disturbance than block areas, due to edge effect. Additionally, these access roads and pipelines can provide public access into what were once remote areas. This improved access has the potential to cause indirect impacts to cultural resources. Improved access tends to increase visitation and vandalism, especially within 0.25 miles of roads (Nickens et al. 1981). Although the mitigation process helps to reduce negative effects from energy development, indirect impacts from improved access are difficult to foresee and measure and, consequently, may be difficult to ameliorate.

An example of this difficulty is provided by a recent oil and gas Master Development Plan (MDP) for a project encompassing an area of approximately 12,000 acres near the western end of the CRVFO area. The MDP anticipated the development of 38 well locations and 29 miles of linear pipeline and road development. A Class III cultural resource inventory completed on 36.5 percent of the area (approximately 4,400 acres) revealed a high resource density comprising multiple cultural resource types. Ninety percent of these resources were within the area of significant cumulative impacts. Although NEPA requirements to inventory and evaluate these sites were completed on an individual basis, the cumulative impacts to these sites resulting from improved access are more difficult to mitigate, as these effects, which may include artifact looting, are indirect and unpredictable. Consequently, the overall condition of the resource base within the project area is expected to decline, based on the potential for vandalism and for the loss of integrity of setting and feeling these sites will experience.

In addition to the current oil and gas boom, OHV use in the CRVFO has increased in recent years, as the sport becomes more popular and visitors to the CRVFO increase in number. OHV use is increasingly common on BLM land in Eagle County, as well as the areas surrounding Basalt and Carbondale. Although OHVs cause relatively few impacts to sites when restricted to existing roads, many vehicle operators fail to comply with established regulations. Severe impacts to sites can result from the disturbance of surface soils when sites are crossed by OHVs, causing potentially serious impacts to cultural remains exposed on the surface. Unauthorized roads or trails are often created, which can create areas of intense disturbance at sites. These roads and trails can increase erosion because they are unplanned and because they are often in areas

especially susceptible to erosion. Other significant impacts to sites occur when unauthorized roads make sites more accessible, resulting in increased potential for site vandalism (Nickens et al. 1981). Intensive OHV use in areas of high site density, particularly when erosive soils are present, has the potential to cause negative affects to cultural resources within the CRVFO. To lessen these effects, various mitigation measures have been implemented, which include rerouting or closing trails to protect cultural resources, and conducting data recovery excavations in order to preserve data that might otherwise be destroyed.

CRVFO land is also used for other non-motorized recreational uses, such as camping, hiking, mountain biking, horseback riding, hunting, and fishing. Although the CRVFO currently manages several Special Recreation Management Areas (SRMA), including Bull Gulch, Deep Creek, Hack Lake, Red Hill, Thompson Creek, and the Upper Colorado River, for various types of non-motorized recreation, virtually all BLM land within the CRVFO planning area is used for recreational pursuits of various kinds. These activities have the potential to cause direct and indirect impacts to cultural resource sites, as these activities can result in increased traffic across areas where sites may be located. Increased travel through sensitive areas, in turn, may result in ground disturbance as surface soils are trampled; it also raises the likelihood that unauthorized collection of artifacts or other site remains will occur. Mechanized forms of recreational travel, such as mountain bikes, can also cause detrimental effects when operated on unauthorized trails or off-trail. Camping may also result in impacts to sites when campers knowingly or unknowingly alter site features, such as rock walls or brush structures, to improve a campsite. These effects, which are generally unpredictable and incremental, are monitored over time as sites are identified or reevaluated in association with cultural resource inventories.

Vegetation treatment is conducted in the CRVFO with increasing frequency, in order to lessen the probability and severity of uncontrolled wildfires and to enhance foraging opportunities for wildlife. Within the CRVFO, vegetation treatments are most often conducted in the urban-interface area, in order to promote fuels reduction in areas where fires have the potential to cause tremendous property damage. Although non-fire vegetation treatments include manual, mechanical, chemical, and biological treatments, mechanical treatments have the most substantial impact on cultural resources. Mechanical treatments are typically conducted with the goal of reducing dense understory vegetation and may involve thinning, crushing, cutting, chipping, and lopping. Although each of these vegetation treatments has a different potential to impact cultural resources, impacts generally include churning of shallow soils under steel treads or rubber tires, uprooting of vegetation, and consequential disturbance of surface soils, or accidental fire ignition. Prescribed fires are being used on a more frequent basis to manage inappropriate vegetation growth, as fire managers have realized that indiscriminant fire suppression creates unnatural situations of fuels buildup. This fuels accumulation, in turn, intensifies the frequency and severity of unplanned wildfire events (BLM 2004b). Impacts from prescribed burns may include destruction of wooden cultural remains such as wickiups, heat spalling of rock art panels, and disturbance of surface soils through fire line excavation. In order to minimize impacts to cultural resource sites, all areas slated for ground-disturbing vegetation treatments are subjected to cultural resource inventory prior to project implementation. Mitigation of project impacts or avoidance of sites is conducted as necessary to protect cultural resources and areas of Native American concern.

Wildfires are another important source of cultural resource site disturbance within the CRVFO, as uncontrolled fires have become more common and in general more intense in recent years. Although wildfires are a natural phenomenon, they can cause extremely detrimental effects to sites. Fires may cause spalling of rock faces and destruction of rock art, may alter surface artifacts, and may complicate radiocarbon dating of archaeological deposits. Some site types, such as wickiups or historic wooden structures, may be destroyed by

fire. Fire suppression efforts, such as the manual or mechanized construction of fire lines, can destroy swaths through sites. Perhaps the most significant impacts, however, result from increased erosion of soils due to vegetation loss. As wildfires are unanticipated, it is often not possible to mitigate negative effects to cultural resources. Recent wildfires in the CRVFO, such as the Coal Seam Fire and the Jolley Mesa Fire, have resulted in the destruction of multiple historic-period sites. However, recent implementation of the GSFO FMP in 2002 has led to the incorporation of several policies that beneficially affect cultural resources management. In addition to specifically directing fire managers to protect archaeological and historic sites, the FMP requires the presence of a resource advisor at all fire events with the potential to affect cultural resources, in order to advise suppression personnel of resource locations and land use concerns. Of course, cultural resource protection is not always possible, as the protection of human life and property is always prioritized over resource preservation.

Livestock grazing is another factor contributing to site impacts on the CRVFO. Currently in the CRVFO, 489,600 acres are open to grazing. This area is organized into approximately 255 allotments, many of which are clustered north of Battlement Mesa and Rifle and south of Eagle. Livestock grazing can create serious impacts to sites, as animals can trample and churn shallowly buried cultural deposits, create trails, or rub against standing structures, such as wickiups, which can be toppled. Impacts from grazing are exacerbated when animal densities are too great, causing destruction of vegetation cover. This type of destruction can occur over a broad area if an area is overgrazed, but can also be highly localized and involve a relatively small number of animals, such as when animals congregate around water sources, salt licks, shades, and corrals. When large concentrations of livestock graze in areas with high site densities, there is always the potential for adverse impacts to cultural resources within the CRVFO. As many grazing allotments were leased prior to the implementation of current cultural resource management practices, it is often difficult to protect cultural resources on land leased for grazing. When grazing permits are renewed, data on historic properties are reviewed and mitigation measures are proposed to protect known significant cultural resources and areas of Native American concern.

Land exchanges or outright sales of BLM land are not immediately associated with site destruction, but usually result in loss of meaningful protection. Few recent land exchanges have occurred in the CRVFO, resulting in a lessening of impacts to cultural resources. However, they do occur periodically. For example, a recent, congressionally driven land exchange between the Pitkin County Open Space and Trails Board and the White River National Forest included 40 acres of CRVFO land, and resulted in the removal of four sites from federal protection. As with any other federal project, however, when a land exchange is planned to occur, areas planned for land exchange or sale must be inventoried for cultural resources, and impacts to historic properties must be mitigated prior to sale or exchange.

On the whole, the condition of the cultural resource base in the CRVFO has generally declined over the last 30 years. Although adherence to Section 106, NEPA, and internal BLM policies regarding cultural resources protection has resulted in the continued identification and preservation of cultural resource sites, unanticipated impacts to cultural resources continue to occur. Due to the nonrenewable nature of cultural resources, these impacts are cumulative and may result in severe deterioration when compounded over time. Although the nonrenewable nature of individual cultural resource sites ensures that declines in condition of the resource base will continue, this trend is also exacerbated by rapid development within and around the CRVFO, as well as by a general lack of sufficient funding and personnel to monitor at-risk cultural resource sites. High levels of development in the CRVFO, particularly related to oil and gas drilling, have resulted in substantial amounts of surface disturbance. Additionally, the creation of new roads to well sites, as well as

roads associated with recreational development, has made it much easier to access sites that were once remote, a circumstance that raises the potential for sites to be looted or otherwise disturbed. Nickens et al. (1981) provide a comprehensive analysis of the ways in which accessibility correlates to site vandalism.

Fortunately, development of the CRVFO has resulted in positive effects to cultural resources as well. Increasing numbers of cultural resource inventories, site testing, and data recovery excavations have resulted in the production of additional information regarding the archaeology of the area. Although this information is inevitably restricted to the areas slated for ground-disturbing activity, rather than the areas that might produce the most archaeological information, the compilation of this data is still of public benefit. In particular, the ongoing Colorado Wickiup Project undertaken in partnership with the Dominguez Archaeological Resource Group (DARG) and the cooperation of independent cultural resource contractors, has resulted in the accumulation of a large amount of knowledge regarding Late Prehistoric brush habitation structures.

3.2.9 Paleontological Resources

Paleontological resources constitute a fragile and nonrenewable scientific record of the history of life on earth. BLM policy is to manage paleontological resources for scientific, educational, and recreational values and to protect these resources from adverse impacts. To accomplish this goal, paleontological resources must be professionally identified and evaluated, considering paleontological data as early as possible in the decision-making process. The BLM Potential Fossil Yield Classification (PFYC) system will be used to classify paleontological resource potential to assess possible resource impacts and mitigation needs for actions involving surface disturbance, land tenure adjustments, and land-use planning. This system replaces the Condition Classification in the Handbook (H-8270-1) for Paleontological Resource Management.

The PFYC system provides a uniform method to assess potential occurrences of paleontological resources and evaluate possible impacts using geologic units. Occurrences of paleontological resources are closely tied to the geologic units (i.e., formations, members, or beds) that contain them. The probability for finding paleontological resources can be broadly predicted from the geologic units present at or near the surface. It is intended to be applied in broad approach for planning efforts, and as an intermediate step in evaluating specific projects.

Using the PFYC system, geologic units are classified based on the relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts, with a higher class number indicating a higher potential. It is not intended to be applied to specific paleontological localities or small areas within units. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher class; instead, the relative abundance of significant localities is intended to be the major determinant for the class assignment. Geologic unit classifications are delineated as follows:

Class 1 – **Very Low**. Geologic units that are unlikely to contain recognizable fossil remains (igneous, metamorphic, or Precambrian rock units).

Class 2 – **Low**. Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils.

Class 3 – **Moderate** or **Unknown**. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential.

Class 4 – **High**. Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability. Surface disturbing activities may adversely affect paleontological resources in many cases.

Class 5 – **Very High**. Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils, and that are at risk of human-caused adverse impacts or natural degradation.

Class 4 and Class 5 units may be combined as Class 5 for broad applications, such as planning efforts or preliminary assessments, when geologic mapping at an appropriate scale is not available. Resource assessment, mitigation, and other management considerations are similar at this level of analysis, and impacts and

alternatives can be addressed at a level appropriate to the application. Field surveys by qualified paleontologists would be needed to assess local conditions prior to surface disturbing activities or land tenure adjustments. Mitigation will often be necessary before and/or during these actions.

Management prescriptions for resource preservation and conservation through controlled access or special management designation should be considered. Official designation of areas of avoidance, special interest, and concern may be appropriate. On-site monitoring may be necessary during construction activities.

Paleontological resources in the CRVFO planning area are integrally associated with the geologic rock units in which they are located. Caution must be exercised when comparing fossils to rock units because paleontological work is often conducted in certain areas; other areas may also contain fossils but have not been examined and evaluated (Armstrong and Wolny 1989).

The greatest potential for impacts would result from actions that include direct large-scale disturbance of bedrock, weathered bedrock, or unconsolidated alluvial deposits that may include fossils of more recent geologic age. These actions include excavation and land clearing activities associated with oil and gas development, mining, and road construction. BLM management actions regarding surface disturbing activities will affect paleontological resources. In addition, vandalism and unauthorized collecting can directly destroy paleontological resources or remove them from their context and availability for scientific study. Increased access associated with new development and increased recreation use leads to increased access to paleontological sites.

Current Conditions

A comprehensive paleontological inventory has not been carried out for the CRVFO planning area, but various government, academic, and private industry personnel have conducted studies. Over 1,000 paleontological localities have been documented in the CRVFO planning area, and the fossils recovered represent a diverse array of plants, invertebrates, and vertebrates. There are active paleontological use permits issued on CRVFO decision area BLM lands.

The CRVFO planning area contains 78 named formations at the surface, 20 of which are known to contain fossils (Armstrong 1994), but these formations have differing potentials to contain significant fossils (any vertebrate fossil remains or fossils of exceptional preservation or context). Table 3.2.9-1, Geologic Formations in the CRVFO Planning Area with Paleontological Resources, presents those formations classified as Class 4 or 5.

Table 3.2.9-1
Geologic Formations in the CRVFO Planning Area with Paleontological Resources

Formation	Fossils	Classification*
Tgp, Green River (Parachute Creek Member)	Over 100 species of insects, plants, gar and other fish, turtles, and crocodilians (with stomach stones)	Class 5
Tw, Two, Wasatch (Debeque)	Mammals including horses, primates, artiodactyls (deer-like, even-toed), other perissodactyls (odd-toed), pantodonts (cow-sized herbivores), creodonts (carnivorous mammals), carnivores, marsupials, multituberculates (rodent-like mammals), insectivores, rodents, condylarths (ungulate mammals), and others; gar and other fish; lizards; turtles; crocodilians; birds; freshwater clams, snails, and other invertebrates; petrified wood, leaves, and other plant fragments; algal heads (stromatolites)	Class 5
Jm, Jmr, Jmre, Morrison	Various dinosaurs (Camarasaurus, Diplodocus, Barosaurus, Allosaurus, and one other)	Class 5
TRkc, TRwc, TRc, TRPcs, Chinle	Dinosaur and other tracks, lungfish burrows, and various small crocodile-like reptiles	Class 5
TRPs, State Bridge	Invertebrates, including brachiopods (bivalve shellfish) and vertebrates	Class 5
Q, Quaternary	Mammoth rib, bison	Class 4
Q, Gravels and Alluviums	Mammoth rib	Class 4
Q, Older Gravels and Alluviums	None known	Class 4
Q, Eolian Deposits	None known	Class 4
Q, Glacial Drift of Pinedale and Bull Lake	None known	Class 4
Q, Older Glacial Drift	None known	Class 4
Q, Landslide Deposits	None known	Class 4
Q, Ancient Alluvium	None known	Class 4
Tbb, Basalt Flows and Associated Tuff, Breccia and Conglomerate of Late-Volcanic Bimodal Suite (Age 3.5-26 m.y.)	Ram's horn	Class 4
Tbp, Browns Park	None known	Class 4
Tu, Uinta	None known	Class 4
Tb, Bridger Formation, Lower Part	None known	Class 4
Tg, Green River	Over 100 species of insects, plants, gar and other fish, turtles, and crocodilians (with stomach stones)	Class 4
Tgl, Green River (Lower Part)	Some fossil insects and plants	Class 4
Mz, MzPz, Mesozoic	Plants, invertebrates, and vertebrates (as below) in Mesozoic rocks	Class 4
Two, Ohio Creek	None known	Class 4
Kmv, Mesaverde Group, Undivided	None known	Class 4
Kmvu, Mesaverde Group, Upper Part	None known	Class 4
Kh, Hunter Canyon	None known	Class 4
Kmgs, Mount Garfield	None known	Class 4
Kw, Williams Fork	None known	Class 4
Kmvl, Mesaverde Group, Lower Part	None known	Class 4
Ki, Iles	None known	Class 4
Ksc, Kmgs Sego Sandstone	None known	Class 4
Kp, Pierre Shale, Undivided	None known	Class 4

Table 3.2.9-1 *(continued)*
Geologic Formations in the CRVFO Planning Area with Paleontological Resources

Formation	Fossils	Classification*
Km, Mancos Shale	Large fossil fish (Xiphactinus) and a mosasaur (marine reptile)	Class 4
Kmfm, Kfd, Frontier Sandstone	None known	Class 4
Kc, Colorado Group	None known	Class 4
Kmfm, Kfd, Mowry Shale	None known	Class 4
Kd, Dakota Sandstone	None known	Class 4
Kd, Dakota Group	None known	Class 4
Kdp, Purgatoire	None known	Class 4
Jmr, Jmre, Ralston Creek	None known	Class 4
Jmse, Summerville	None known	Class 4
Jmc, Jmce, Curtis	None known	Class 4
Jme, Jmse, Jmce, Entrada Sandstone	None known	Class 4
JTRg, Glen Canyon	None known	Class 4
JTRgc, Glen Canyon Group	None known	Class 4
TRkc, Kayenta Sandstone	None known	Class 4
TRkc, TRwc, Wingate Sandstone	None known	Class 4
TRPcp, Moenkopi	None known	Class 4
MzPz, Paleozoic	Various plants, invertebrates, and vertebrates	Class 4
Pc, Cutler	None known	Class 4
PPennw, PPennwm, Weber Sandstone	None known	Class 4
PPennwm, Maroon	None known	Class 4
Pennm, Pennmb, Minturn	Various invertebrates, including trilobites, corals, trace fossils, crinoids, brachiopods, and other marine invertebrates, and conodonts	Class 4
Pennb, Pennmb, Pennmbe, Belden	Fossil tracks?	Class 4
MCamb, MDO, MD, MDCamb, MdCamb, Leadville Limestone	Algal layers, oolites, and mixed invertebrate skeletal packstones from an intertidal environment	Class 4
MD, MDCamb, Gilman Sandstone	None known	Class 4
MD, MDCamb, Dyer Dolomite	Brachiopod bivalves, algal layers, and others	Class 4
MD, MDCamb, Parting Sandstone	None known	Class 4
DO, Fremont	None known	Class 4
DO, Harding	None known	Class 4
DOCamb, DO, Manitou Limestone	Trilobites, brachiopods, cephalopods, and bryozoans	Class 4
OCamb, MCamb, Dotsero	Stromatolites	Class 4
OCamb, MCamb, Cambs, Peerless	None known	Class 4
OCamb, MCamb, MDCamb, Cambs, Sawatch Quartzite	None known	Class 4

*Formations were originally evaluated in accordance with the BLM Handbook (H-8270-1) for Paleontological Resource Management. Class 4 is equivalent to Condition 2, and Class 5 is equivalent to Condition 1.
Source: BLM 2007g

Characterization

Indicators

Paleontological resources are indicated by both the presence of and potential for presence of vertebrate and scientifically important fossils or physical or chemical records of past life or climates. In addition to the potential presence of paleontological resources in the formations listed above, there are known fossil locations including the Sharrard Park Paleontological Area.

Trends

Interest in fossils and paleontology has been greatly stimulated in recent years, bringing new avocational and professional visitors to the known fossil locations, and increased exploration to discover new fossil localities. This has in turn increased agency concern for potential impacts to the resource from vandalism and theft. The current trend of paleontological resource use permits and scientific activity is likely to continue or to increase slightly in the future. Clearances and monitoring of surface-disturbing activities, land tenure adjustments, and scientific research are anticipated to be the primary means of identifying paleontological localities.

3.2.10 Visual Resources

Visual resources refer to the visible features and objects, natural and human-made, that compose the character of the landscape as visually observed from a given location—the objects (natural and human-made, and natural, moving and stationary) and features (e.g., landforms and water bodies) that are visible on a landscape. These resources contribute to the scenic or visual quality/visual appeal of the landscape. Visual impact is the creation of an intrusion or perceptible contrast that affects the scenic quality of a landscape. A visual impact can be perceived by an individual or group as either positive or negative, depending on a variety of factors or conditions (e.g., personal experience, time of day, weather/seasonal conditions).

Visual Resource Management (VRM) System

The Federal Land policy and Management Act, 1976 mandates protection of scenic values. Section 102 [43 U.S.C. 1701] "(a) The Congress declares that it is the policy of the United States that – (8) the public lands be managed in a manner that will protect the quality of scientific, scenic, historical…and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition…"

Sec. 201. [43 U.S.C.] "(a)…shall prepare and maintain on a continuing basis an inventory of all public lands and their resource and other values (including,…and scenic values)…." "This inventory shall be kept current…."

In response to the FLPMA mandate, BLM's Visual Resource Management (VRM) policy is set forth in Manual M-8400-1 with implementation guidance provided in handbooks H-8410-1 Visual Resource Inventory and H-8431-1 Contrast Rating. Policy dictates that all BLM administered surface acreage will be inventoried for visual values and visual values will be managed through designation of VRM classes.

BLM's VRM system provides an objective and systematic method for identifying and evaluating scenic values to determine the appropriate levels of management (BLM 1984c). It provides a way to analyze potential visual impacts on visual resources, apply visual design techniques to ensure that resource uses and management activities are in harmony with their surroundings, and meet the assigned VRM class objectives. VRM is a tool to identify and map essential landscape settings to meet public and community preferences and recreational experiences today and into the future. The objective of visual resource management is to manage BLM lands in a manner which will protect the quality of the scenic values.

The VRM system consists of three stages: visual resource inventory (VRI) and assignment of VRI classes, designation of VRM management classes during the land use planning process, and analysis stage (visual contrast rating) during RMP implementation. The inventory stage involves identifying the visual resources of an area and assigning them to inventory classes using BLM's visual resource inventory process. The process involves rating the visual appeal of a tract of land, measuring public concern for scenic quality, and determining whether the tract of land is visible from travel routes or observation points. The process is described in detail in BLM handbook H-8410-1, Visual Resource Inventory (BLM 1986a). Overlaying the three layers of inventory data (scenic quality, sensitivity, visibility), VRI class designations I through IV are established, with class I having the highest value and class IV having the lowest visual value. The area's visual resources are then assigned to management classes with established objectives that are described in Table 3.2.10-1, BLM Visual Resource Management Class Descriptions.

Table 3.2.10-1
BLM Visual Resource Management Class Descriptions

VRM Class	Class Objective
I	Preserve landscape character. This class provides for natural ecological changes but does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
II	Retain existing landscape character. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract a casual observer's attention. Any changes must repeat the basic elements of line, form, color, and texture found in the predominant natural features of the characteristic landscape.
III	Partially retain existing landscape character. The level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate a casual observer's view. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
IV	Provide for management activities that require major modification of the landscape character. The level of change to the characteristic landscape can be high. Management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repetition of the basic landscape elements.
Rehabilitation Areas	Areas in need of rehabilitation should be flagged during the inventory process. The level of rehabilitation is determined through the RMP process by assigning the VRM approved for that particular area.

Source: BLM 1984c

Visual management objectives are established in RMPs. VRM management class decisions consider visual values established by the inventory along with land use allocations, desired outcomes, and future desired conditions The VRM management classes may differ from VRM inventory classes, based on management priorities for land uses and compatibility with land use allocations. VRM Class IV does not necessarily imply low scenic quality as would be the case with a VRI Class IV. There may be situations where a high visually valued area may be managed under the VRM management Class IV objectives to meet certain land management priorities. The inverse may also occur. These area specific objectives provide the standards for planning, designing, and evaluating future management projects. The VRM system therefore, provides a means to identify visual values, to establish objectives through the RMP process for managing those values in conformance with other allocation decisions, and to provide timely inputs for proposed resource uses and management activities to ensure these objectives are met.

The analysis stage done during implementation of the plan involves determining whether the potential visual impacts from proposed resource uses and management activities would meet the management objectives of VRM classes established for the area through land use planning or whether design adjustments would be required. A visual contrast rating process is used that involves identifying a key observation point or range of points for which an analysis is done to compare proposed project features with the major features in the existing landscape. This analysis uses the basic design elements of form, line, color, and texture. This process is described in BLM Handbook H-8431-1, Visual Resource Contrast Rating (BLM 1986b). The analysis can then be used as a guide for resolving visual impacts. The BLM may: (1) attach additional mitigation through stipulations or Conditions of Approval or special design requirements to bring the proposal into compliance; (2) work with the proponent to modify the proposal or relocate it; or (3) deny the proposal. According to Washington Office Information Bulletin Number 98-135, visual design techniques and best management practices shall be incorporated to mitigate the potential for short-term and long-term impacts resulting from all resource uses and management activities. Examples of management resource uses and activities include

energy development, utility corridors, road construction, recreational activities and OHV use, wildland fires, mining, vegetation treatments, and increased urban infrastructure needs and associated development on BLM lands (roads, power lines, water tanks, communication towers, etc).

Current Conditions

The landscape type is diverse and consists of foothills, mountains, plateaus, mesas, canyons, and broad and narrow river valleys. Vegetation types vary from lowland sagebrush, grasslands, and scrub oak, pinyon, and juniper forests to aspen and spruce in the higher elevations. Some of the streams and rivers flowing though and adjacent to the CRVFO decision area include the Colorado, Eagle, and Roaring Fork Rivers, and Deep, Thompson, Sweetwater, Elk, Rock, Egeria, and Abrams Creeks. Several prominent landscape features also occur in the CRVFO decision area, such as Anvil Points, the Grand Hogback, Castle Peak, Deep Creek Canyon, Bull Gulch, Thompson Creek, and the East Fork of Parachute Creek. While most of the valley bottoms are private and within the foreground of the viewsheds, adjacent public lands serve as important scenic backdrops and visual open space.

The CRVFO encompasses 10 communities (Parachute, Rifle, Silt, New Castle, Glenwood Springs, Dotsero, Gypsum, Eagle, Carbondale, and El Jebel/Basalt) and is bisected by some of Colorado's busiest highway corridors (Interstate 70 and State Highways 82, 131, and 13). Visual quality is a concern to most residents in the CRVFO planning area. The proximity of CRVFO lands to communities and key transportation corridors, in addition to the combined effects of scenic quality, the high degree of sensitivity, and visual accessibility, have resulted in 40 percent of the CRVFO decision area being managed as VRM Class II. While many of CRVFO lands are highly visible and have a high degree of sensitivity, the diverse topography and vegetation types allow these lands to have a high degree of visual absorption capability. The current VRM classes were chosen to emphasize scenic quality along Interstate 70, Highways 82 and 131, the Colorado River Road, and other high sensitivity transportation corridors. Deep Creek, Thompson Creek, and Bull Gulch were proposed for special management to protect their outstanding scenic qualities and to preserve their naturalness.

In preparation for the revision of the RMP, the VRI was updated in accordance with BLM handbook H-8410-1. The VRI involves considering the scenic quality, sensitivity, and visibility of the landscape and assigning VRI classes. A VRM assessment was conducted in 2007 (OTAK 2007) that created a viewshed analysis of the major transportation corridors throughout the field office area. In addition to the viewshed analysis, the VRM assessment gathered data from communities, counties, and other land management agencies regarding sensitive viewsheds (OTAK 2007). The results of this VRM assessment, combined with the North-Central Colorado Community Assessment Report (BLM 2007d), were used to update the sensitivity component of the inventory. Table 3.2.10-2 summarizes the acres of this updated inventory of the four VRI classes within the CRVFO decision area. The distribution of the classes is shown in Figure 2-28, Alternative A: Visual Resource Management.

Table 3.2.10-2
Visual Resource Inventory Classes for the CRVFO Decision Area

VRI Class	Acres	Percent of Decision Area
I	0	0
II	228,100	45
III	129,100	26
IV	148,100	29

In addition to the viewshed analysis, the VRM update (OTAK 2007) included outreach and a data gathering process with all towns, counties, state, and the adjacent White River and Routt National Forests within the CRVFO planning area. Current information was collected regarding urban boundaries and zoning, as well as information relating how the community or agency addresses visual and scenic resources within its jurisdiction. The information gathered was compared with BLM's existing VRM classes, and discrepancies were identified. Those discrepancies and management conflicts were eliminated through changes in VRM classes under alternatives B and C to ensure BLM objectives were aligned with neighboring communities and "other" agency planning objectives.

In response to increasing concerns from local communities, a VRM assessment for the CRVFO planning area was conducted in 2007 (Otak 2007) for key transportation corridors' sensitive viewsheds, in coordination with adjacent communities and other local, state, and federal agencies. VRM classes from the 1984 CRVFO RMP (BLM 1984a) have been updated within those sensitive viewsheds to ensure that VRM class boundaries reflect real world conditions. This is not a revision of VRM class boundaries but a refinement of the data to improve VRM class boundary accuracy.

Characterization

Indicators

The four visual inventory classes represent the relative quality of the visual resources. The inventory classes are the basis for visual values, and they serve as an indicator for visual quality and a baseline measurement for scenic values. Designation and management of VRM classes allows the BLM to manage activities in a manner consistent with natural features and existing uses throughout the area. VRI classes are assigned to areas based on the combination of scenic quality, visual sensitivity, and distance zones. VRM classes are then designated and have associated management objectives that range from managing natural landscapes for preservation to allowing for extensive human modification. Visual values are considered throughout the RMP process, along with the planning area's other natural resource values, land use allocations, desired outcomes, and future desired conditions, when designating VRM classes, and managed to meet those class objectives during RMP implementation. VRM class boundaries may differ from VRI class boundaries reflecting decisions made within the RMP.

Trends

According to the North-central Colorado Community Assessment Report for the BLM CRVFO (BLM 2007d), there were community concerns and interests regarding visual resources in the CRVFO planning area, as follows:

- Recreation and natural scenic beauty were the most commonly cited reasons that people live in or visit the communities in the CRVFO planning area.
- Communities were concerned about impacts on forest visual resources from pine beetle.
- Communities were concerned about impacts on visual resources from wildfires.
- Communities were concerned about the proliferation of unauthorized routes on BLM lands because it was believed to cause erosion, scarring, and deterioration of the scenic landscape, as well as impacts on wildlife.

- Communities indicated that BLM lands offer wide open spaces and scenic vistas that many communities considered a substantial benefit and contribution to quality of life. Being surrounded by a natural looking landscape appealed to current residents and was a reason many chose to stay in these communities. Several towns included pictures of the scenic BLM land vistas in their marketing materials to attract recreation tourists and new permanent residents.
- Communities indicated that preserving and maintaining the scenic viewsheds on BLM lands was important, including maintaining a natural appearing landscape by minimizing the number of modifications and visual impacts of any alterations made to the landscape.
- Communities were concerned about visual impacts from energy development, including an abandoned gas line that runs downhill outside of Rifle.
- Communities were concerned about VRM in Eagle County.
- Communities were concerned that masses, shapes, colors, materials, and fabrics "do not belong" or were visually disruptive in Eagle County.
- Communities indicated that visual resources on BLM lands attracted recreationists in Pitkin County.
- Glenwood Springs indicated that natural and scenic viewshed was important.
- Communities indicated that maintaining the natural landscape was important in drawing people to Basalt and in preserving open space, which has more value for acquisition when it is adjacent to natural and scenic federal lands.

The aforementioned trends were also supported in the Visual Resource Management Update (Otak, Inc. 2007), Eagle County Quality of Place Survey (Research & Polling, Inc. 2007), and the Final Report of the Glenwood Springs Field Office Planning Area Visitor Study (Virden et al. 2008a).

Although the population is not evenly distributed across the CRVFO planning or decision areas, human influences have altered the visual landscape, especially with respect to land use and land cover. Management of multiple resources on BLM lands can alter scenic resources. With an increased amount of urban development throughout the CRVFO planning area on adjacent private lands, increased management activities are also occurring on BLM lands. In some places, intensive human activities and growing pressures are being placed on the visual resources as a result of actions associated with oil and gas extraction, recreation and OHV activities, fire management, utility corridors, roads and trails, communication sites, and pipelines, and these activities have significantly altered the natural visual landscape. Large, fast-growing cities also contain heavily altered landscapes, with urban sprawl spreading into what were recently relatively undisturbed landscapes. Public concern is also on the rise regarding preservation of visual and scenic quality, and preservation of scenic backgrounds in residential areas for open space and recreational uses.

The overall landscape is highly fragmented. The landscape is experiencing a high degree of human modification due to urban development (and its associated infrastructure and uses) and from energy development. Most gas development has taken place in the western portion of Garfield County, which has modified the landscape into a more industrialized setting on private and public lands.

Tourism also plays a major role in the economy of western Colorado, and much of the CRVFO planning area is viewed en route to or from major tourist destination areas, such as Vail and Aspen. As the state's

population grows, more visitors will be attracted to BLM lands for recreation in natural landscapes. In addition, a high demand is being placed on scenic resources near population centers.

The VRM objectives have been maintained in most areas, but in other areas cumulative impacts and land use modifications that have occurred from non-discretionary actions (Valid Existing Rights such as old gas leases) are of concern. Modifications on adjacent private lands are also having an effect on visual values and scenic quality throughout the planning area. With increases in both resident populations and in tourism, scenic values and visual open space have become more important. Management direction aimed at preserving sensitive viewsheds will continue to compete with other land use allocation decisions and management activities for urban development infrastructure needs, energy development, recreation uses, and other surface-use activities.

According to the Scoping Summary Report (BLM 2007b), desired outcomes and future conditions include maintaining high visual integrity and appreciation of visual resources throughout the field office. Also, the Scoping Summary Report identified the need for management actions and allowable uses that prevent modification and promote sensitive use of the landscape.

3.2.11 Wildland Fire Management

The success of fire suppression efforts and resource management activities over the last 100 years has influenced the structure and composition of forests and fuel conditions by changing the tree species composition, increasing stand density (trees per acre), vertical structure (understory and overstory vegetation) and the amount of dead and dying woody vegetation that remains on the site. The function and process of ecological systems has changed. Fire is not the agent of change it once was and tree species composition and density has led to increasing insect and disease problems impacting fuel loads. These factors have increased the risk and severity of fires on public lands.

In addition to fuel accumulations and structure, fire suppression has changed the vegetation patterns, structure, and composition of forests. For example, in many locations where fires normally occurred in sagebrush and pinyon-juniper communities, fire suppression has prevented substantial fire spread to mid- and upper elevation forest zones. This decrease in periodic understory fire in forest stands has led to an increase in shrub biomass and subsequent creation of ladder fuels. Ladder fuels help spread ground fire through shrub canopies and into the forest canopy resulting in higher intensity, difficult to control fires. In mid- to upper-elevation aspen stands, the lack of low-intensity fire (short flame lengths) for many years has allowed conifers to replace aspen, thus creating a more flammable fuel profile. Within the upper elevation conifer forests, the lack of fire, coupled with insect and disease epidemics, has led to increased fuel loadings in the form of downed woody debris. The lack of fire and relatively older age-class forests has created vast areas of highly flammable fuels, which burn with high intensity (long flame lengths) and for long durations once they are ignited. As a result of fire suppression, the role that fire plays in these ecosystems has been altered.

In most cases, vegetation communities adapted to frequent fire are now or will shortly be outside of their historic fire return interval, which can be attributed to aggressive fire suppression response. Current suppression resources are rapid, efficient, and highly mobile at the local, state, and federal levels, and have effectively removed fire from these habitat types. Although prescribed fire has been effective in reducing crown height and biomass in some areas, most of the prescribed burns have not been located in urban-interface areas. Increasing development of private lands, combined with aggressive fire suppression activities, will only continue to limit fire's role in these regimes.

The land use plans will establish the general fire management activities that will occur in specific areas. Such decisions include whether naturally occurring fires will be allowed to burn and under what conditions, whether there are areas where fires will always be suppressed, and whether there are areas where prescribed fire can and cannot be used as a management tool. Other activity decisions could affect how fuels are treated and how fire suppression occurs, such as protecting wildlife habitat or establishing Special Recreation Management Areas. Activities such as oil and gas development and more roads can alter the number of ignition sources and suppression priority.

Current Conditions

The CRVFO incorporates a portion of the southern Rocky Mountains which supports coniferous forest and aspen stands and lower, drier pinyon-juniper and Gambel oak woodlands. Four vegetation communities having different structure, density, fuel loading, and historic fire intervals are found in the CRVFO and are described below:

Mixed-Conifer Forests. The naturally cool, moist environment of these forests makes them relatively fire resistant, but under very dry conditions, fire is usually of high intensity due to the naturally high density of

trees and high fuel loading on the forest floor. Historically, median fire return intervals in the warm, dry mixed conifer forest were about 20 to 30 years. Fires can be either stand-replacing or not, sometimes killing the overstory and sometimes killing smaller understory trees only, leaving the larger overstory trees. Fires play a major role in shaping the composition, structure, and function of these forests and have a big effect on the abundance and distribution of overstory and understory plant species.

Aspen Forests. Generally, aspen forests in the southwestern part of Colorado had a historic mean fire interval of 18 to 48 years. The naturally cool, moist environment associated with these forests makes most fires quickly die out. Under very dry conditions, high-intensity fires occur, particularly in stands with high amounts of ground fuels and a heavy conifer component. Aspen readily resprouts after fire. Unless aspen has been encroached by conifer due to fire suppression or grazing, aspen is fairly resilient to fire.

Pinyon-Juniper Woodlands. Frequent, light surface fires characterize pinyon-juniper woodlands with fire return intervals over 25 years. Long-term fire intervals are characteristic for stand-replacing fires and indicate that when these fires occur they tend to be large and very intense.

Grass Sagebrush Community. This vegetation type has a fire history interval that is largely unknown, but recent fire occurrence data from 1981 to 2000 suggest that there is a lower rate of natural ignitions in this fuel type than in the lodgepole and woodland vegetation types. This vegetation type, in most instances within the planning area, needs specific weather regimes to burn in relation to the availability of the fuels.

Fire History

Analysis indicates a changing and variable fire occurrence since European settlement of western Colorado (BLM 2007j). Before settlement, the BLM estimates that, in the CRVFO planning area, there were approximately 450 fires ignited each year, burning approximately 20 to 100 acres annually, with a large fire of 5,000 to 10,000 acres occurring every decade or so (BLM 2007j). It is likely that about 10 percent of the annual ignitions burned to a level that would consume significant acres and reach a size that was detectable by inhabitants of the area during that period (BLM 2007j). Therefore, one can assume that an average of 45 fires burned annually, with an annual average burned of 766 acres (an average of all years, including estimated large fires). From 1971 until 1995, the rates of detected and suppressed fires remain similar at around 45; however, the acres have risen by 161 percent to 1,236 acres burned annually.

The fire season for the CRVFO planning area normally extends from late April to early November. The most critical fire conditions for the CRVFO planning area begin as early as May and can last until widespread fall moisture occurs.

Fires are categorized on the basis of period of occurrence, size class, regime, and condition class. Over the past decade, most wildfires in the CRVFO planning area have been less than 300 acres. From 1980 to 2005, 98.8 percent of the wildfires that occurred within the CRVFO planning area were from 0.25 acre to 300 acres. Fire regimes (Table 3.2.11-1, Fire Regimes in the CRVFO) are used as part of the fire regime condition class (FRCC) discussion to describe fire frequency (average number of years between fires) and fire severity (effect of the fire on the dominant overstory vegetation—low, mixed, or stand replacement). There are five historical fire regimes.

Table 3.2.11-1
Fire Regimes in the CRVFO

Fire Regime Class	Acres	Percent
I (0- to 35-year frequency and low to mixed severity—surface fires most common)	85,200	15
II (0- to 35-year frequency and high severity—stand-replacement fires)	51,100	9
III (35- to >100-year frequency and mixed severity)	90,900	16
IV (35- to >100-year frequency and high severity—stand-replacement fires)	153,400	27
V (>200-year frequency and high severity—stand-replacement fires)	176,100	31
Unclassified (water, barren, and alpine/tundra)	11,400	2

Source: BLM 2008c

Fire Regime Condition Class

Fire regime condition class is a classification system that describes the amount of departure an area or landscape is from the historic condition to the present condition. It is used to classify existing ecosystem conditions (Table 3.2.11-2, Condition Class Definitions and Acreages in the CRVFO).

Table 3.2.11-2
Condition Class Definitions and Acreages in the CRVFO

Condition Class	Fire Regime Example Management Options
Condition Class I Acres: 96,569 17 percent CRVFO	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 such as fire use.
Condition Class II Acres: 409,000 72 percent of CRVFO	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). This 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 may 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 III Acres: 51,125 9 percent of CRVFO	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. This 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 may need high levels of restoration treatments, such as hand or mechanical treatments, before fire can be used to restore the historical fire regime.

Source: BLM 2007j, 2008d

Fuel Conditions

The fuel structure in the CRVFO planning area is gradually changing due to management practices and incursion of non-native annual grasses, such as the increasing problem with cheatgrass, and invasive annual grass. Cheatgrass typically forms a dense cover that dies in late spring, leaving abundant fuel at the ground surface. Once established, cheatgrass may persist for decades. In areas where fuels are continuous, fires spread rapidly. Much of this area is grouped typically in fire regimes II and III (sagebrush), but many of the pinyon and juniper stands have much older stand characteristics, which often have heavier fuel accumulations and have stand-replacement fire. Many areas have sparse fuels and other natural barriers that limit fire spread;

most are dry sites where the age-class distribution is moderate to old. Cheatgrass has increased from historically inhabiting scattered pockets to becoming a dominant fine fuel component intermixed with sagebrush and pinyon-juniper stands.

The moderate to long return fire interval, fire exclusion and other management practices, and increased human use and incursion into these areas have rendered many of the forested areas susceptible to large, severe wildland fires.

Wildland Fire Management

The Department of Interior and USDA Forest Service policies require that every area with burnable vegetation must have an approved fire management plan. Fire management plans are strategic plans that define a program to manage wildland and prescribed fires based on the area's approved land management plans. The CRVFO Fire Management Plan (FMP) focuses on wildland fire suppression and prescribed fire and mechanical fuels treatments (BLM 2004a). In the event of multiple wildland fire ignitions or limited resources/funding, priorities are derived from national, state, and local guidance. The priorities are established using a rating system of low, moderate, and high for wildland fire suppression, unplanned natural fire used for resource benefit, fuels treatment, emergency stabilization and rehabilitation, and community assistance and protection.

Prescribed burning and mechanical treatment are used to enhance and rejuvenate mountain shrub and pinyon-juniper communities, which increases species and landscape diversity, helps rehabilitate ecosystem functions and processes, reduces the accumulation of hazardous fuels, and can increase quality of available forage through the release of nutrients. From 2003 to 2006, prescribed burns averaged 1,000 acres a year, and mechanical fuels treatments averaged 400 acres a year.

The wildland urban interface (WUI) identified included Interstate 70, Light Hill, El Jebel, Lookout Mountain, New Castle, Harvey Gap, Cedar Hills, Oak Meadows, and land around Potato Bill Creek, among others. Mechanical fuel treatment is an appropriate management tool in the WUI and is often combined with pile burning for fuels reduction. The main focus is to work with the Community Wildfire Protection Plans on identified areas where new development is happening in the WUI.

The Upper Colorado River Interagency Fire Management Unit (UCR) provides a full range of fire management services to participating federal, state and local jurisdictions in western Colorado. The fuels program is collaborating with Colorado State Forest Service, White River National Forest, and Garfield, Pitkin, and Eagle Counties, along with their Fire Protection Districts, to identify fuels treatment projects around jurisdictional boundaries. In the CRVFO planning area, ownership is intermixed, and oil and gas development is on the rise. The Upper Colorado River fuels program is working with industry and resource specialists to plan ahead of the development by writing mitigation measures into NEPA documents.

CRVFO has had several large fires (>1,000 acres) and a handful of smaller fires (10-1,000 acres) in the past 15 years. Most of these fires were rehabilitated with one or more of the following treatment methods: broadcast seeding with grasses and/or forbs, application of straw bales and/or mulch, ripping and seeding of dozer lines, and weed monitoring and control.

Characterization

Indicators

The resource condition will be assessed using the fire regime and condition classes, population influences (WUI), insects and disease, and resource management activities that would influence wildland fire (e.g., timber harvest, wildland urban interface expansion).

Trends

The trend in condition class is likely to continue as vegetation types move farther outside their historic fire regime due to fire suppression and increased non-native vegetation. Some of Condition Class I will move into Condition Class II and some of Condition Class II will move into Condition Class III. As human development and recreational use impinge on these fire regimes, increased ignition risks and the concern for protecting economic values will substantially affect fire management activities in these areas. As these vegetation types continue to age, fuel loadings will increase, resulting in a larger number or percentage of high-intensity stand-replacement fires. These fires will be difficult or impossible to control with existing fire management resources.

3.2.12 Lands with Wilderness Characteristics

Through the land use planning process, the BLM will consider all available information to determine the mix of resource use and protection that best serves the FLPMA multiple use mandate. The BLM has numerous authorities under FLPMA to maintain inventories of all public lands and their resources, including wilderness characteristics, and to consider such information during land use planning processes. During the CRVFO RMP revision process, the BLM completed a review of its lands within the field office area to determine whether they possess wilderness characteristics. This review included only BLM lands and does not include portions of proposals on National Forest lands, existing WSAs, or BLM lands on the Roan Plateau. Proposals involving lands exclusively within existing WSAs were not analyzed; however, additions to the WSAs (lands outside or adjacent to) were assessed (see below). All wilderness characteristic proposal areas that occur within existing designated WSAs would be managed to protect those wilderness characteristics under the BLM's interim management policy until Congress designates them as wilderness or releases them for other uses (see Section 3.4.2, Wilderness and WSAs). Wilderness characteristics include naturalness and outstanding opportunities for solitude and for primitive and unconfined recreation within an area of sufficient size to allow associated management and protection.

Results of the wilderness characteristics assessment are provided in Appendix D. Through this assessment (Appendix D), the CRVFO is meeting its obligations for updating and maintaining an inventory of wilderness resources under sections 102, 201, and 202 of FLPMA and BLM Manual 6300-1-Wilderness Inventory. In addition, BLM Handbook 1601-1, Land Use Planning Handbook, identifies broad decisions that guide future land management actions and subsequent site-specific implementation decisions. Specifically, Appendix C, Part K of the BLM Handbook directs field offices to identify decisions to protect or preserve wilderness characteristics.

The wilderness characteristics assessment is designed to answer the following question: Do any portions of the CRVFO meet the overall criteria for wilderness character? The assessment reflects current conditions and is used to update wilderness inventories. The process entails the identification of wilderness inventory units, an inventory of roads and wilderness character, and a determination of whether the area meets the criteria for wilderness character. Units found to possess such character are evaluated during the land use planning process to address future management. The following factors are documented:

A. Size: For an area to qualify as lands with wilderness characteristics, it must possess sufficient size:
    1. Roadless areas over 5,000 acres of contiguous BLM lands. Non-federal lands are not considered.
    2. Roadless areas under 5,000 acres of contiguous BLM lands where any of the following applies:
        a. Contiguous with lands formally determined to have wilderness or potential wilderness values or with any Federal lands managed for the protection of wilderness characteristics, including designated wilderness, BLM WSAs, USFWS areas proposed for wilderness designation, USFS WSAs or areas recommended for designation as wilderness, and NPS areas recommended or proposed for designation. Does not include NPS areas merely considered eligible for wilderness study or FS Roadless Areas unless also designated or recommended for designation through a forest plan revision.
        b. Of sufficient size to make practicable their preservation and use in an unimpaired condition.
        c. Any roadless island of the public lands.

B. Naturalness: Lands and resources exhibit a high degree of naturalness when affected primarily by the forces of nature and where the imprint of human activity is substantially unnoticeable. An area's naturalness may be influenced by the presence or absence of roads and trails, fences or other developments; the nature and extent of landscape modifications; the presence of native vegetation communities; and the connectivity of habitats. Wildlife populations and habitat are recognized as important aspects of naturalness and would be actively managed.

C. Outstanding Opportunities for Solitude and Primitive and Unconfined Types of Recreation: Visitors may have outstanding opportunities for solitude, or primitive and unconfined types of recreation, when the sights, sounds, and evidence of other people are rare or infrequent, where visitors can be isolated, alone or secluded from others, where the use of an area is through non-motorized, non-mechanical means, and where no or minimal recreation facilities are encountered.

D. Supplemental Values: These include ecological, geological, or other features of scientific, educational, scenic, or historical value.

Activities that could affect lands with wilderness characteristics are those that would impair naturalness and outstanding opportunities for solitude and primitive and unconfined types of recreation. Examples include construction of new roads or structures and an increase in recreational use that affects solitude and primitive recreation opportunities. Actions that would have an effect on wildlife habitat and native vegetation communities would also adversely affect lands with wilderness characteristics.

Current Conditions

The BLM reviewed original wilderness inventory reports and maps from 1979 and 1980 to see if conditions had changed and if a new assessment was needed to determine if the area contained wilderness characteristics. This review enabled BLM to determine if there is any new information that was not considered as part of the original inventories. Numerous external groups have varying interests and have advocated wilderness designations through legislation and through participation in the land use planning processes. Proposal areas and acre figures have changed over time. This assessment included consideration of the most recent proposal submitted to the BLM for consideration of protection of wilderness characteristics in May 2007, by Colorado Environmental Coalition, the Wilderness Society, American Rivers, Inc., Center for Native Ecosystems, Colorado Mountain Club, and the Wilderness Workshop.

In 1994, Colorado conservationists presented to BLM the *Conservationists' Wilderness Proposal for BLM Lands* that compiled numerous citizen wilderness inventories and area-by-area justification for the statewide citizens' wilderness proposal. The 1994 citizens' proposal included six areas in the CRVFO planning area: Bull Gulch, Castle Peak, Deep Creek, Flat Tops Addition, Maroon Bells-Snowmass Addition, and Thompson Creek. In 2001, based on new citizen inventories, the citizens' proposal was expanded to include areas on the Grand Hogback. In 2007, the Colorado Environmental Coalition, Wilderness Society, American Rivers, Inc., Center for Native Ecosystems, Colorado Mountain Club, and Wilderness Workshop submitted an additional proposal for CRVFO lands near Pisgah Mountain. Table 3.2.12-1, Lands with Wilderness Characteristics in the CRVFO, shows the BLM CRVFO areas that were assessed as part of the CRVFO RMP revision process (Appendix D). Because the portions of Bull Gulch and Maroon Bells-Snowmass Addition on BLM lands are within existing WSAs, they were not analyzed for wilderness characteristics.

Table 3.2.12-1
Lands with Wilderness Characteristics in the CRVFO

Name	Total BLM CRVFO Acres Included in Public Wilderness Proposals[1]	Acres in Existing WSAs	Acres Analyzed for Wilderness Character outside Existing WSAs	Acres with Wilderness Character[2]	Acres with No Wilderness Character[2]
Bull Gulch	15,155	15,201	0	N/A	N/A
Castle Peak	16,263	12,237	4,026	3,906	120
Deep Creek	4,422	0	4,422	4,422	0
Flat Tops Addition/Hack Lake	3,558	10	3,548	3,548	0
Grand Hogback	11,356	0	11,356	11,356	0
Maroon Bells-Snowmass Addition	316	330	0	N/A	N/A
Pisgah Mountain	15,679	0	15,679	14,757	922
Thompson Creek	8,171	0	8,171	8,171	0

[1] Reflects total BLM lands, including acres in existing WSAs.
[2] Appendix D details the wilderness characteristics assessment process.

Castle Peak Addition Inventory Unit

The Castle Peak citizens' wilderness proposal includes a total of 16,263 acres, of which, 12,237 acres are within the Castle Peak WSA. BLM's analysis (Appendix D) is for the 4,026 acres outside the Castle Peak WSA known as the "Addition." The area, located entirely on BLM lands,, meets the overall required criteria for wilderness character and is summarized as follows:

- The area is managed as visual resource management (VRM) Class II.
- Motorized and mechanized travel is limited to designated routes only. Two routes are open to motorized and mechanized travel.
- Existing Recreation Opportunity Spectrum physical settings show the area as primarily middle country with pockets of backcountry.
- Livestock grazing occurs on two allotments. There are 12 fence lines, 13 ponds and reservoirs, and seven spring developments within the unit.
- There are currently eight water rights associated with ditches, ponds, and springs on record with the Colorado Division of Water Resources.
- The unit is open to oil and gas leasing but no land is currently leased. NSO stipulations exist within the Castle Peak SRMA for the protection of non-motorized recreation opportunities.

Deep Creek Inventory Unit

The Deep Creek citizens' wilderness proposal includes 20,847 acres, of which 4,422 acres are on BLM lands and 16,425 acres are on White River National Forest lands. Both agencies have managed the area for protection of its numerous unique and outstanding values. BLM's analysis (Appendix D) encompasses BLM lands only. The proposed area meets the overall required criteria for wilderness character and is summarized as follows:

- An ACEC occurs within a portion of the proposed unit and is one of only three areas in the CRVFO recognized for its outstanding scenic quality. This area has been designated VRM Class I. The remainder of the proposed unit is designated VRM Class II.

- A joint US Forest Service and BLM Wild and Scenic River (WSR) eligibility study done for Deep Creek in 1995 found the creek met necessary free-flowing criteria and was eligible for its numerous outstanding values, including scenic, geologic, recreational, wildlife, and cultural.
- Livestock grazing occurs on three allotments, and seven or more livestock reservoirs exist.
- The unit is open to oil and gas leasing, but no land is currently leased. NSO stipulations exist for areas within the ACEC.
- Two water rights have been recorded by the State Water Resources Division. Verification of the existing location would need to occur to exclude this human-made disturbance from the unit's boundary.
- The citizens' proposed area has retained a natural landscape within the unit as a whole. While several human-made intrusions exist in the northern portions of the unit, these disturbances do not dominate the unit or detract from the area's overall naturalness.
- The unit offers outstanding opportunities for solitude because of its steep terrain, vertical relief, and difficult access. In addition to a rugged canyon, the unit offers numerous side drainages and remote uplands.
- Supplemental values include critical winter range for sage-grouse and significant concentrations of cultural resource sites.

Flat Tops Addition/Hack Lake Inventory Unit

The Flat Tops Addition/Hack Lake citizens' wilderness proposal includes 3,558 acres of BLM lands, 10 of which are within the Hack Lake WSA. BLM's analysis (Appendix D) is for the 3,548 acres outside the Flat Tops Addition and Hack Lake WSA. The area is bordered to the north by the Flat Tops Wilderness on National Forest land and overlaps the Hack Lake SRMA. This area has been managed to protect semi-primitive, non-motorized recreation values and to minimize impacts of all land uses. The Hack Lake SRMA is closed to motorized travel, while the remaining portions of the unit are open, although many areas remain effectively inaccessible due to steep terrain or dense vegetation. The proposed area meets the overall required criteria for wilderness character (Appendix D) and is summarized as follows:

- Hack Creek was evaluated for WSR eligibility in 2007 and found eligible.
- Livestock grazing occurs on two allotments, and one livestock reservoir exists within the unit.
- The proposed wilderness is open to oil and gas leasing, with no current leases. The SRMA portion includes NSO stipulations.
- Two water rights have been recorded for the area by the State Water Resources Division.
- The unit has retained a natural landscape. Because of prior management, the area has experienced limited evidence of significant human activity. There is occasional limited evidence of hunting camps at and adjacent to Hack Lake; however, these disturbances are temporary and do not dominate the area.
- The unit offers outstanding opportunities for solitude due to its size, terraced landscape, and varied vegetation. Two permitted commercial outfitters offer horseback riding tours and hunting services within the unit, although these activities are also permitted on adjacent National Forest System lands,

so use is dispersed. In addition to these activities, excellent opportunities for fishing, photography, backpacking, hiking, and camping exist.

- Supplemental values include important habitat for a variety of wildlife species, including bald eagle, bighorn, black bear, lynx, elk, and other big game species. The area also contains two watersheds that provide habitat for Colorado River cutthroat trout. The historic Ute Trail traverses the area, and the Colorado Office of Archeology and Historic Preservation lists six registered sites within the unit.

Grand Hogback Inventory Unit

The Grand Hogback citizens' wilderness proposal unit contains 11,356 acres of BLM lands. All of the proposed area meets the overall required criteria for wilderness character (Appendix D) and is summarized as follows:

- Most of the unit is classified VRM Class II due to unique and colorful landforms. The unit is also within foreground viewing distance to travelers on State Highway 13, and sensitivity to changes within the landscape is high.
- Livestock grazing occurs on no allotments; there is one livestock reservoir near the unit boundary.
- There are 15 active oil and gas leases within the unit, totaling approximately 4,179 acres. None of these leases shows any active drilling or has previously drilled wells. The ability to manage for wilderness characteristics in the unit would be difficult. If the current acres in the area continue to be leased and experience any development, protecting the unit's wilderness characteristics would be infeasible. Wilderness characteristics could be preserved if none, or most, of the leases remain undeveloped under current leasing stipulations, and if, upon expiration of existing leases (between 2010 and 2016), those expired leases would be made unavailable for renewal or sale.
- While the unit's condition has generally maintained its naturalness and has remained undeveloped, 15 separate leases exist within the unit. Some protective stipulations are attached to these leases for other resources; however, it cannot be assumed that the areas would remain undeveloped and would continue to maintain their natural character.
- The unit has been managed predominately for non-motorized types of recreation. Outstanding opportunities exist for primitive and unconfined types of recreation including hiking, hunting, wildlife viewing, horseback riding, and photography. Some areas within the unit offer outstanding opportunities for solitude. Due to its proximity to the town of Rifle and its accessibility year round, the highest amount of visitation occurs on BLM lands adjacent to the Rifle Arch Trail. Most visitations occurring in the rest of the unit are infrequent and occur during hunting season.
- Supplemental values include the area's representation as the largest uninterrupted portions of BLM lands on the "Grand Hogback," one of the longest geologic structures in Colorado. The area provides habitat for bald eagle and big game species such as elk and mule deer. Historic remnants of mining activity are also present.

Pisgah Mountain Inventory Unit

The Pisgah Mountain citizens' wilderness proposal includes 15,679 acres on BLM lands, of which 14,757 acres meet the overall required criteria for wilderness character (Appendix D). The analysis is summarized as follows:

- The Colorado River adjacent to the unit was found to meet the eligibility criteria for its fish, wildlife, and recreation values under a WSR study conducted in 2007.

- Livestock grazing occurs on four allotments.
- The area contains the CRVFO's largest intact sage-grouse habitats and serves as important habitat for numerous big game species.
- The unit has retained a natural appearing landscape as a whole. While several routes and numerous livestock developments exist, the overall landscape has been managed to preserve its natural setting. A boundary adjustment to the citizens' wilderness proposal was made due to road #8350 (which serves as the main access route), which would detract from the area's naturalness. This boundary adjustment includes 922 acres and was found not to be natural.
- Outstanding opportunities for solitude are found within the unit, especially along the Colorado River, where dense vegetation, diverse and rugged drainages, and canyon topography extend toward the river.
- The area has been managed for predominately non-motorized types of recreation. Much of the unit is remote and offers outstanding opportunities for primitive types of recreation including hunting, hiking, camping, and photography. The area is popular for those seeking to hunt in a non-motorized setting. Seasonal and non-seasonal closures are in effect for some areas to mitigate impacts to big game.
- The unit has been identified as important to a wide variety of species and their habitat, including bald eagle, black bear, elk, sage grouse, lynx, and moose, and has been recognized for its Class II scenery along the Colorado River.

Thompson Creek Inventory Unit

The Thompson Creek citizens' wilderness proposal includes 25,285 acres encompassing the White River National Forest (17,114 acres) and BLM lands (8,171 acres). The White River National Forest found adjacent forest lands (Assignation Ridge Roadless Area, 11,800 acres) to be roadless, to contain opportunities for solitude, and to provide biological diversity to the designated wilderness system. The 2002 Revised White River National Forest Plan ROD recommended the Assignation Ridge Roadless Area for wilderness designation and prescribed management to not impair its wilderness qualities. The proposed unit on BLM lands meets the overall required criteria for wilderness character (Appendix D) and is summarized as follows:

- Portions (4,286 acres) of the unit are designated an ACEC and SRMA.
- The ACEC portions of the citizens' proposed unit contain one of only four areas within the CRVFO that is managed as VRM Class I. This scenic area was rated as Class A due to outstanding scenic qualities tied to the unique topography and geologic forms.
- Thompson Creek was found to meet the eligibility criteria for its outstandingly remarkable geologic and scenic values during a WSR study conducted in 2007.
- Three grazing allotments occur within the unit.
- Although there are no active leases on BLM lands within the unit, parts of the region have been leased. The area has been mapped as medium potential for oil and gas. No interest in other minerals has arisen to date.
- The Thompson Creek unit has retained a natural landscape as a whole. While a few livestock developments exist within the northern portion of the unit and some historic features can be found

adjacent to the creek, these do not dominate the landscape and do not detract from the area's overall naturalness.

- The unit offers outstanding opportunities for solitude. While the Thompson Creek drainage itself is used more heavily, numerous side drainages, canyons, steep rock outcrops, and isolated pockets offer visitors opportunities for solitude. While a trail exists along the creek, the trail disappears approximately 1.5 miles from the trailhead, where hikers must travel in the creek itself to access farther downstream. This effectively reduces the number of visitors and retains the primitive setting. The trail is apparent again to the south along the historic railroad grade, but it is not maintained.
- The unit contains unique geologic features that were identified as meeting the criteria for ACECs. Approximately 12 unique formations from the Paleozoic Era are exposed and represent past depositional events.
- Remains of the abandoned Aspen and Western Railway occur within the unit, and are considered a historic value.

Characterization

Indicators

The indicators for lands with wilderness characteristics are those criteria listed at the beginning of this section. If an area no longer meets those criteria, the area would not be considered as having wilderness characteristics. Areas identified as having wilderness characteristics would be managed to maintain those values. Any proposed or potential projects within lands having wilderness characteristics would be authorized only if those characteristics would be protected and preserved.

Trends

Most of the acres within the Castle Peak Addition have been managed to protect the area's semi-primitive, non-motorized recreation settings and to minimize impacts of all land uses since the 1997 Castle Peak Travel Management Plan. Current information shows no long-term threats to the area's wilderness characteristics from current or projected proposed land uses.

Conditional water rights are held in the headwaters of Deep Creek, which could have the potential to disrupt water flows. While there are no active limestone claims, BLM has not formally withdrawn the area from mineral entry. Increased recreation visitation and subsequent impacts are occurring along the creek on BLM lands adjacent to Coffee Pot Road. OHV encroachment has continued to occur into Jack Creek and in the northern portions of the uplands off of the Onion Ridge road accessed from an old trail at Lyons Gulch. Proposed future development and associated improvements, along with an existing dozed route into Deep Creek Canyon on adjacent private lands to the south, have created disturbance into an otherwise intact and undisturbed canyon.

The BLM, the White River National Forest, and the Colorado Army National Guard have agreements in place that allow the Colorado Army National Guard to train helicopter pilots under high altitude conditions on National Forest and BLM lands. The Deep Creek unit is within a Colorado Army National Guard training area and contains some frequently used landing areas within the canyon corridor. This use has occurred since 1985, and its impacts have been determined to be minimal, temporary, reversible, and would not preclude the area from legislative designation.

Since 1984, the Flat Tops Addition/Hack Lake area has been managed to protect its semi-primitive, non-motorized recreation values and to minimize impacts of all land uses. Although the area is experiencing some mountain pine beetle infestations in spruce fir forests, there is no known potential for commercial logging in the area.

The Grand Hogback lies along the eastern boundary of the Piceance Basin; it has been essentially split in half and mapped as medium and high potential for oil and gas resources. There currently are 15 active oil and gas leases within the unit, totaling approximately 4,417 acres. However, none of these leases has yet been developed. No applications for permits to drill have been filed on these leases, which have expiration dates ranging from 2010 to 2016. While no impacts to areas with wilderness characteristics have occurred at the time the research was done for the inventory and assessment in 2009, wilderness characteristics would probably be lost in the leased portions of the unit if they were developed.

While much of the unit has NSO stipulations in place for steep slopes and visual resources, lease holders have valid existing rights to develop their leases and obtain their minerals. If the leases expire, additional lease stipulations could be attached to a new or renewed lease that may protect some characteristics while still allowing for the lease holder to recover their gas. However, it can be expected that if the area continues to be leased and experiences any development, protecting the area's wilderness characteristics would not be feasible on large portions of the unit.

Under the 1984 RMP, this area was included and mapped as part of a larger area known as the Hogback Coal Field (28,529 acres) that was designated as acceptable for further consideration for coal leasing. Old historic coal mine features still exist today in the Estes Gulch area near the southern edge of the unit.

Current management issues within the Pisgah Mountain area include maintaining existing active sage-grouse leks to ensure the integrity of the sagebrush communities and reducing pinyon-juniper encroachment. While the area was designated as limited to designated routes in the 1997 Castle Peak Travel Plan, continued off-road travel occurs (mostly during hunting season) in some portions of the unit due to the open nature of the vegetation and gentle topography.

Although there are no active leases currently on BLM lands within the Thompson Creek area, parts of the region have been leased and the area has been mapped as medium potential for oil and gas.

Recreation related impacts in the area continue due to increased visitation from both the local and regional public. Subsequently, areas adjacent to the north and western boundaries are experiencing impacts. Issues are being raised related to human health and safety and the need for more active management and potential recreational infrastructure (such as bathrooms, signs, developed trailheads, and parking lots). Maintaining a primitive recreation setting and related social experiences has become increasingly difficult.

Thompson Creek canyon has seen a large increase in visitation since 2006 relating to sport rock climbing. In 2006, 45 routes were bolted onto one of the unique geologic fins, and the area became very popular for nearby Roaring Fork residents and other sport climbers in the state. The Roaring Fork Climbers Coalition was formed to try to mitigate the social and physical impacts until this plan is completed and further direction is provided.

Unmanaged travel and trail building activities continue to occur mostly within the northern half of the unit.

3.2.13 Cave and Karst Resources

Existing or potential threats to cave/karst resources include unmanaged cave use, which could damage fragile and sensitive resources. Other threats could include contamination through mineral leasing or mining operations, dewatering or pollution of karst systems from surface activities outside "known" areas from urbanization, agricultural operations, fires, overgrazing, or chemical spills.

Current Conditions

Seventeen caves are known to exist within the CRVFO planning area. The estimated acres and unexplored passages within the CRVFO are unknown at this time. However, the CRVFO is continuing to partner with Colorado Cave Survey (CCS) in identifying and determining significance of all known caves within CRVFO.

Of the 17 known caves in the CRVFO planning area, primary cave user groups consist of members of CCS and/or one of Colorado's seven Grotto Groups. Members of the caving community have a wide range of scientific and practical knowledge of the caves and their unique environments. The CRVFO has a working relationship and Cooperative Management Agreement with CCS. The agreement established a general framework of cooperation upon which the partners have worked together to preserve and improve cave resources on public lands, and to seek and use the skills, knowledge, and expertise in CCS to plan, develop, and implement cave management and conservation efforts. Most of the work has surrounded the Anvil Points Claystone Cave complex (located on the Roan Plateau, outside the RMP planning area) and focused on the development and implementation of the LaSunder Cave Plan, completed in 2006 (BLM 2007j). The La Sunder Cave Plan includes management for permit administration.

Most of the caves identified by the caving community would meet the significance criteria set forth in the Federal Cave Resources Protection Act of 1988, but have not undergone the inventory needed to identify them as significant. A significant cave on Federal lands shall possess one or more of the following features, characteristics, or values: biota; cultural; geologic, mineralogic, or paleontologic; hydrologic; recreational; and educational or scientific.

Critical karst groundwater recharge areas in the CRVFO planning area include the "Deep Creek ACEC", lands to the north known as Onion Ridge, and private lands to the south known as the "Wilderness Ranch." Lands to the west are managed by the WRNF. Cave-related habitat for special status species in the CRVFO area is known to occur within the Deep Creek ACEC. Geologic values specific to the high concentration of cave and karst resources within Deep Creek met the relevance criteria for ACEC designation in the 1984 RMP and in this RMP revision/EIS. Subsequent surface and subsurface management prescriptions, allowable uses, and stipulations will preserve the area's current physical setting.

Additional cave and karst inventory work will continue to be done in partnership with CCS.

Characterization

Indicators

Cave and karst resources are indicated by both the presence of and potential for these resources.

Trends

The CRVFO is experiencing a large increase in visitation due to the population growth within the region. With that increased population trend, the forecast is for increased visitation and exploration to many caves.

While the BLM does not market, publish, or release information regarding cave locations to the general public, unmanaged cave use could damage fragile and sensitive resources. Additional coordination and partnership efforts with CCS and other Grotto Groups would need to be given priority to ensure protection and appropriate management for cave resources.

Hibernating bats in the eastern United States are dying in record numbers. White-nose syndrome (WNS) disease is named for the white fungus evident on the muzzles and wings of affected bats. Bats affected by WNS eventually die from starvation; however, the factors causing this starvation are unknown. WNS is believed to be transmitted primarily from bat to bat. There is a strong possibility that it may also be transmitted by humans inadvertently carrying the causative agent from a cave. Laboratory tests performed at the US Geological Survey National Health Center in Madison Wisconsin have confirmed that a cave myotis (*Myotis velifer*) collected alive on May 3, 2010, from a cave in northwestern Oklahoma tested positive for the fungus *Geomyces destructans* (USFWS 2010b). The cave myotis is the first uniquely western bat species to be infected by the fungus. This indicates that WNS is not isolated to bat species found in the eastern US and will likely spread to other western states. The potential impact of WNS is considered to be significant due to the highly beneficial ecological and economic roles played by bats. If bats are identified as a cave value or resource, then actions will be taken to protect that value or resource.

In an effort to stay ahead of this serious issue, the BLM has provided interim direction to Field Offices on how to prepare for the anticipated occurrence of WNS on BLM-administered lands nationwide. As of July 2010, the USFS indicated that it would close caves on federal forests and grassland in Colorado, Kansas, Nebraska, and most of Wyoming and South Dakota. This would limit human access to caves, which would hopefully prevent further spread of the disease, as scientists believe it can be transported from cave to cave on clothing, boots, cave gear, and other equipment. The closure is expected to be in effect for 12 months (USFS 2010).

3.3 RESOURCE USES

This section contains a description of the resource uses of the CRVFO and follows the order of topics addressed in Chapter 2, as follows:

- Forestry
- Livestock grazing
- Recreation and visitor services
- Comprehensive trails and travel management
- Lands and realty
- Energy and minerals
- Renewable energy

3.3.1 Forestry

The practice of forestry is defined as the profession embracing the science, art, and practice of creating, managing, using, and conserving forests and associated resources for human benefit and in a sustainable manner to meet desired goals, needs, and values. Forestry techniques can be used as a management tool to derive products from forest and woodlands, such as timber for home construction, biomass for paper or alternative fuel sources, and other products. In addition, proper forestry techniques can maintain and enhance resource values, such as water quality, through reduced runoff, or habitat for wildlife species through selective cutting of overcrowded stands. Forestry uses a variety of management techniques such as clearcutting, shelterwood and other partial cut systems, and thinning to achieve the desired stand condition and provide wood products on a sustainable basis.

Decisions in the RMP may affect the quantity and quality of forest products: by indirectly increasing or decreasing the amount of wood products available, by changing access to increase or decrease transportation costs, by improving or damaging the health of forest and woodland ecosystems through the harvesting of stands, or by imposing requirements such as weed control following harvest. All of these plan decisions may affect the economic feasibility of forestry operations in the project area. The following actions may also impact the ability of the Field Offices to provide sustainable forest products:

- Strict management actions for wildlife, visual quality, cultural resources (including survey requirements) that limit flexibility in harvesting systems and activity timing.
- Increasing or decreasing the Probable Sale Quantity (PSQ).
- Limiting or increasing public access.
- Establishment of SMRAs.
- Policies that increase the likelihood of insect and disease outbreaks or wildland fire.

Probable sale quantity is the average amount of timber, measured in millions of board feet (MMBF) that could be sold annually on BLM lands where commercial forest uses are considered appropriate. A PSQ recognizes a level of uncertainty in meeting the determined level; this uncertainty is typically based on other environmental factors that preclude harvesting at a particular time (for example, because of watershed or habitat concerns). A PSQ is not a commitment to offer for sale a specific level of timber volume every year.

Current Conditions

The annual allowable harvest is 1.8 million board feet in the CRVFO. However, harvest levels have averaged less than 10,000 board-feet per year in the last 5 years as the CRVFO sought to hire timber program personnel. Lodgepole pine is the primary commercial species, with the occasional sale of Engelmann spruce and subalpine fir. Douglas-fir and aspen are also under commercial forest management in the CRVFO.

Pinyon-juniper woodlands in the CRVFO are managed as forest products, with an estimated allowable harvest of 6,465 cords. Most of this harvest is firewood for individual use. Average annual firewood harvest over the last 5 years is 650 cords. Special forest products are sold individually and include post and pole, Christmas trees, and landscaping transplants. These sales average 160 trees per year in the CRVFO.

Characterization

Indicators

The demand for timber (sawlogs), firewood, and biomass are changing in response to the regional economy. This demand for forest products, combined with insect and disease outbreaks, wildland fire, and resource demands such as recreational use will be used as indicators to prioritize harvest treatments and harvest amounts.

Trends

Over the past 15 years, the sawlog market has decreased in Colorado. Regional demand for sawlogs should decrease because demand depends on national housing construction levels, which are declining. The ability of federal lands to provide sawlogs with 16-inch diameter at breast height (DBH) or greater will decrease because Title 1 Section 102(f) of the Healthy Forests Restoration Act directs the BLM and USFS to favor retention of larger trees in many public forests. With the emphasis on removing small diameter (ingrowth) trees and favoring retention of larger trees, the supply of forest products coming from BLM lands will be mostly small-diameter trees and biomass recovery from vegetation that is less than 4 inches DBH.

Firewood demand largely decreased over the past 15 years due to burning limitations and the availability of relatively cheap electric and natural gas. This trend may reverse itself with the recent increases in natural gas and fuel oil prices. The supply of firewood is expected to increase in response to salvage and forest health projects. Changes in technology have led to emergence of the biomass industry and will increase the demand for wood previously considered valuable only as firewood.

A biomass industry is developing around the availability of small sawlogs and dead and dying timber, increasing woodland density, and increasing energy costs. Numerous projects and programs have been developed to identify and promote the use of small sawlogs and woody biomass in Colorado. While woody biomass products are a small portion of the CRVFO's timber program, growth of this market sector is anticipated to continue, placing higher demand on small sawlogs and woodlands.

The DOI collaborates with the DOE and USDA to encourage the use of woody biomass by-products from restoration and fuels treatment projects. Legislation has expanded and extended the use of stewardship contracting by the BLM and US Forest Service. Stewardship contracting allows private organizations or businesses to do the necessary thinning, and remove small trees and undergrowth; as partial payment, stewardship contractors are able to keep part of what they remove. This contract vehicle allows the BLM to trade goods (e.g., biomass, sawlogs) for services, such as thinning or noxious weed control. Contractors

purchase the goods generated through the project, through conservation credits earned for completing services. This contracting vehicle provides additional incentive for the private sector to invest in forest health and restoration projects, aiding in development of the biomass market.

Past decisions regarding forest and woodland products management emphasized wood products, but forest management policy on federal lands has changed, emphasizing forest health and hazardous fuels reduction. Much of the current forest management is guided by the National Fire Plan and the Healthy Forests Restoration Act. The National Fire Plan established an intensive, long-term hazardous fuels reduction program. Provisions to hasten hazardous fuels reduction and forest-restoration projects are provided in the Healthy Forests Restoration Act, which also emphasizes retaining larger trees and removing ingrowth to promote healthy forests that are more resistant to fire, insects, and disease.

3.3.2 Livestock Grazing

For multiple use and sustained yield, the BLM authorizes livestock grazing on BLM land under the authority of the Taylor Grazing Act of June 28, 1934, as amended, and the FLPMA of 1976, as amended by the Public Rangelands Improvement Act of 1978. The BLM manages grazing lands in conformance with current law, regulation, and policy.

Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado

The Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado (Appendix J) are directed at improving resource conditions for soils, riparian systems, upland vegetation, wildlife habitat, threatened and endangered species, and water quality (BLM 1997a). Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado are implemented through land health assessments, determination documents, EAs, permit renewals, and other permit changes. These standards not only pertain to impacts associated with livestock grazing but also to other rangeland impacts from such activities as recreation, development activities, wildlife grazing, and wild horse management. Sustainable livestock grazing and desired rangeland condition requires the collective management of forage, water, soil, and livestock by the BLM and by the livestock owners and operators. An interdisciplinary approach ensures effective management of the multiple resource values and uses.

Management practices for livestock grazing have been focused on achieving land health standards and meeting objectives for other resources (for example, vegetation and soils) established for allotments. This has been accomplished by better conformance with the guidelines for livestock management, such as changing the duration of grazing use and season of use, reducing animal units, and improving grazing distribution. Reducing the duration of grazing use, including rest or deferment grazing plans, and improving livestock distribution are generally the keys to meeting rangeland objectives, particularly those associated with riparian areas. Grazing management has been improved by a variety of actions, such as adjustments in grazing permits (including adding terms and conditions designed to maintain or improve riparian zones and wetlands, utilization, herding and riding requirements, and placing salt and supplemental feed away from riparian zones), construction of water developments and pasture fencing, and ensured compliance with maintenance of range improvements and grazing permits.

Impacts on livestock grazing are generally the result of activities that affect forage levels, livestock exclusion, or reduction of allotment acres. Land Disposals, access, competition with fish and wildlife, and mineral development activities impact grazing in the long term, while recreational events, wildland fire, and drought conditions impact grazing in the short term.

Current Conditions

Allotments

Approximately 489,566 acres of the CRVFO decision area are within grazing allotment boundaries, which are managed in accordance with the 1984 RMP (BLM 1984a) (Figure 2-44, Alternative A: Grazing Allotments). Unallotted acres include small isolated parcels not included within existing allotment boundaries and areas within allotment boundaries that have no permitted livestock grazing. 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. Section 3 allotments are those within a grazing district, as provided in the Taylor Grazing Act. Section 15 allotments are those outside a grazing district (all Section 15 allotments in the CRVFO are in

Routt County). Appendix I provides allotment and grazing use data for all allotments currently permitted for grazing use.

The livestock that graze on CRVFO decision area lands are primarily cattle but also include sheep and some domestic horses. The relative numbers of these kinds of livestock have not varied much over the last 10 years. Total permitted numbers change frequently due to conversions of the class of livestock and changes in allotment or livestock management. The allotments are used for grazing cattle (88 percent of the allotments), sheep and cattle (5 percent of the allotments), or sheep (7 percent of the allotments). Three of these allotments also have horse permits.

The season of use within the CRVFO decision area is generally from May through October, with much of the use in spring (May and early June). Spring use occurs on the lower benches and is designed to coordinate with the end of calving on private lands and transitions from private land to Forest Service permits. Summer and fall use (late June through October) generally occurs at higher elevations.

Table 3.3.2-1 below summarizes the current management:

Table 3.3.2-1
Current Grazing Management in the CRVFO

BLM Area within Grazing Allotments	Active Preference (Permitted Use)	Grazing Permits/Leases	Allotments in the CRVFO
• Total: 489,566 acres • CRVFO BLM Lands within Grazing Allotments: 97% • Projected Allocation (1984 RMP): 50,594 AUMs	• Total: 35,297 AUMs • Suspended Use: 12,870 AUMs • Initial Allocation (1984 RMP): 37,852 AUMs	• Total: 126 • Section 3 Leases: 112 (33,050 AUMs) • Section 15 leases: 14 (2,247 AUMs)	• Total: 235 • Current in use: 180 • Vacant: 55

Allotment Management

In 1982, the BLM developed the following three selective management categories to prioritize grazing allotments according to management needs:

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

These categories are designed to concentrate public funds and management efforts on allotments with the most significant resource conflicts and the greatest potential improvement. Each allotment went through the selective management process and was then placed into one of these categories according to management needs, resource conflicts, potential for improvement, and BLM funding/staffing constraints. See Appendix I for grazing allotment management categories. The results of the selective management process for each allotment are identified in allotment management plans (AMPs).

Twenty-two allotments in the CRVFO decision area have AMPs implemented. Improve category allotments have priority in completing AMPs, but due to new resource issues and increased focus in some areas, AMPs have been established for lower priority allotments. Allotments 8218, 8219, 8220, 8221, and 8501 were closed due to land exchanges. Many of these allotments have received increased focus due to new resource issues leading to change in level of management intensity.

Land Health Assessments were initiated in 1999. The results of these assessments are presented in Table 3.3.2.-2 below:

Table 3.3.2-2
Results of CRVFO Land Health Assessments by Selective Management Categories

Category	Definition	Allotments	Acres
A	Rangelands meeting all standards or making significant progress toward meeting the standard.	133	281,807
B	Rangelands not meeting all standards or making significant progress toward meeting the standard, but appropriate action has been taken to ensure significant progress toward meeting the standards (existing livestock grazing is a significant factor).	3	31,553
C	Rangelands not meeting all standards or making significant progress toward meeting the standard, and no appropriate action has been taken to ensure significant progress toward meeting the standards (existing livestock grazing is a significant factor).	0	**0**
D	Rangelands not meeting all standards or making significant progress toward meeting the standard due to causes other than livestock grazing.	33	110,287

Note: Two watersheds in the CRVFO have not had an initial assessment. Land Health categories do not correspond to grazing allotment management categories.

Partners

The CRVFO has established partnerships/collaboration with the Grand Junction District Grazing Board of Advisors, the CDOW Habitat Partnership Program, and grazing permittees on range improvement projects and funding.

Characterization

Indicators

As stated above, management categories assigned to each allotment are used to prioritize funding and management efforts to balance grazing with resource protection and other resource uses.

Trends

Trends in livestock grazing reflect changes in livestock species, in permittees and their perspectives, and in permitted use or season of use. Absentee ownership of base property associated with many of the allotments has increased, as has 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 in the CRVFO decision area have resulted in diversification of perspectives. Some permittees have shifted the focus of their management to habitat improvement for wildlife and recreation as an alternative source of income.

Changes in permitted use or season of use are in response to changes in rangeland condition, socioeconomics, and other factors. The condition of the land is due to a variety of factors, such as climate,

wildlife, livestock, oil and gas development, recreational use, and increased population. Increased development and recreational demands are resource uses that are competing for resources that limit livestock grazing. If rangeland condition deteriorates, the BLM has the ability to reduce the number of permitted AUMs, to manage plant communities that provide forage and browse through vegetation treatments, to change the season of use, to require deferment and pasture rotations, and to 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 use, but they also require more management on the part of the grazing permittee. Range improvement and permittee involvement may become more crucial to sustain future resource demands. BLM's traditional goal in managing livestock grazing is to provide sustainable habitat for livestock and other animals, which is likely to remain the primary focus of BLM's management of livestock.

Urbanization of rural areas within the CRVFO has also caused conflicts with livestock grazing. New landowners are often unfamiliar with state livestock laws and associated fencing requirements. Conflicts develop when livestock authorized on BLM land drift onto private land. This is largely the result of BLM/private land boundaries that are not fenced or that are poorly fenced, or where fences have not been maintained. It is BLM policy not to fence, or be responsible for maintenance, on boundaries bordering BLM land. In most instances the BLM has determined that it is not in the public interest to construct these fences largely because it would not be practical or economical. As an example, due to the mixture of BLM and private land, the CRVFO would require about 1,700 miles of boundary fence. At an average cost of $3.50/foot, the fence would cost taxpayers $31.4 million.

Rural-urban interface conflicts, such as the one above, have often forced ranchers to seek other areas for grazing. Livestock operations near more urban areas in the CRVFO decision area, such as Aspen, Glenwood Springs, Eagle, and Gypsum, have consequently diminished, as has livestock use on BLM land surrounding these areas.

Increasing elk populations have also been an issue with many grazing permittees. Elk are often in direct competition with livestock for forage resources. Although most of the competition occurs on private land, particularly during the winter, further increases in elk populations would likely increase forage competition on BLM lands. The level of concern varies among grazing permittees. Those who own land where concentrated elk use occurs typically express the most concern over distributional problems. On the other hand, many grazing permittees are engaged in guiding and outfitting activities as another source of income, and do not express the same concern as their neighbors.

Increased gas development and activity in the western portion of the CRVFO decision area has also increased conflicts with livestock operations on BLM lands. As new roads are constructed and use of existing roads increases, livestock have become more difficult to control.

3.3.3 Recreation and Visitor Services

BLM lands in north-central Colorado offer a variety of outdoor recreation opportunities, including land-based, water-based, and snow sports activities. Typical recreational activities on BLM lands include camping, hiking, horseback riding, mountain biking, OHV use, and cross-country skiing. Migrating and resident wildlife provide plentiful opportunities for hunting, photography, and observation. Renowned local rivers (Eagle, Colorado, Blue, and Roaring Fork), streams, and lakes offer boating and coldwater fishing opportunities.

North-central Colorado is a world-renowned destination for outdoor recreation enthusiasts. Recreation visitors to the planning area come from three primary sources: national and international locations, the Denver metropolitan area and Colorado's Front Range, and locally. This is partially because most of the planning area can be reached via an easy 90-minute drive from Denver on Interstate 70. Visitors from the Denver metropolitan area come to the region because it is an easily accessible weekend getaway with a diversity of outdoor activity offerings and recreation settings. Other recreation-tourism markets are also affecting the amount of use on BLM lands. Increased visitation to small towns and destination resorts, such as Winter Park, Rocky Mountain National Park, and the Summit County area, are contributing to increased use of BLM lands by drawing more visitors to these areas.

Colorado's population has grown significantly (43.4 percent) since 1990 (Colorado State Demography Office 2007a), and an increasing number of people are living near or seeking local BLM lands for a diversity of recreational opportunities characterized by the "mountain resort or outdoor lifestyle." This region of Colorado is a year-round place to live and work, so BLM lands are absorbing increasing recreational demand and use. As the demand for BLM land increases, so does the potential for conflicts among its users. Although not statistically measured, OHV use in the planning area is increasing, which has the potential to conflict with other recreation such as hiking, biking, and equestrian use, which use many of the same routes and trails. Developing energy resources could conflict with recreation as route densities increase and landscapes are altered, thereby affecting recreation experiences. Hunting with motors is also an important recreation activity in the planning area. While this sport could conflict with recreation users seeking more quiet natural settings, such as hikers and those viewing wildlife, hunting is also the most important recreation activity to local economies (BLM 2007d). Management prescriptions to protect resources, such as protections in place for water, archaeological or paleontological, or wildlife resources, could also affect recreation.

Current Conditions

The CRVFO RMP recreation objective has been to ensure the continued availability of outdoor recreation opportunities which the public seeks and which are not readily available from other sources, to reduce the impacts of recreational use on fragile and unique resource values, and to provide for visitor safety. The 1984 RMP did not anticipate the rapid population growth in the intermountain west, the changing customer demand for a diversity of recreation opportunities and activities, or the large recreation-tourism demand.

Recreation-Tourism Elements

Community Growth Areas

A considerable and growing recreation demand is found on BLM lands around and between communities in wildland-urban interface areas with trail/road networks and aesthetic amenities. Over 696,100 acres of the CRVFO planning area is private land. Community growth issues abound since 80 percent of the BLM lands are within 1 mile of private lands. The towns of Eagle, Gypsum, Glenwood Springs, Carbondale, Basalt, New Castle, Parachute, Silt, and Rifle have bordering BLM lands that are valued as "backyard" recreation areas by

local residents. National Geographic Adventure, September 2008 issue, identified Carbondale, Colorado, as one of the 50 best places to live in the Rocky Mountains due to its varied and close outdoor recreation opportunities, supporting the importance of BLM lands to private residence (National Geographic 2008).

Colorado residents value the ability to conveniently access BLM lands near their homes for a variety of recreational activities. Recreation and scenic beauty were the most commonly cited reasons in a community assessment why people live in or visit the communities in the CRVFO planning area (BLM 2007d). A 2006-2007 visitor field survey found that over 95 percent of the visitors to the surveyed areas are from the state of Colorado and over 80 percent were repeat visitors to BLM lands (Arizona State University 2008a).

Outdoor Recreation Service Providers and Tourism

The most prominent outdoor recreation provider in the CRVFO planning area is the White River National Forest. Best known for its world-famous ski resorts such as Aspen, Aspen Highlands, Snowmass, Vail, and Beaver Creek, the adjacent White River National Forest administers the largest land base (1,504,180 acres) within the CRVFO planning area. In the 1990s, these ski areas evolved into four-season resorts that attract visitors throughout the year. Outdoor recreation, including both summer and winter activities, is the primary use of the White River National Forest. The 2002 White River National Forest Plan Revision limited in number new developed recreation sites and provided for the expansion of existing developed sites to concentrate recreational use (USFS 2002).

Other outdoor destinations in the CRVFO planning area include state parks administered by Colorado State Parks, state wildlife areas managed by the CDOW, Rifle Mountain Park administered by the City of Rifle, and community parks, open spaces, recreation facilities, and trails administered by towns and counties.

Ease of access to the mountain communities is a relevant BLM planning factor. Interstate 70 is a vital transportation corridor linking Denver International Airport, the Denver metropolitan area, and other Front Range population centers to the CRVFO planning area. The area can be reached via an easy 2 hour drive from Denver on Interstate 70 thereby offering easy access to BLM lands, many lodging options, great dining, arts and entertainment, and renowned historical sites. Besides the ski resorts the most popular tourist attraction is Glenwood Springs, conveniently located along Interstate 70 and home to the world's largest hot springs swimming pool. Glenwood Springs has become a year-round destination due to the diversity of outdoor activities, nearby ski resorts, the Colorado and Roaring Fork Rivers, and the Glenwood Caverns Adventure Park.

Hunting

The nation's largest herd of elk attracts large numbers of hunters during the fall big game hunting beginning in late August and lasting into December. Because Colorado offers unlimited over-the-counter elk hunting licenses, big game hunting alone accounts for over 200,000 participants and over 600,000 visitor days within the CRVFO planning area (CDOW 2008). The most commonly cited economic benefit derived from BLM lands is contributions to the local economy made from hunting and wildlife-related tourism. Some communities say that revenues from hunting season are so important that they sustain many businesses throughout the rest of the year (BLM 2007d).

Recreation Management Areas

Previously the recreation and visitor services (R&VS) program established Special Recreation Management Areas (SRMAs) and Extensive Recreation Management Areas (ERMAs) in Resource Management Plans

(RMPs) and amendments. SRMAs were established where BLM lands were experiencing heavy recreation use or where BLM planned on making large investments in staff, funding, facilities, or time. All remaining BLM lands were identified as one large ERMA. A wide variety of recreation-tourism issues and activities were custodially managed in the ERMA.

It is important to note that the 1999 Oil & Gas Leasing & Development amendment also used the term "recreation management areas" to describe areas where a no surface occupancy (NSO) stipulation would be applied in order to protect the non-motorized recreation opportunities. The stipulation was applied in the following areas: King Mountain, Siloam Springs, Castle Peak, Bull Gulch (the portion of the Bull Gulch WSA not within the Bull Gulch SRMA), Sunlight Peak, Fisher Creek and the Pisgah Mountain. The stipulation protected the physical recreation setting (i.e., naturalness and remoteness) by restricting surface-disturbing and inconsistent activities. The stipulation for these areas did not amend the RMP and establish the lands as SRMAs. However areas covered by the stipulation are discussed because the recognition of the recreation values is relevant to understanding recreation and other program proposals and analysis.

Special Recreation Management Areas

Five SRMAs (i.e., Bull Gulch, Deep Creek, Hack Lake, Thompson Creek and the Upper Colorado River) were identified in the original Glenwood Springs RMP. The Castle Peak Travel Management Plan amendment added the Bocco Mountain SRMA and the Gypsum Hills SRMA. The Red Hill RMP amendment added the Red Hill SRMA (near Carbondale). The eight SRMAs total 60,400 acres and are carried forward into Alternative A (Table 3.3.3-1 and Figure 2-58, Alternative A: Special Recreation Management Areas).

Table 3.3.3-1
SRMAs in the CRVFO

SRMA Name (acres)	Targeted Activity Opportunity	Management Summary
Bocco Mountain (1,388)	Motorcycling	Identified as an SRMA in the 1997 Castle Peak Travel Management Plan. Designated and maintained single-track trails with highest use in the spring. Administered by BLM via travel route designations and implementation plan.
Bull Gulch (8,252)	Hiking, Hunting	Low use until fall hunting seasons. No developed facilities or maintained trails. SRMA overlaps with ACEC and WSA designations.
Carbondale Red Hill (3,092)	Hiking/Running/Mountain Biking	Identified as an SRMA in the 1999 Red Hill SRMA RMP amendment. Administrative partnership with the Red Hill Council. Implementation plan completed in 2000. Designated and maintained single-track trails. Only SRMA in CRVFO integrating BBM concepts. Primary market strategy is the residents of the Roaring Fork Valley.
Deep Creek (2,406)	Hiking	SRMA overlaps with ACEC designation. Eligible/suitable W&SR section. Trailhead and primitive trail along Deep Creek.
Gypsum Hills (16,931)	OHV driving and riding	Identified as an SRMA in the 1997 Castle Peak Travel Management Plan. Minimal public interest and the CRVFO staff never completed an implementation plan. Administered by BLM via travel route designations.
Hack Lake (3,337)	Hiking, Horseback Riding, Hunting	Low use until fall hunting seasons. SRMA overlaps with small WSA. Adjacent to Flat Tops Wilderness Area. Trailhead and a few primitive trails.

Table 3.3.3-1 *(continued)*
SRMAs in the CRVFO

SRMA Name (acres)	Targeted Activity Opportunity	Management Summary
Thompson Creek (4,270)	Hiking, Climbing	SRMA overlaps with ACEC designation. Eligible/suitable W&SR section. Trailhead and one maintained trail.
Upper Colorado River (20,600)	Fishing, Floatboating	High visitation. Marketed as a destination for visitors to resorts for fishing and boating and popular with Colorado residents. Eligible/suitable W&SR section. Numerous facility developments and access points.

Revised Recreation Management Area Planning Guidance

The designation and management of RMAs for Alternatives B, C and D applies revised R&VS planning guidance. BLM Instruction Memorandum No. 2011-004 clarified and refined land use planning guidance for R&VS. The guidance established three potential classifications– SRMAs, ERMAs and undesignated lands.

RMAs in Alternatives B, C and D are defined as land units where R&VS objectives are recognized as a primary resource management consideration and specific management is required to protect the recreation opportunities. RMAs are classified as either SRMAs or ERMAs depending on the management focus. SRMAs are defined as administrative units where the existing or proposed recreation opportunities and recreation setting characteristics are recognized for their unique value, importance and/or distinctiveness, especially as compared to other areas used for recreation. ERMAs are defined as administrative units that require specific management consideration in order to address recreation use, demand, or R&VS program investments.

The RMA designation is based on: recreation demand and issues, recreation setting characteristics, resolving use/user conflicts, compatibility with other resource uses, and resource protection needs. Within the recreation program, lands not designated as an SRMA or an ERMA are left undesignated. Recreation is not emphasized on these lands; however management actions and allowable use decisions may still be necessary to address basic R&VS and resource stewardship needs.

River Recreation Management

Water-based recreation in the planning area provides a mixture of opportunities in a variety of scenic settings. Fishing, floatboating (including rafting, kayaking, and canoeing), camping, picnicking, sightseeing, photography, hiking, and wildlife viewing may be enjoyed along the river corridors.

The CRVFO has management responsibilities on the Colorado, Eagle, and Roaring Fork Rivers. On the Colorado River from Glenwood Canyon to Parachute, the CRVFO administers only a few parcels of BLM land along the river, with the South Canyon Boat Launch being the most prominent for river access. From State Bridge to Glenwood Canyon, use is light and primarily revolves around day-use activities. The proximity of private land, the road, and the railroad, along with numerous access points, limit solitude along this stretch of river, thereby limiting primitive camping opportunities. Other limiting factors are the distance from population centers, and the natural turbidity of the water, which limits the quality of fishing. While there is limited white water to challenge enthusiasts, sections of the river are hazardous enough to discourage many casual floaters. Consequently, this stretch of river receives 5 to 10 percent of the use the Colorado River above State Bridge is experiencing. The developed sites, while basic, more than satisfy the recreational demand.

The CRVFO manages a handful of developed recreation sites along the lower Eagle River, which receives moderate use during the 6- to 8-week white water season. In other times of the year, river-related use is quite light, and facilities are adequate to satisfy recreation demand. However, these sites are adjacent to growing communities and Interstate 70, so residents and travelers often use them as urban-type parks. Management challenges exist because these sites were not designed to meet the activity demands of these users. Additional infrastructure and maintenance resources will be required to meet the additional recreation demand created by residents and travelers.

The CRVFO also manages one small parcel on the Roaring Fork River. The parcel is in a ROW managed by the Colorado Department of Transportation (CDOT) in cooperation with Pitkin County. This area is used by the public and local outfitters and guides to access the river.

Developed Recreation Facilities

Developed recreation sites and facilities have been constructed to enhance recreation opportunities, protect resources, manage activities, or reduce recreation use conflicts. Developments range from campgrounds to trailheads with simple bulletin boards to developed river access. Recreation management has traditionally focused on managing BLM lands and developed recreation sites along the Colorado, Eagle, and Roaring Fork Rivers except during the fall big game seasons when the focus shifts to upland areas. The developed sites adjacent to growing communities and Interstate 70 are used by residents as community/urban parks for day-use activities.

The CRVFO manages 19 day-use sites, all of which provide river access, and 10 of which provide boat launches. The CRVFO also manages 15 trailheads, in addition to 5 developed campgrounds that contain a total of 36 campsites (Figure 3.3.3-1, Recreation Sites). Most of the developed campgrounds have basic infrastructure and few campsites, and receive seasonal use. One exception, the Gypsum campground, is often used for activities, such as permanent residency and late-night parties, due to its proximity to Interstate 70. Two of the developed campgrounds collect fees, together totaling $4,000 to $5,000, and 1,000 to 1,300 visitor-days per year. These sites are maintained by BLM seasonal staff.

Recreation Administration

Cooperative Management

The BLM has established a number of active partnerships between entities for the management of BLM land resources. Many of these partnerships are involved with facilitating local community events and developing trail systems, notably for OHV use.

In the CRVFO, most developed local trail systems are cooperatively administered with communities/community groups. Each partner shares responsibility for the development, administration, and maintenance of local trail systems. Through these partnerships, the CRVFO has been able to partially meet the local demand for trail-based recreation. CRVFO's active partnerships include ECO Trails, Red Hill Council, and the Town of New Castle.

Stipulations

The Glenwood Springs Resource Area - Oil & Gas Leasing & Development - Record of Decision and RMP Plan Amendment (BLM 1999b) identified stipulations to protect recreation values and areas (Table 3.3.3-2).

Table 3.3.3-2
Stipulations for Recreation Opportunities in the CRVFO

Stipulation	Name	Rational	Applicable Location
NSO	Major River Corridors	For the protection of the recreation values.	Colorado, Roaring Fork, Frying Pan, Eagle, and Piney Rivers to protect recreation values
NSO	Special Recreation Management Areas	For the protection of the recreation setting, recreational opportunities and recreation facilities.	Deep Creek, Bull Gulch, Thompson Creek, Hack Lake SRMAs, and Rifle Mountain Park
NSO	Recreation Management Areas	To protect non-motorized recreation opportunities.	King Mountain/King Creek area, Siloam Springs area, Castle Peak area, Bull Gulch area (The portion of the Bull Gulch WSA not within the Bull Gulch SRMA), Sunlight Peak area, Fisher Creek area (Haff Ranch), and Pisgah Mountain Area.

Special Recreation Permits

The CRVFO administers an average of 75 special recreation permits (SRPs) each year. Most SRPs are related to commercial river-related recreation and upland hunting outfitting. There are 36 SRPs being issued for river-related recreation. The CRVFO has not been issuing additional commercial SRPs on the Colorado or Eagle Rivers due to lack of infrastructure and staffing limitations.

There are 19 SRPs being issued for upland hunting, authorized on a geographical area basis. Very few permanent camps/facilities are authorized on BLM lands because most camps are on the nearby private lands. The CRVFO is not accepting new applications for upland hunting SRPs, including mountain lion hunting, due to the complete allocation of big game hunting areas, the increase in complaints and conflicts, the low reported use, quality of hunt concerns, urban interface issues, limited law enforcement/compliance staff, and limited BLM lands accessible in the winter for lion hunting. Fifteen commercial permits are authorized for other activities such as trail rides, photography, jeep tours, kayak/canoe instruction, hot-air ballooning, and paragliding. Annually five to ten different groups are issued SRPs to conduct competitive events or organized group activities.

No individual user fees are charged outside of developed campgrounds within the CRVFO. The CRVFO collects about $25,000 to $35,000 per year in SRP fees which are retained by the CRVFO for program administration, visitor services, on-site improvements, and monitoring.

Accessibility

Participation in outdoor recreation can be restricted by age, disabilities, poor health, lack of appropriate facilities within an accessible distance, undesirable recreation settings, lack of information about recreation opportunities, poor transportation, or lack of convenience.

The BLM improves facilities to make them more accessible to people with disabilities, as well as to provide better general public land access and information about recreation opportunities. All construction is reviewed for compliance with Uniform Federal Accessibility Standards and the Americans with Disabilities Act

Guidelines. As newer Accessibility Guidelines for Outdoor Developed Areas become final, those standards will also be followed.

Recreation Marketing/Information/Education

Marketing and Tourism

The State of Colorado attracts visitors who embrace its image as a place for adventure and recreation. Outdoor recreation is a big business and accounts for approximately 31 percent of all travel into Colorado (including business travel and skiing). A variety of attractions and activities, during all seasons, provide a stable tourism industry that is important to the regional economy, as well as to the fiscal well-being of the sales tax dependent local governments. Tourism and out-of-area incomes are often the primary economic engines of an economy which boasts renowned recreation opportunities.

The CRVFO is in Colorado's northwestern tourism region. BLM marketing has generally focused on hunting and motorized sports on the White River National Forest and other opportunities elsewhere in the region. BLM lands tend to be marketed indirectly or lumped in with opportunities on the White River National Forest (Colorado Tourism Office 2008).

Maps, past personal experiences, and friends and relatives are the most used information sources for visitors (Arizona State University 2008b). The CRVFO provides basic recreation information and maps are available through the CRVFO website for a few select areas. Interactive maps with community trails can be found on the Ecosports website (http://www.ecosports.com). Additionally, the Town of Eagle website (http://www.townofeagle.org) and the Eagle County website (http://www.eaglecounty.us) have community trail maps of the East Eagle and Hardscrabble areas. The Carbondale Chamber of Commerce website and brochures market hiking and mountain biking trails in the Carbondale area http://www.carbondale.com) and maps are also available on Singletracks.com (http://www.singletracks.com) and Trails.com (http://www.trails.com).

In the CRVFO, many community trail systems are cooperatively administered with communities/community groups (e.g., Town of New Castle, ECO Trails). Each partner shares responsibility for the development, administration, and maintenance of the local trail systems. It is through these partnerships that the CRVFO has been able to partially meet the demand for community-based recreation. The Red Hill Council administers the Red Hill SRMA and the Town of New Castle administers the Colorow Trail through MOUs with the CRVFO.

Interpretation and Education

No formal education or interpretation program exists. Education and interpretation on recreational opportunities and land stewardship is mostly done through brochures, signs, and BLM's website. The BLM staff participates in school programs and promotes resource protection through programs such as "Tread Lightly!" and "Stay the Trail."

Discussions with local communities, as documented in The North-Central Colorado Community Assessment Report for the Bureau of Land Management (BLM 2007d), indicated that many communities would like BLM staff to engage in more education and outreach regarding resource stewardship. This would involve not only an increased presence of BLM staff on the ground to engage users in discussions about sound resource use, but also an active effort to teach the next generation of users by going into local schools and teaching

children about land use and stewardship ethics. The ongoing challenge, in an era of tight budgets and limited staffing, is to find partners to help the BLM accomplish this.

Recreation Monitoring and Evaluation

The BLM recreation staff and the law enforcement officers monitor and evaluate all forms of public use for user conflicts, recreation activity effects on natural and cultural resources, visitor health and safety issues, and conflicts with adjacent private landowners. In addition, recreation staff members monitor implementation of management actions and the achievement of management objectives.

Recreation Setting Character Conditions

The contextual information provided by discussing recreation settings [rooted in the Recreation Opportunity Spectrum (ROS)] offer land managers both a descriptive tool and a prescriptive tool for recreation planning, management, and research (Clark and Stankey 1979). Since 2005, recreation setting characteristic conditions (RACC) are specifically described and prescribed for SRMAs (BLM 2005). RSCC can be described by attributes addressing the physical qualities of nature, social qualities associated with use, and operational conditions created by management.

The CRVFO adopted the ROS management classes in the 1984 CRVFO RMP (BLM 1984a). All three setting components (physical, social, and operational-formally managerial) were merged into one map emphasizing the physical setting. Recreation planners now find it more advantageous to discuss the distinctive differences between the physical, social, and operational setting components.

Physical Setting Character Condition

For the protection of the physical RSCC, the CRVFO has two no surface occupancy stipulations (BLM 1999b) covering SRMAs and Recreation Management Areas. NSO 16 for SRMAs includes: Deep Creek SRMA, Bull Gulch SRMA, Thompson Creek SRMA, Hack Lake SRMA, and Rifle Mountain Park. NSO 17 for Recreation Management Areas includes: King Mountain Area, Siloam Springs Area, Castle Peak Area, Bull Gulch Area (the portion of the Bull Gulch WSA not within the Bull Gulch SRMA), Sunlight Peak Area, Fisher Creek Area (Haff Ranch), King Creek Area (with exceptions) and Pisgah Mountain Area (with exceptions).

In addition, BLM's ability to map the physical natural resource recreation settings across the CRVFO has improved considerably due to available GIS data. Consequently, the physical recreation setting from 2008 is much more detailed than what was completed for the 1984 CRVFO RMP (BLM 1984a). In 1984, 49 percent of the CRVFO was described as semi-primitive motorized, 42 percent was roaded natural, 5 percent was semi-urban, 3 percent semi-primitive non-motorized, and less than 1 percent was classified as either primitive or urban. The physical recreation setting now estimates 13 percent as primitive, 3 percent as backcountry, 26 percent as middle country, 41 percent as front country, 11 percent as rural, and 6 percent as urban.

Maps prepared by the BLM for this Draft EIS display small "islands" or fragments of physical setting classes. In the 1984 CRVFO RMP (BLM 1984a), these same islands were likely merged into the dominant setting class or were not seen due to the scale of analysis. The displaying of these islands shows that even with the land use trends in the region, pockets of physical remoteness, as defined by the backcountry setting class, still exist (BLM 2007d). The fundamental physical setting character trends for the CRVFO are clear and predictable realizing the physical changes in the region. The acre differences show that the physical urban setting class has expanded into the rural setting class due to the consequences of urban growth. More

improved roads and more man-made developments can be attributed to causing a decrease in the physical middle country class and the dramatic increase in the physical front country setting class. Cumulatively over 23 years, the natural resource recreation settings (remoteness attribute) have generally become physically less remote due to many factors, including gas development, urban growth, and mechanized/motorized use on BLM lands.

In 2002, the White River National Forest Plan Revision Record of Decision placed a Forest-wide emphasis on semi-primitive non-motorized opportunities, followed by primitive and semi-primitive motorized opportunities (USFS 2002).

Social Setting Character Conditions

BLM recreation visitation is roughly estimated and input into the Recreation Management Information System (RMIS). It is estimated that the CRVFO receives an estimated 1.3 million visits per year (BLM 2008c). The BLM does not have precise visitation data; however, the adjacent White River National Forest recorded more than 8.8 million recreation visitor days in 1997 and was the nation's fifth most visited national forest in 1995 in terms of visitor recreation days (USFS 2002). The highest use of BLM lands occurs on a daily basis near communities and along the major rivers. On weekends and in the evenings the sights and sounds of people are seemingly everywhere in the more popular areas. This use continues to grow exponentially with the rapid growth in the communities. The Red Hill Council social monitoring in the Red Hill SRMA shows this growing use trend.

Many upland areas still offer uncrowded social settings outside of hunting seasons. Hack Lake SRMA, Castle Peak WSA, Bull Gulch SRMA, Gypsum Hills SRMA, Sheep Creek, King Mountain RMA, Cedar Mountain, and Pisgah Mountain RMA, at least seasonally receive low levels of visitation. With use levels growing, there is increasing evidence of visitation (e.g., vehicle use, litter, man-made structures, tree damage, surface vegetation impacts, hardened campsites), and compacted soils is also increasing.

Operational Setting Character Conditions

Operationally the CRVFO has had to limit motorized use in many areas (e.g., motor vehicle closures), limit motorized use by season (e.g., winter closures), increase signing, field staff, and visitor services, create brochures and maps for visitors, and apply more rules and regulations in order to maintain natural resource settings, direct recreation use, and protect resources. Within some SRMAs and in urban-interface areas, new issues necessitate that the BLM consider additional operational remedies to manage recreation use and produce recreation opportunities. These issues are domestic animals, noise, and visual aesthetics.

Visitor Preference/Recreation Demand

Activity Preference/Demand

A 2006-2007 visitor field survey and focus group study of BLM lands was coordinated through the Colorado Plateau Cooperative Ecosystem Studies Unit under a partnership between the CRVFO and Arizona State University. The most popular activities of the onsite and mail-back surveys were hiking/walking (33 percent), mountain biking (26 percent), hunting (22 percent), driving and general sightseeing (18 percent), camping (17 percent), motorcycling (15 percent), watching wildlife (13 percent) and ATV riding (11 percent). Respondents in the focus group discussions identified a broad array of recreation desired by local residents including hiking, mountain biking, camping, horseback riding, motorcycling, ATV riding, hunting, fishing, rafting, four-wheel driving, rafting, snowmobiling, cross-country skiing, and rock climbing.

Other types of recreation were reported but at lower levels. Sixty-eight percent reported that activities contributed most to their satisfaction (Arizona State University 2008b). A community assessment identified hiking and wildlife-related activities (hunting and fishing) as extremely popular in most areas. Motorized activities (all-terrain vehicles, four-wheeling, and motor-biking) and mountain biking are common throughout the CRVFO, but extreme popularity for these activities is concentrated in certain communities (BLM 2007d).

Recreation Setting Character Condition Preference

A 2006-2007 visitor field survey (supported by BLM's scoping effort) indicated that visitors expressed considerable support for current management direction and the current recreation setting character conditions. Sixty-four percent of visitor study respondents indicated that natural places contributed most to their satisfaction (Arizona State University 2008b). BLM lands tend to be open and mostly natural in appearance. Maintaining this natural looking landscape is commonly cited as an environmental and social benefit. Some communities simply stated that BLM should "keep BLM lands the way they are now" (BLM 2007d).

Experience and Benefit Outcome Preference

The most commonly identified outcomes that communities currently receive (and hope to receive in the future) from BLM lands are related to benefits from participation in recreation. For residents, the proximity and diversity of leisure activities support an outdoor-oriented lifestyle, adds to their quality of life, and fosters quality time and positive experiences with their families (BLM 2007d). The 2006-2007 visitor study identified enjoying access to outdoor physical activity, experiencing natural surroundings, getting physical exercise, enjoying the area's wildlife and scenery, and escaping everyday responsibilities for awhile, as the highest rated desired experiences. Increased satisfaction with life, restored mind from stress, improved physical fitness and health, and improved balance of work and play were rated as desirable personal benefits. The most desired community, environmental, and economic benefits were increased awareness and protection of natural landscapes, greater protection of fish, wildlife and plant habitat, preserving the special landscape character of this place, strengthening relationships with family and friends, and lifestyle improvement or maintenance. These same items were reported as the top attained benefits along with increased desirability as a place to live/retire and greater family bonding (Arizona State University 2008b).

Characterization

Indicators

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

Trends

Historically, the use of BLM lands emphasized commodity production; however it is clear that recreation has grown to become the predominant use of BLM lands (BLM 2008c). The region has become a year-round place to visit, live and work, and BLM lands are absorbing increasing recreational use. Colorado's population has also grown by more than 43 percent since 1990 (Colorado State Demography Office 2007a), and an increasing number of people are living near or seeking local BLM lands for a diversity of recreational opportunities characterized by the "mountain resort or outdoor lifestyle." Eight of the 20 fastest growing counties in the nation during the 1990s were in Colorado (BLM 2008c)

BLM land trends include increasing demands for varied outdoor recreation opportunities from local communities, improving technology, recreation marketing, increasing bandit trails, funding shortfalls, developing resorts, maintaining access, changing demographics and expectations, and increasing energy development. Similar key issues were identified by the Colorado Statewide Comprehensive Outdoor Recreation Plan steering committee.

At the broadest level, the physical, social, and operational recreation setting character conditions of the CRVFO BLM lands are quickly changing from less natural to more developed, from less crowded to more congested, and from less restrictive to more regulated. These changes will impact the recreation opportunities that can be produced by land managers and partners in the future.

3.3.4 Comprehensive Trails and Travel Management

One of the BLM's greatest management challenges is providing reasonable and varied routes for access to BLM lands, and also providing areas for a wide variety of both motorized and non-motorized recreational activities. The various landscapes, user interests, equipment options, weather conditions, transportation infrastructure, and resource constraints all must be considered through a holistic process. Travel and transportation are an integral part of virtually every activity that occurs on BLM lands, including recreation, livestock and wildlife management, commodity resources management, ROWs to private inholdings, electronic site maintenance, and BLM lands management and monitoring. Comprehensive Trails and Travel Management (CTTM) is the proactive interdisciplinary planning, on-the-ground management, and administration of roads and trails (both motorized and non-motorized) to ensure that public access, natural resources, and regulatory needs are considered.

Traditionally, BLM's travel management program focused primarily on motor vehicle use. Within the framework of CTTM, this paradigm is significantly expanded to encompass all forms of travel, including travel by foot, horseback and other livestock, mechanized vehicles (e.g., bicycles), motorized vehicles (e.g., two-wheeled, such as motorcycles and four-wheeled, such as off-road vehicles, cars, and trucks), and travel by motorized and non-motorized boats.

There is considerable overlap between travel management and all BLM uses on BLM lands. For example, many users of BLM land are there to recreate. For visitors, a route system may serve as either a route to a destination or as the recreation location itself. For destination recreation, vehicle routes serve as the means to get to a starting point to engage in the recreation activity, such as a parking area/trailhead. The route itself also can serve as the focus of the recreation activity, (e.g., pleasure driving, four-wheel driving, motorcycling, ATV riding, biking, horseback riding, hiking, snowmobiling, and cross-county skiing) (USFS 2008b). To reduce the duplication of narrative between travel management and the other sections of this document, this section addresses only public travel and access (e.g., OHV management area designations, route designations, types of travel, over-the-snow travel, and seasonal area limitations). The interrelated recreation component narrative, for example, is addressed under Section 3.3.3 Recreation and Visitor Services. The transportation component of CTTM addressing administrative access, agricultural use, commercial use, commodity use, and road maintenance is addressed under Section 3.5.1, Transportation Facilities.

Off-Highway Vehicle Management Areas

An OHV is synonymous with Off-Road Vehicles (ORV). ORV is defined in 43 CFR 8340.0-5 (a): Off-road vehicle means any motorized/battery-powered vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain, excluding: 1) Any nonamphibious registered motorboat; 2) Any military, fire, emergency, or law enforcement vehicle while being used for emergency purposes; 3) Any vehicle whose use is expressly authorized by the authorized officer, or otherwise officially approved; 4) Vehicles in official use; and 5) Any combat or combat support vehicle when used in times of national defense emergencies. OHVs generally include dirt motorcycles, dune buggies, sand rails, jeeps, four-wheel drive vehicles, snowmobiles, and ATVs.

A 4-wheel drive vehicle (4x4, 4WD) is a passenger vehicle or light truck having power available to all wheels. An all-terrain vehicle (ATV) is a wheeled vehicle other than a snowmobile, which is defined as having a wheelbase and chassis of fifty (50) inches in width or less, steered with handlebars, generally having a dry weight of 800 pounds or less, travels on three or more low-pressure tires, and with a seat designed to be straddled by the operator. A motorcycle is defined as a motorized vehicle with two tires and with a seat

designed to be straddled by the operator. Many of these routes are designed more for the off-highway type of motorcycles.

Pursuant to 43 CFR 8342.1, the BLM's regulations for OHV management, "the authorized officer shall designate all BLM lands as either open, limited, or closed to [OHVs]." As such, all BLM lands within the planning area have been designated in one of three OHV designation categories, as follows:

Open Area Designations are used for intensive OHV or other transportation use areas where there are no special restrictions or where there are no compelling resource protection needs, user conflicts, or public safety issues to warrant limiting cross-country travel.

Limited Area Designations are used where travel must be restricted to meet specific resource/resource use objectives. For areas classified as limited, the BLM must consider a full range of possibilities, including travel that will be limited to types or modes of travel, such as foot, equestrian, bicycle, motorized, etc.; limited to existing roads and trails; limited to time or season of use; limited to certain types of vehicles (OHVs, motorcycles, all-terrain vehicles, high clearance, etc.); limited to licensed or permitted vehicles or users; limited to BLM administrative use only; or other types of limitations. In addition, the BLM must provide specific guidance about the process for managing motorized vehicle access for authorized, permitted, or otherwise approved vehicles for those specific categories of motorized vehicle uses that are exempt from a limited designation.

Closed Area Designations are completely restricted to any and all travel and transportation. Areas or trails are designated closed if closure to all vehicular use is necessary to protect resources, promote visitor safety, or reduce use conflicts.

Modes of Travel

Non-Mechanized Travel— Non-mechanized modes of travel include cross-country skiing, dog sledding, snowshoeing, horseback riding, pack animal driving, hiking, boating, hang-gliding, paragliding, and ballooning.

Mechanized Travel— Mechanized vehicles include, primarily, mountain bikes and specialized equipment such as mountain skateboards.

Motorized Travel—Motorized travel includes standard passenger vehicles on maintained roads and OHVs on primitive roads and trails. OHVs include off-road motorcycles, ATVs, jeeps, specialized 4x4 trucks, and snowmobiles. It also includes motorboats on lakes, reservoirs, and the Colorado River.

Existing Route Systems

Many routes within the planning area were constructed to access BLM land improvements and projects for timber/vegetation management, gas/mineral development, range management, and various ROWs. Some of these routes are maintained by the authorized permittee to access the improvement, such as a livestock/wildlife pond or fence. Over the years, many of these routes have also become part of the roads and trail system frequently used by visitors who are engaged in mechanized and motorized recreation.

Many more mechanized/motorized routes were created, or "pioneered," by users themselves. Open travel designations that allow cross-country mechanized and motorized use, high levels of use, and improvements in mechanized/motorized vehicle technology have allowed users to gain access to and through rough terrain. The repeated passage of vehicles or mountain bikes creates and maintains these routes. Not designed but created by consistent use, these routes often cause conflict with public land resources and other public land uses.

Current Conditions

The emerging issues within the CRVFO planning area are the following:

- The current 1984 RMP for the CRVFO provides the framework for travel planning, but was completed prior to the rapid expansion of recreational vehicle use and visitation on BLM lands.
- A lack of planning for recreation has preceded the construction of historic routes.
- Subdivision of private property has dramatically increased the number of adjacent property owners and increased the number of new access routes to BLM lands.
- Unauthorized creation of unmanaged user-created routes is impacting other resources.
- Users travel routes both as an end in itself and to get to specific places.
- Construction of new routes and the conversion of existing high clearance routes to improved oil and gas roads are expected to increase in the western portion of the CRVFO.
- Some routes and areas that are open to motorized use are accessible only to adjacent landowners.
- Conflicts among recreational users are increasing.

The BLM lands host over 55 million recreation visitors annually – an increase of over 80 percent since 1990. The BLM estimates that 22 million of these visitors participate in motorized recreation. These include:

- 9 million who participate in driving for pleasure.
- 12 million who participate in off-highway vehicle travel.
- 500,000 who participate in snowmobiling.
- 500,000 who participate in other specialized motorized sports, events, and activities (BLM 2009e).

Prominent among the travel management issues the BLM faces is the complex challenge in managing motorized activities on BLM lands. The combined effect of population increases in the west, explosive growth in the use of OHVs, and the advances in technology has generated increased social conflicts and resource impacts on the BLM lands related to motorized recreation and the impact on other recreation and resource uses (BLM 2009e). Throughout the planning areas, there is a dramatic increase in OHV use on BLM lands from hunters during the fall big game hunting seasons.

More than 58 percent of the CRVFO is open to OHV use (Figure 2-66, Alternative A: OHV Area Designations). Table 3.3.4-1, CRVFO Acres with Travel Limitations (Open Areas not included), is a summary of acres within the CRVFO that have restrictions on OHV travel. Most of the routes in CRVFO are managed as limited to designated roads and trails (approximately 176,000 acres). Less than 40,000 acres within the CRVFO are managed as closed to OHV use, consisting primarily of WSAs and ACECs.

Seasonal Travel Limitations

Travel limitations, especially for motorized use, of varying degrees have been in place since the 1984 RMP. The CRVFO has utilized seasonal limitations on motorized use to protect the road system, because almost all BLM routes are native surface and vulnerable to erosion during wet periods. Usually limitations are in place to limit disturbance to wildlife and sensitive resources during critical times. Table 3.3.4-2, Seasonal OHV Travel

Table 3.3.4-1
CRVFO OHV Management Areas (Open Areas not included)

Location	Area Limited To Existing Roads and Trails	Area Limited to Designated Roads and Trails	Closed
Blue Hill ACEC	3,700		
Bull Gulch WSA/ACEC			15,200
Castle Peak Area		92,200	
Castle Peak WSA			12,200
Center Mountain	3,600		
Deep Creek			2,400
East Eagle		1,700	
East Elk Creek	4,800		
Fisher Creek			1,000
Flatiron Mesa	770		
Gibson Gulch	8,400		
Glenwood Springs Debris Flow		5,900	
Hack Lake Area (including WSA)			3,300
King Mountain		17,500	
Red Hill SRMA (Carbondale)			2,600
Red Hill (West of Gypsum)	14,500		
Siloam Springs		5,500	
Sloane Peak			2,500
Sunlight Peak	1,700		
Tenderfoot Gulch	4,000		
Thompson Creek WSA			4,300
Ward Gulch	4,400		
Total	**45,900**	**122,800**	**43,600**

Source: BLM 2008c

Table 3.3.4-2
Seasonal OHV Travel Limitations in the CRVFO

Location	Description of Seasonal Route Limitations
Transfer Trail	Route 8149 and 8149F closed to all motorized wheeled travel from 12/1 to 4/30.
Pisgah Mountain	Route 8535 closed to all motorized travel from 10/1 to 11/30.
Domantle	Route 8513 closed to all motorized travel from 10/1 to 11/30.
Location	**Description of Seasonal Area Limitations**
Black Mountain-Winter Ridge	Closed to all motorized travel from 12/1 to 4/30.
Bocco Mountain (near Wolcott)	Closed to all motorized travel from 12/1 to 4/30.
Boore Flat-Domantle (Castle Peak area)	Closed to all motorized travel from 12/1 to 4/30.
Cottonwood Creek (northwest of Eagle, CO)	Closed to all motorized travel from 12/1 to 4/30.
Crown	Closed to all motorized travel from 12/1 to 4/30.
East Elk Creek	Closed to all motorized travel from 12/1 to 4/30.
Flatiron Mesa	Closed to all motorized travel from 12/ 1 to 4/30.
Light Hill (near Basalt)	Closed to all motorized travel from 12/1 to 4/30.
Pisgah Mountain-Windy Point	Closed to all motorized travel from 12/1 to 4/30.
Red Canyon (East of Eby Creek)	Closed to all motorized travel from 12/ 1 to 4/30.
Red Hill SRMA	Closed to all motorized travel year-round and mechanized travel from 12/1 to 3/31 (north side).

Source: BLM 2008c

Limitations in the CRVFO, is a summary of roads within the CRVFO that have seasonal restrictions. At times the CRVFO has issued emergency route closures to protect resources, users, and the routes themselves from damage under wet and muddy conditions.

Over-the-Snow (Snowmobile) Vehicle Travel

An over-snow vehicle is defined as a motor vehicle that is designed for use over snow that runs on a track or tracks and/or a ski or skis, while in use over snow. An over-snow vehicle does not include machinery used strictly for the grooming of non-motorized trails.

Use of motorized vehicles for travel over-the-snow are subject to the same requirements, limitations, and designations as all other motorized transport, as specified in this CRVFO RMP, unless the area or route is designated as open to over-the-snow travel during the winter season (usually defined as December 1 to April 30). Areas and routes open to over-the-snow travel must have a minimum average of 12" of snow to be considered as open for public use. Table 3.3.4-3, Over-the-Snow (Snowmobile) Travel in the CRVFO illustrates over-the-snow travel restrictions in the CRVFO.

Table 3.3.4-3
Over-the-Snow (Snowmobile) Travel in the CRVFO

Location	Area Limited to Designated Roads and Trails	Closed
Castle Peak Area		92,200
Crown		9,200
Deep Creek		2,400
Fisher Creek		1,000
Hack Lake Area		3,300
King Mountain	17,500	
Light Hill		3,800
Red Hill SRMA		2,600
Siloam Springs		5,500
Sloane Peak		2,500
Thompson Creek		4,300
Total	**17,500**	**126,900**

Source: BLM 2008c

Types of Routes

There are approximately 1,500 miles of routes in the CRVFO planning area. Approximately 80 percent of these routes are open to motorized travel. Table 3.3.4-4, Types of Routes in the CRVFO, is a summary of the types and miles of the routes in the CRVFO, most of which are classified as primitive roads, followed by primitive four-wheel-drive roads and light-duty roads.

Parking/Camping Off of Designated and Existing Routes

In limited areas for direct access to campsites motorized/mechanized travel up to 300 feet from designated motorized/mechanized routes is allowed for dispersed camping only provided resource damage does not occur with no new routes being created, and such access is not otherwise prohibited by the BLM Field Manager. Driving off of the road for the purpose of fuel wood cutting and gathering of forest products is allowed as provided by the permit.

Table 3.3.4-4
Types of Routes in the CRVFO

Route Open To	Miles
Foot/horseback	106
Single-track mechanized	160
Single-track motorized	63
ATV trail	77
Interstate highway	24
Light-duty road	178
Obliterated	38
Primary highway	14
Primitive 4-wheel-drive	239
Primitive road	843
Secondary highway	6
Not classified	86
Total	**1,834**

Source: BLM 2008c

Mechanized Travel

Mountain biking is becoming increasing popular on BLM lands, and several areas in Colorado are considered top national destinations. Mountain bike use is currently occurring on old motorized routes, game trails, and user-created mountain bike trails as well as planned single-track routes. Popular mountain bike areas for both community and destination visitors in the CRVFO includes the Crown, Red Hill SRMA, East Eagle, Hardscrabble area, and the Glenwood Springs Area.

Mechanized travel is closed within WSAs. Mechanized travel is currently limited to designated routes on approximately 23,700 acres and closed on approximately 27,800 acres (Table 3.3.4-5, Mechanized Travel Limitations in the CRVFO). Seasonal restrictions apply in Fisher Creek from December 1 – April 30 and within the Red Hill SRMA (north side) from December 1 – March 31.

Table 3.3.4-5
Mechanized Travel Limitations in the CRVFO

Location	Acres Limited To Designated Routes	Acres Closed
Bull Gulch WSA		15,200
Castle Peak WSA		12,200
Eagle Mountain WSA		330
Fisher Creek	1,000	
Hack Lake WSA		10
King Mountain	17,500	
Red Hill SRMA	2,600	
Sloane Peak	2,500	

Source: BLM 2008c

Non-Mechanized Travel

Hiking and horseback riding has been increasing on all of the BLM lands bordering municipalities within the CRVFO. The communities of Rifle, Silt, New Castle, Glenwood Springs, Carbondale, Basalt, Gypsum, and

Eagle have all grown rapidly and subsequently, the BLM lands adjacent to them have become the "backyard" community recreation area.

Canyon Creek, Castle Peak, East Eagle, Hack Lake, Hardscrabble area, Lookout Mountain, New Castle, Red Hill – Mushroom Rock, Siloam Springs, Sloane Peak, and Thompson Creek are popular hiking areas. Horseback riding is common but dispersed throughout the CRVFO on existing trails and roads. No routes have been specifically constructed for horseback riding; however trail design and construction for other modes of travel accommodate horse use.

Foot and horse travel has not been limited to existing or designated routes. Areas closed to motorized use and seasonal closures currently do not apply to foot or horse travel.

Characterization

Indicators

Indicators to measure trends in travel management include the size of designated areas for motorized use (e.g., open, limited, or closed), miles of routes and trails in limited use areas, miles of routes and trails where motorized, mechanized, and non-motorized uses are allowed, restricted, or not allowed depending on resource and use considerations.

Trends

Research shows that the demand for OHV use rapidly increased in the 1990s, and continued into the first few years of the 2000s (Cordell et al. 2008). In 1995, approximately 368,600 OHVs and ATVs were sold. By 2006, that number had almost tripled to approximately 1,035,000 OHVs. Over a 10-year period, the total existing number of OHVs grew from fewer than 3 million vehicles to more than 8 million in 2003. Sales from 2004 through 2006 totaled almost 3.25 million vehicles. Assuming at least one million new vehicles were sold in 2007 and that 80 percent of all vehicles are still operable, there would be as many as 9.8 million ATVs and off-road motorcycles in the US as of January 1, 2008 (Cordell et al. 2008).

OHV use is expected to continue to increase, especially in Hardscrabble because of its proximity to growing urban areas. Other OHV areas expected to increase use are Gypsum Red Hill, McCoy, and Bocco Mountain areas. OHV use also is likely to increase in the western portion of the planning area, following the development of oil and gas and an increase in population. Use may become more concentrated in these areas as other places become more urbanized. Motorized users will likely look for areas with fewer recreation conflicts.

Non-motorized vehicle use close to urbanizing areas is expected to grow as population grows. Demand for hiking and mountain biking trails is expected to increase on BLM lands adjacent to all of the municipalities in the CRVFO, as well as in areas close to major subdivisions outside incorporated towns. Demand for floating and fishing access to the Eagle River and lower Colorado River is expected to increase also.

Private property adjacent to BLM lands is expected to continue to be subdivided. Continued collaboration between the BLM and municipalities/counties will help provide appropriate access, during the subdivision design, and valuable stewardship, once the homes are occupied.

Construction of new routes for oil and gas development is expected to increase in the western portion of the CRVFO. While OHV users will likely use these routes, the routes will not be designed to optimize recreation experiences. As a result, the new routes may conflict with existing OHV routes and current recreation experiences.

Nationally, the BLM is moving towards a system of limiting use to designated roads, primitive roads and trails/areas and not encouraging extensive cross-country travel by motorized and mechanized vehicles. Current planning guidance (H-1601-1, Land Use Planning Handbook – Appendix C, Section D, attachment 2) requires identifying a defined travel management network system of areas, roads, primitive roads and trails, in all BLM land use plans. It is BLM's expectation that each RMP Record of Decision will include a system of designated routes for those areas in the limited category. Designations that are limited to existing should be used only as an interim measure prior to the next scheduled RMP revision. Field Managers may elect to add other additional limitations as necessary to achieve management objectives. If Field Managers select a limited area designation in the RMP, the Field Office should identify the designated routes and modes of travel (BLM2007e).

3.3.5 Lands and Realty

Lands and realty actions can be divided between land tenure adjustments and land use authorizations. Land tenure adjustments focus primarily on land acquisition and disposal (including easement acquisition), while land use authorizations consist of rights-of-way (ROWs), utility corridors, communication sites, and other leases or permits. Lands and realty actions ensure that BLM lands are managed to benefit the public. BLM lands are used for a variety of purposes. Major focus areas for the lands and realty program include land tenure adjustments, federal mineral estate, ROWs, other leases or permits, utility corridors, and communication sites. Wind and solar renewable resource production is also permitted by ROWs through the lands and realty program.

Land use plan decisions related to land tenure adjustments or land use authorizations as described above could affect the lands and realty program. In addition, any land use plan decisions that limit or restrict the use of portions of the planning area could also affect lands and realty.

Current Conditions

Land Tenure

Surface landownership in the CRVFO planning area is mixed (Table 3.3.5-1, Surface Land Ownership in the CRVFO Planning Area). BLM-administered lands total 504,910 acres, or approximately 18 percent. Private ownership accounts for 755,347 acres, or 27 percent. Most land is managed under other federal ownership, including the USFS. All of these lands are managed in accordance with the 1984 CRVFO RMP (BLM 1984a), which was revised in 1988 (BLM 1988), and the Oil and Gas Leasing and Development EIS (BLM 1999b). See Figure 1-2, Planning Area and Land Status.

Table 3.3.5-1
Surface Land Ownership in the CRVFO Planning Area

Land Status	Acres	Percentage of Area
BLM	504,910	18
Bureau of Reclamation	1,585	<1
Colorado Division of Wildlife	514	<1
Department of Energy	205	<1
Private	755,347	27
State (not including CDOW)	27,656	<1
US Forest Service	1,501,617	54
Total	**2,791,834**	**100**

Source: BLM 2008c

Land Tenure Adjustments

Land exchanges in the CRVFO allow for more efficient and better management of resource values on BLM lands. Acquisition of non-federal lands has improved public access, provided additional protection for special status species habitat, reduced the potential for trespass, and improved the management and protection of cultural and rangeland resources. Additionally, BLM land tenure adjustments are used to consolidate, where possible, BLM-administered surface and subsurface estates. Consolidation of lands has been an ongoing management objective of the CRVFO. The CRVFO classifies all of its BLM lands into the following two categories with regard to their potential for disposal or retention:

- Category I (Disposal)—Determined suitable for disposal by sale, state selections, Recreation and Public Purposes Act conveyance, and exchange. These lands are considered for disposal usually because they are small, isolated tracts that cannot be effectively managed.
- Category II (Retention)—Category II lands are the land base to be managed under multiple use principles, and are not suitable for disposal through public sale. On a case-by-case basis, disposal of Category II lands would be considered through exchange, boundary adjustment, state selection, Recreation and Public Purpose Act conveyance, or other appropriate statutory authority, providing such disposal is consistent with management efficiency and effectiveness under multiple use principles for specific areas (BLM 2000b). Applications under the Desert Land Act or General Allotment Act of 1887 are rejected in Category II lands.

The BLM may acquire land through exchange with other entities. Inholdings may be acquired if they become available for purchase or exchange. The BLM also occasionally receives donated land or interests in land where an entity elects not to receive the fair market value for the interests being conveyed.

The BLM's general sale authority for public land is Section 203 of FLPMA, which requires that public land be retained in public ownership, unless, as a result of land use planning, disposals of certain parcels are warranted. Also, tracts of land that are designated in BLM land use plans as potentially available for disposal are likely to be conveyed out of federal ownership through an exchange rather than a sale. Public land must be sold at not less than fair market value and must meet very specific sale criteria of FLPMA. The other sale authority is the Federal Land Transaction Facilitation Act.

The current management objective in the CRVFO is to increase overall efficiency and effectiveness of public land management by identifying public land suitable for disposal through public sale (Category I lands) and suitable for continued management under multiple use concepts (Category II lands) (BLM 2007b). Certain administrative actions require special attention beyond the scope of the current plan. These include issuing permits for land actions, including grants, leases, permits, and resolution of trespass (BLM 2007b).

Under the 1984 CRVFO RMP (BLM 1984a) (revised in 1988 [BLM 1988]), the BLM is administering 15,500 acres of Category I lands that are suitable for disposal through exchange, state selections, and Recreation and Public Purpose Act purchases. The BLM manages 550,542 acres of Category II lands, which is the land base to be managed under multiple-use principles and are not suitable for disposal through public sale. The BLM is administering 62,780 acres of Category II lands as cooperative management areas where multiple-use principles are influenced by other adjacent or interested governmental agencies. Cooperative management areas can be managed through cooperative agreements, memoranda of understanding, or withdrawals. They can also be exchanged with other governmental agencies if exchange best meets management objectives and public needs (BLM 2007b).

Since the 1984 CRVFO RMP (BLM 1984a), the CRVFO has acquired 658 acres through sale under Section 203 of FLPMA, 1,001 acres through Recreation and Public Purposes Act Purchases, and 16,122 acres through exchange. The CRVFO has acquired 2,071 acres through purchases and 15,206 acres through exchanges since the 1984 RMP.

Land Use Authorizations

The most common form of authorization to permit uses of BLM lands by commercial, private, or governmental entities is the ROW, which is used to permit private and public roads that cross BLM lands, pipelines not within the boundaries of an oil and gas lease, public utilities, communications facilities, reservoirs, and a variety of other purposes. Some uses of BLM lands are authorized through land use permits under 43 CFR 2800 and 43 CFR 2900. These ROWs are for a variety of uses (Table 3.3.5-2, Active Right-of-Way Authorizations in the CRVFO and are held by private individuals and groups, as well as various businesses and government entities.

Table 3.3.5-2
Active Right-of-Way Authorizations in the CRVFO

Type	Number of Authorizations	Size (Acres)
Road	217	2,410
Railroad	18	2,383
Power	99	2,577
Telephone	81	457
Water facilities	86	965
Oil and gas	94	822
Communication sites	50	87
Other	135	1,122
Total	**780**	**10,823**

Source: BLM2008e

The CRVFO planning area covers almost 2.8 million acres of federal, state, and private land in Eagle, Garfield, Mesa, Pitkin, and Routt Counties in central Colorado. Eighty percent of the CRVFO borders private land. Authorizations to permit uses on BLM lands are in high demand (BLM 2007b).

Over the years, individuals have built structures for various purposes in the CRVFO (e.g., occupancy, commercial uses, recreational uses) with little regard for who actually owned the land on which they built. The CRVFO is attempting to manage this problem through a program of detection, control, and abatement. While the inventory is not complete, there are a large number of trespasses that have already been identified.

In the CRVFO, the placement of major linear facilities depends on meeting the following location criteria:

- Concentrate linear facilities within or next to existing corridors where possible.
- Avoid locations that would take intensively managed forest land out of production.
- Avoid locations where the action would adversely affect livestock or wildlife.
- Avoid steep topography, poor soils, or other fragile areas, such as threatened and endangered habitats.
- Avoid cultural sites that are listed on or eligible for listing on the NRHP.

Utility Corridors and Communication Sites

Multiple utility corridors and communication sites exist in the CRVFO planning area. Authorizations for these uses on BLM land in the CRVFO occur through leases, permits, and ROWs under the authority of

Section 302 of FLPMA. In general, leases are for long-term land uses and are used primarily for the benefit of local governments, special districts, or public groups, in accordance with the terms of the Recreation and Public Purposes Act of 1926. Permits are used to authorize short-term land uses under 43 CFR 2800 and 2900. However, the most common form of authorization to permit uses of BLM land by commercial, private, or governmental entities is the ROW, which is used for pipelines not within the boundaries of an oil and gas lease, public utilities, and communications facilities.

In addition, Section 368 of the Energy Policy Act of 2005 directs the Secretaries of Agriculture, Commerce, Defense, Energy, and the Interior to designate corridors on federal land in 11 western states for oil, gas, and hydrogen pipelines and for electricity transmission and distribution facilities. In accordance with that act, the draft Programmatic EIS for the Designation of Energy Corridors on Federal Land in the 11 Western States was published in October 2007 (DOE and BLM 2008). The pending Final Programmatic EIS will designate utility corridors in the CRVFO.

Utility Corridors

Many electricity and telephone corridors (above and below ground) serve the public throughout the CRVFO planning area. Most ROWs for utilities and associated facilities have been in place well over 30 years. Additionally, the 2007 Draft Programmatic EIS on Designation of Energy Corridors proposes a multiple-use corridor within the CRVFO, which would follow the Interstate 70 corridor from Silt to the west (DOE and BLM 2008). The other multiple-use corridor would be a north-south route following State Highway 13.

Communication Sites

The 1984 CRVFO RMP (BLM 1984a) designated Monument Peak, Doghead Mountain, Sunlight Mountain (in conjunction with the White River National Forest), Bellyache Ridge, Castle Peak, and Lookout Mountain as communication sites and required that management plans be prepared for these areas. There are 24 communication sites on the CRVFO decision area. Table 3.3.5-3, Communications Sites within the CRVFO Planning Area, provides the communication sites authorized by the CRVFO.

Table 3.3.5-3
Communications Sites within the CRVFO Planning Area

Serial Number	Holder/Owner	Town, Range, Section	Tenant/Customer
COC33394 Bellyache Ridge	American Tower Corporation	4S-83W-34	B&B Excavating Kensington Partners/Summit Course Longs Excavating Nextel Communications San Isabel Telecom Sprint Spectrum LP Two-Way Communications Voicestream PCS II Corporation Western Mobile Verizon Wireless T-Mobile USA USA Mobility New Cingular Wireless New Field Broadcasting NRC Broadcasting
COC66093 Blowout	Union Pacific Railroad	4S-86W-21	Eagle County

Table 3.3.5-3 *(continued)*
Communications Sites within the CRVFO Planning Area

Serial Number	Holder/Owner	Town, Range, Section	Tenant/Customer
COC70235 Blowout	Eagle County Emergency Management	4S-86W-21	Eagle County
COC13274 Castle Peak	Centurytel of Eagle	3S-84W-19	Centurytel of Eagle
COC65939 Castle Peak	Federal Aviation Administration	3S-84W-19	Federal Aviation Administration
COC38486 Castle Peak	Garfield County	3S-84W-19	Garfield County
COC16041A Castle Peak	Holy Cross Energy	3S-84W-19	Holy Cross Energy
COC33395 Castle Peak	American Tower Corporation	3S-84W-19	American Tower Corporation
COC20514 Castle Peak	Public Service Company of Colorado/Tri-State	3S-84W-19	Public Service Company of Colorado/Tri-State
COC43077 Castle Peak	Roaring Fork Public Radio/KAJX	3S-84W-19	Roaring Fork Public Radio/KAJX
COC16041B Castle Peak	State of Colorado	3S-84W-19	State of Colorado
COC22500 Castle Peak	US Forest Service (White River National Forest)	3S-84W-19	US Forest Service
COC70869 Castle Peak	Eagle County Emergency Management	3S-84W-19	Eagle County Emergency Management
COC71107 Castle Peak	BLM	3S-84W-19	BLM
COC22082 Crown Mountain	Pitkin County	8S-87W-15	Pitkin County Basalt Rural Fire Eagle County Pitkin County
COC93722 Doghead Mountain	Garfield County	7S-95W-14	Garfield County
COC33399 Doghead Mountain	American Tower Corporation	7S-95W-14	AT&T Wireless Channel 20 TV Company Cottonwood Holdings Educational Media Foundation Nextel Communications Public Broadcasting of Colorado Public Service Company of Colorado Rocky Mountain Public Broadcasting Two-Way Communications Union Pacific RR Williams Production Hoak Media of Colorado Alamosa Properties LP T-Mobile USA USA Mobility New Cingular Wireless MBC Grand Broadcasting American Messaging JAB Wireless Pikes Peak Television

Table 3.3.5-3 *(continued)*
Communications Sites within the CRVFO Planning Area

Serial Number	Holder/Owner	Town, Range, Section	Tenant/Customer
COC61886 East Eagle	American Tower Corporation	4S-84W-34	Nextel Communications Sprint Spectrum Voicestream PCS II T Mobile USA New Cingular Wireless Cricket Communications
COC35213A East Eagle Airport Beacon	Eagle County	5S-84W-6	Salisbury Broadcasting Educational Media Foundation
COC43094 East Eagle Airport Beacon	Salisbury Broadcasting-Colorado	5S-84W-6	Salisbury Broadcasting
COC35213B West Eagle Airport Beacon	Eagle County	5S-86W-1	Eagle County
COC25947 East Elk Creek	Garfield County	7S-91W-13	Withers Broadcasting
COC55573 Grass Mesa	Colorado RSA No.3 dba Verizon Wireless	6S-93W-23	Colorado RSA No.3 dba Verizon Wireless
COC13758 Grass Mesa	Garfield County	6S-93W-23	Garfield County
COC55952 Grass Mesa	American Tower Corporation	6S-93W-23	Nextel Communications New Cingular Wireless
COC54381 Grass Mesa	Colorado West Broadcasting	6S-93W-23	Sopris Surfers Kellin Communications
COC55178 Gypsum Point	American Tower Corporation	4S-86W-35	-Cottonwood Holdings -Nextel Communications -San Isabel Telecom -Sprint Spectrum LP -Verizon Wireless -T-Mobile USA -New Cingular Wireless -Voicestream PCS II -Cricket Communications
COC62993 Gypsum Watertank	San Isabel Telecom	5S-85W-9	San Isabel Telecom
COC36784 Harvey Gap	Garfield County	5S-91W-19	-Questar PPLN -Willow Wisp
COC56229 King Canyon	Routt County	1N-84W-27	Yampa Valley Electric
COC25252 Lookout Mountain	Federal Aviation Administration	6S-89W-11	Federal Aviation Administration
COC23456 Lookout Mountain	Garfield County	6S-89W-11	Garfield County
COC63242 Lookout Mountain	Garfield County Emergency Communications	6S-89W-11	Garfield County Emergency Communications
COC33396 Lookout Mountain	American Tower Corporation	6S-89W-11	American Tower Corporation
COC50830 Lookout Mountain	US Forest Service	6S-89W-11	US Forest Service

Table 3.3.5-3 *(continued)*
Communications Sites within the CRVFO Planning Area

Serial Number	Holder/Owner	Town, Range, Section	Tenant/Customer
COC10694 Lookout Mountain	QWEST Communications	6S-89W-11	QWEST Communications
COC38478 Lookout Mountain	Valley Public Radio	6S-89W-11	Valley Public Radio
COC14895 Monument Peak	Mountain Communication and Electronics	4S-94W-11	Mountain Communication and Electronics
COC33398 Monument Peak	American Tower Corporation	4S-94W-11	American Tower Corporation
COC23764 Monument Peak	Public Service Company of Colorado	4S-94W-11	Public Service Company of Colorado
COC30057 Monument Peak	Public Service Company of Colorado	4S-94W-11	Public Service Company of Colorado
COC128059 Monument Peak	Questar InfoComm.	4S-94W-11	Questar InfoComm.
COC50467 Monument Peak	White River Electric Association	4S-94W-11	White River Electric Association
COC69303 Monument Peak	Garfield County Emergency Communications	4S-94W-11	Garfield County Emergency Communications
COC61885 New Castle	American Tower Corporation	6S-90W-3	-Nextel West Corporation -T Mobile USA -New Cingular Wireless
COC0112731 Parachute/Grand Valley	QWEST Communications	7S-96W-22	QWEST Communications
COC11300 Sunlight Peak	Garfield County	7S-90W-24	-Rocky Mountain PBS -UPN KTVD
COC0123501 Sunlight Peak	DOE, Western Area Power Administration	7S-90W-24	DOE, Western Area Power Administration
COC40264 Sweetwater	Garfield County	3S-87W-24	Garfield County
COC18884 Transfer Trail Passive Reflector	QWEST Communications	5S-89W-36	QWEST Communications
COC25091 Williams Hill	AT&T Wireless Services of Colo.	8S-86W-35	NRC Broadcasting
COC59746 Williams Hill	Aspen FM	8S-86W-35	BS&T Wireless

Beginning in 2007, individual site plans to designate current and future communication sites were written based on priority (such as complexity and overload of users). The purposes for writing communication site plans are as follows:

- Selected management strategy.
- Location of new facilities and no-build zones.
- Access requirements.
- Use of existing facilities, shared building/tower space.

- Multiple-use terms and conditions.
- Areas closed or excluded from communication site development.

Designating sites provides direction for the following:

- Management direction/philosophy and objectives.
- Management constraints (technical limitations, noise floors, compatible uses).
- Electronic conflicts (frequencies and power).
- Environmental concerns (soil stability, earthquake, and avalanche hazards, threatened and endangered species, migratory birds, cultural and historical).
- Site coverage and area served (population zones for rental purposes).

Several initiatives directed federal agencies to provide a high level of customer service to telecommunications carriers, as follows:

- The President's Executive Memorandum, dated August 10, 1995, "Facilitating Access to Federal Property for the Siting of Mobile Services. Antennas," which states "1(a) agencies shall make available federal government buildings and lands for the siting of mobile service antennas in accordance with federal, state, and local laws and regulations…."
- The Telecommunications Act of 1996
- The General Service Administration Bulletin 1997

Characterization

Indicators

An indicator used to assess the condition of lands and realty in the planning area is surface land ownership. Any exchange, acquisition, or disposal of land in the CRVFO would be reflected in the acres of surface land ownership. Other indicators used to assess the lands and realty program are changes in the number of active right-of-way authorizations, leases and permits in the CRVFO.

Trends

As with other field offices in Colorado, the CRVFO is consolidating its lands to benefit the public. To achieve this, 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, parcels that are relatively small and are adjacent to other federally or state-managed lands, parcels that would increase conservation of natural resources, and parcels that increase access to and use of BLM land.

Under current management, parcels eligible for disposal through sale or exchange have been limited to those identified for disposal in the 1984 CRVFO RMP (BLM 1984a). The BLM is developing a set of criteria to determine if a parcel is suitable for disposal. Criteria would be used to assess disposal applications on a case-by-case basis instead of developing a standard list of disposal properties in the management plan. A set of criteria for land disposal would facilitate an adaptive model of land adjustment throughout the life of the

management plan. Considerations for disposal are also trending toward taking into account if the action would adversely affect or conflict with existing uses or management of renewable resources.

Many of the management decisions related to lands and realty in the CRVFO are driven by growth and urbanization issues. Other driving issues include the interface between private landowners and the demands on BLM land to locate the facilities (e.g., access roads, communication sites, FLPMA pipelines, water tanks and utility corridors) needed to support the fast-growing infrastructure (BLM 2007b).

Although land exchanges and other land tenure adjustment actions completed by the CRVFO conform to the 1984 CRVFO RMP (BLM 1984a), recent community meetings have expressed that local communities and local governments would like the BLM to retain BLM land, which tends to be open space surrounded by private lands. New procedures are being considered for land tenure adjustments in the CRVFO planning area, including reviewing parcels on a case-by-case basis based on management criteria and public input (BLM 2007b).

Most utility and associated facilities' ROWs have been in place well over 30 years, so it is likely that the infrastructure would require replacement or upgraded technology. There are many utility ROWs throughout the CRVFO that could be utilized to upgrade existing infrastructure. As communities continue to expand in the CRVFO planning area it is likely that requests for the use of BLM land for facilities would increase.

Corridors are preferred routes for transportation and transmission facilities. Identification of corridors does not preclude 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 does not 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. Each ROW application would be reviewed and analyzed using the environmental data that exist for the area as a basis to determine compatibility with existing uses and resource values.

3.3.6 Energy and Minerals

Mineral production on public land in Colorado involves three distinct categories: leasable, locatable, and salable minerals.

- **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. Oil and gas, coal, sodium and other similar minerals, and geothermal resources are available through mineral leasing. Leases are issued for specific periods, and the lessee pays a rental fee and royalties on the minerals produced.
- **Locatable minerals** are hard-rock minerals, such as gold, silver, molybdenum, and uranium. The BLM manages the use of these minerals under mining such laws as the Mining Law of 1872. Placer claims, which are for minerals that occur in geologic sediments rather than in veins, are also managed under such mining laws. Miners locate claims in order to acquire the right to develop the mineral values in a specified area.

  The Mining Law of 1872 makes available to the public and on public land metallic and nonmetallic locatable minerals. The law also encourages mining companies to explore for and develop such minerals. Locating a mining claim gives a mining company the right to develop the minerals under the claim. Within a mining claim, the surface lands remain open to the public for other multiple uses.
- **Salable Minerals**, also referred to as mineral materials, include sand and gravel, limestone aggregate, building stone, moss-covered rock (moss rock), cinders (clinker), decorative rock, and others. Salable minerals are sold or permitted under the Mineral Materials Sale Act of 1947, as amended.

In general, mineral exploration and extraction activities depend to a large extent on commodity prices. They also depend in part on the amount of surface acres made available for drilling and other mining activities. Areas withdrawn from mineral entry, areas closed to leasing, and areas with NSO, CSU, or Timing Limitation (TL) stipulations limit energy and mineral activities. BLM restricts energy and mineral activities with these tools to comply with the land management direction and multiple-use considerations that are part of its responsibilities under FLPMA. Appendix B lists the resource concerns related to the stipulations in this RMP/EIS.

Current Conditions

The analysis area considered for energy and minerals focuses on the CRVFO, excluding USFS lands (Table 3.3.6-1, CRVFO Mineral Status). Energy and mineral decisions on USFS lands are addressed through separate USFS planning efforts and are not addressed in this RMP. Section 1.3, Description of the Planning Area, describes the CRVFO planning area and the federal mineral estate within the CRVFO.

Table 3.3.6-1
CRVFO Mineral Status

Land Status	Acres
BLM surface/federal mineral estate	504,800
Bureau of Reclamation surface/federal mineral estate	1,000
Department of Energy surface/federal mineral estate	200
Private surface/federal mineral estate	189,000
State surface/federal mineral estate	11,900
Total	**707,000**

Current management documents (BLM 1988, BLM 1999b) have placed several limitations on mineral exploration and development in the CRVFO.

Mineral withdrawals are formal orders that withhold federal lands and minerals from entry under the Mining Law of 1872 and close the area to mineral location (staking mining claims) and development. They are used for uses not compatible with mineral development. Protective measures (NSO, CSU, and TL stipulations) are placed on mineral activities in some areas to protect other resources, including high-value recreation resources, wilderness resources, critical wildlife habitat, and water resources (critical watersheds). Mineral exploration and development is allowed in the CRVFO on lands not withdrawn for other uses or restricted to mineral activity.

Specific NSO stipulations are in effect in some areas within the CRVFO. These include surface coal mines, riparian and wetland zones, major river corridors, state wildlife areas, fish hatcheries, domestic watershed areas, debris flow hazard zones, steep slope areas, ACECs, SRMAs, recreation management area, Interstate 70 viewshed, and the Anvil Points Cave Area. Important wildlife habitat areas also protected with NSO stipulations are grouse leks, raptor nest sites, bald eagle roost or nest sites, peregrine falcon nest complexes, Mexican spotted owl roost or nest sites, wildlife seclusion areas, and threatened or endangered species habitat. Timing limitations are used to avoid development activities during periods critical to many wildlife species. CSU stipulations are used for underground coal mines, riparian and wetland zones, BLM sensitive species habitat, areas with erodible soils or steep slopes, areas in VRM Classes I and II, and in the Sharrard Park Paleontological Area. Stipulations currently in effect in the CRVFO are as follows: NSO – 239,600 acres; CSU – 424,800 acres; TL – 352,400 acres (Table 2-1, Comparative Summary of Alternatives). Note that some restrictions overlap. Appendix B lists all of the existing protective measures (see Alternative A).

A proposal has been submitted to the Secretary of the Interior to withdraw the Deep Creek and Thompson Creek areas for recreation, excluding mineral development in these areas. Approximately 1,560 acres in the Hogback Coal Field are designated as unacceptable for coal leasing based on multiple-use conflicts. Approximately 27,800 acres of federal mineral estate within the CRVFO (the WSAs) is closed to oil and gas leasing.

Applications for mineral material removal are processed on a case-by-case basis. Mineral material sales are not allowed in areas considered suitable for wilderness, the Thompson Creek Natural Environment Area, or the Deep Creek SRMA.

Leasable Minerals

Leasable minerals in the CRVFO include oil and gas, coal, oil shale, and non-energy leasables (sylvite and halite). Geothermal resources are discussed in Section 3.3.7, Renewable Energy.

Oil and Gas

The Energy Policy and Conservation Act Amendments of 2000, Public Law 106-469, directed the DOI to inventory oil and natural gas resources beneath federal lands. The act also directed the DOI to identify the extent and nature of any restrictions to oil and natural gas development. Executive Order 13212 (69 Fed. Reg. 28357 [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 DOE released a report titled Energy Policy and

Conservation Act Inventory in January 2003, and subsequently updated it in 2006 (DOI, USDA, and DOE 2006). Based on these documents, the BLM designated seven Energy Policy Conservation Act Focus Areas to concentrate its efforts and resources to meet the President's National Energy Policy. The BLM is integrating the results of the Energy Policy Conservation Act Inventory into RMPs and reasonable foreseeable development (RFD) scenarios (BLM 2008a and BLM 2008g).

The USGS has identified five total petroleum systems and 20 assessment units that extend into the Piceance Basin, which is the western portion of the CRVFO (including the Grand Hogback) and the eastern half of a greater geologic basin known as the Uinta-Piceance Basin. Most of the hydrocarbon production in the CRVFO is natural gas, with some associated oil, natural gas liquids, or water. Current drilling activity is most prevalent within the southern portion of the Piceance Basin, a broad elongate structural basin located at the eastern edge of the Colorado Plateau. Surface exposures in the Piceance Basin are primarily sedimentary rocks of the Green River and Wasatch formations. Gas production is from the Tertiary Wasatch Formation and the Cretaceous Mesaverde Group. The Mesaverde Group is often called the Mesaverde Formation and includes informal subdivisions based on gas productivity characteristics. Hydrocarbon-producing sands within the Mesaverde Group have been the most productive zones within the Piceance Basin. Current oil and gas leases in the CRVFO are shown on Figure 3.3.6-1, Oil and Gas Leases and Occurrence Potential. A total of 679,200 acres are currently open and 27,800 acres are closed to fluid minerals leasing in the CRVFO (Table 2-1, Comparative Summary of Alternatives). None of the areas closed to leasing overlap with high-potential areas.

Oil and gas development is concentrated on the western 20 percent of the CRVFO, west of the Grand Hogback, where a high potential for the occurrence and development of oil and gas resources is found (Figure 3.3.6-1, Oil and Gas Leases and Occurrence Potential). Most of these lands are either already leased or being addressed through the separate RMP for the Roan Plateau (BLM 2007a, BLM 2008b). Of the 127,335 acres of federal mineral estate in this high potential area, 95 percent has been leased. Most of the unleased land outside this area is along the Grand Hogback, with a few small scattered parcels elsewhere.

Additional leasing may occur in the area of the USGS Hanging Wall Assessment Unit (Grand Hogback), which is sparsely leased in the northern portion. Almost all of the areas mapped as medium, low, and no known potential for the occurrence of oil and gas are unleased.

The eastern 80 percent of the CRVFO (east of the Grand Hogback) consists of the Eagle Basin, the White River Uplift, and mountain ranges to the south and east. Because of the low potential for the economic occurrence of oil and gas resources, no USGS oil and gas assessment has been completed for this area. The Eagle Basin is primarily a Pennsylvanian-age depositional basin in a structurally complex area. This basin has relatively low potential for the discovery of significant gas, based on available well data (subsurface data) and surface data. The basin has very low potential for discovery of economic oil because of the very high thermal maturity of most Paleozoic rocks and the presence of only small areas containing younger rocks with oil source beds. There are some noncompetitive leases north of Gypsum, which is classified as a low potential area (Figure 3.3.6-1, Oil and Gas Leases and Occurrence Potential).

The BLM maintains unitization agreements with lessees in the CRVFO, under which lessees formally agree on one operator to conduct all operations on their behalf. All lessees and lessors join a unitization agreement, approved by the BLM, which allows the BLM to directly control and manage the timing, location, and type of operations. In effect, all of the leases act administratively as a single lease. The BLM works with just one operator for the life of the unitized oil and gas operations. Among other things, the unitization agreement

identifies the agreed on single operator and stipulates how to allocate the benefits of gas and production to all of the leases.

There are 28 units and participating areas within the CRVFO, all in the area that is classified as high potential for the occurrence of oil and gas (Figure 3.3.6-1, Oil and Gas Leases and Occurrence Potential). The units are all south of Interstate 70 and involve 259,600 acres, regardless of federal mineral estate and surface ownership.

Communitization involves pooling mineral interests and is used extensively within the CRVFO, with 128 communitization agreements for more than 44,700 acres. These agreements mainly communitize gas production from the Mesaverde/Williams Fork, but some communitize gas production from other formations, such as the Wasatch Formation and the Cozzette Member of the Iles Formation. All of the agreements are within the area classified as high potential for the occurrence of oil and gas.

The Colorado Oil and Gas Conservation Commission (COGCC), which regulates the oil and gas drilling and production industry in Colorado, requires spacing of 40 acres (600-foot setbacks from lease lines) for wells greater than 2,500 feet deep. This requirement can be increased or decreased, depending on geology and reservoir characteristics. The COGCC uses the term default spacing, with modification occurring through cause orders. These adjustments are meant to maximize production of the resource, while minimizing surface disturbance and expense. In the case involving production from the Williams Fork Formation, 10-acre spacing has been justified and approved. Currently the Wasatch Formation is being drained of gas on 160-acre spacing. Figure 3.3.6-2, Oil and Gas Well Locations, shows the locations of wells throughout the CRVFO.

Coal

There are no coal leases or active coal developments within the CRVFO area, but historically coal was mined at multiple locations there. These were former leases along the Grand Hogback, from New Castle (named after the coal-mining district in England) to Harvey Gap, north of Silt and extending north of Rifle. Other historic coal leases were in the Thompson Creek (Coal Basin) area, between Carbondale (named for the presence of coal) and Redstone. Of these, only the Grand Hogback Field north of Rifle is considered to have a potential—although limited—for coal mining.

Although the in-place coal resource in the CRVFO area is estimated at approximately 1.6 billion tons, the potential for commercial development of this resource is very low owing to its geologic occurrence. The bulk of coal resource is at depths too great for conventional mining. Where the coal seams are exposed along the Grand Hogback, they are thin and steeply dipping. Some of this coal was historically suitable for limited underground mining by tunneling into the outcrop a short distance. Beyond that short distance, the seams plunge to prohibitive depths quickly, paralleling the dip slope of the hogback. Although of limited accessibility, this coal was suitable as a domestic and industrial heat and energy source and, to a large degree, as fuel for steam locomotives that plied the Grand Valley. In contrast, the coal near Carbondale was accessed by more typical underground mining techniques in relatively flat-lying layers. Much of the estimated 20 million tons of coal from the Coal Basin mines (which closed in 1991) was shipped by rail to steel mills and smelters in Colorado and Utah.

Oil Shale

Within the CRVFO, limited acres are underlain by prospectively valuable oil shale deposits. The oil shale lands are in the Battlement Mesa Area, which is south of the Colorado River and just west of the town of Parachute. This area represents a tiny fraction of the oil shale resource in the Piceance Basin. The only oil shale leasing activity in the basin was the recent issuance of research and development lease tracts in Rio Blanco County.

Non-Energy Leasables

Based on the presence of evaporate-bearing rocks, approximately 130,000 acres in the Eagle Valley area have been identified as prospectively valuable for potassium (sylvite). The other principal evaporate that is considered leasable is sodium (halite). No commercial extraction and only minimal exploratory drilling has occurred for these minerals. The most recent data were from a 1990 exploration drill hole for a potential potash zone just north of Gypsum, but the analysis showed only trace amounts of potassium. Currently, no leases or development activities exist for non-energy leasable minerals in the CRVFO.

Locatable Minerals

Locatable minerals in the CRVFO include gypsum, limestone, uranium, vanadium, and other locatables (gold, silver, lead, and copper). Numerous mining claims exist, but the only significant mining activity is associated with gypsum and an uncommon variety of limestone mining claims. A total of 470,300 acres are currently open to locatable mineral exploration or development in the CRVFO (Table 2-1, Comparative Summary of Alternatives).

Gypsum

An active gypsum mine is currently being operated by American Gypsum Company (AGC) just northeast of the Town of Gypsum and produces about 600,000 tons per year to supply the nearby wallboard plant. The mine has operated since 1990 on patented mining claims, but the active pit is nearly mined out. Development has started on the new mine area, which is on unpatented mining claims. The company holds numerous mining claims and periodically conducts exploration to expand the proven reserves area..

Limestone

Locatable limestone was mined from a quarry above Glenwood Springs from about 1956 to 1991. Over the years, the limestone was used primarily in refining sugar products, in regional coal-fired power plants such as the Cameo Plant near Grand Junction, in coal mines as a coal-dust suppressant. The limestone mine was closed in 1991 but has recently reopened.

Uranium and Vanadium

Historically, uranium activity occurred in the vicinity of the Grand Hogback. The uranium deposits are in the Entrada Sandstone in the Rifle Creek district, but the uranium and vanadium ore is lower than the grades found in the Morrison Formation in the Uravan Mineral Belt, located farther southwest outside the CRVFO area. The small underground Rifle and Garfield Mines were last active in the late 1970s, during the most recent period of significant uranium mining. The mines are closed and reclaimed, and no new exploration or mining proposals have been submitted, although the price of uranium (yellowcake) has increased substantially since 2005.

Other Locatable Minerals

The BLM processed a notice in 2005 for exploratory drilling of the copper mineralization near Copper Spur. No information is available on the results of the drilling, but the claimant did not submit the required annual claim filing for the 2007 assessment year, which would indicate no current interest in developing any copper resource. The only gold placer activity is sporadic recreational gold panning and dredging along the Colorado River.

Salables/Mineral Materials

Salables under the jurisdiction of the CRVFO include volcanic cinders, common varieties of limestone, decorative rock, building stone, and sand and gravel. The activity is primarily limited to small to medium size sales for commercial and residential uses. Salables are sold at fair market value or through free use permits to government agencies. A total of 28,000 acres are currently closed to mineral material sales in the CRVFO (Table 2-1, Comparative Summary of Alternatives).

Volcanic Cinders

The cinder mining operation on BLM land near Dotsero, currently being operated by Mayne Block, has been seasonally active for many years. It consists of mining and screening volcanic cinders, which are used at a nearby site for making cinder blocks. This operation typically uses about 6,000 tons of cinders each year.

Limestone

Two limestone quarries in Glenwood Springs are designated as community pits. Historically, most of the limestone was mined and processed for locatable minerals markets (described above); currently, only small quantities of lower grade stockpiled limestone are removed and sold for acid neutralization during mill tailings reclamation. There is some demand to use the stockpiled limestone for maintaining the access roads to the area.

Other Salables

Decorative rock, including moss rock, flagstone, and boulders, is available from Copper Spur, West Rifle Creek, East Rifle Creek, Cattle Creek, and Big Alkali Creek. Jack Flats and Battlement contain material suitable for fill. The Sheep Gulch common use area supplies small quantities of sand and gravel material. In Fiscal Year 2006, total sales of 22 cubic yards were reported. Large sand and gravel operations occur on private land along the Colorado, Eagle, and Roaring Fork Rivers within the CRVFO area.

Characterization

Indicators

The trends described in the following sections are based on the CRVFO RFD (BLM 2008g) and forecasting of other minerals based on historical trends and anticipated market conditions. The BLM Energy Office prepared the RFD by interviewing operators, compiling data from various sources, and developing underlying assumptions regarding future development.

Trends

Leasable Minerals

Oil and Gas. Drilling on federal mineral estate and private lands is expected to continue as industry continues to define reservoir boundaries and spacing limitations. Infill drilling and step out drilling are

anticipated to be the major portion of future activity. Although proven reserves will continue to be extracted, industry is interested in the technically recoverable resources identified by the USGS (USGS 2002) and displayed in the Energy Policy Conservation Act study (DOI, USDA, and DOE 2003 and 2006). These interests are for the coalbed natural gas plays, the Niobrara play, and the Mancos Shale resources. It is estimated that 99 percent of the drilling will occur in the area identified as high potential for the occurrence of oil and gas resources (Figure 3.3.6-1, Oil and Gas Leases and Occurrence Potential). Approximately one percent of future drilling will occur in areas of medium and low potential, and no drilling is predicted in the areas identified as no known potential (BLM 2008g).

As industry continues to mine minerals on private lands, drilling on federal mineral estate will increase significantly. Drilling will also increase on USFS lands because only half of the lands available for leasing are currently leased. Much of the development on USFS lands is projected to occur in the latter half of the life of this plan.

Some units in the CRVFO may contract in the future, as reservoirs become depleted or the known reservoir boundary is defined as a smaller area within the unit. New spacing regulations will be necessary to accommodate new drilling and production techniques. Future production from previously undeveloped plays, such as the Niobrara Formation and Mancos Shale, may also require spacing changes. Tight sands, compartmental geology, and reservoir characteristics may increase the demand for tighter spacing in the future in reservoirs other than the Williams Fork Formation.

Coal. The most important factors relating to development of the coal, other than its presence, include ease of access, development and production costs, and market demand. Coal is not expected to be developed commercially over the next 20 years, based on the limited quantity of coal in locations that are amenable to large-scale development, primarily based on depth or the quantity accessible by traditional mining.

Oil Shale. As with coal, the most important factors relating to the development of oil shale, other than its presence, is its ease of access, its development and production costs, and its market demand. Oil shale deposits occur in relatively thin layers, compared to some other areas; this, the high cost of extraction, and the energy and water that it demands using available techniques mean that oil shale is not expected to be commercially developed over the next 20 years. Programmatic decisions related to oil shale leasing were being deferred to the Oil Shale and Tar Sands RMP Amendments to Address Land Use Allocations in Colorado, Utah, and Wyoming and Programmatic EIS (BLM 2007h).

Non-Energy Leasables. As with coal and oil shale, the most important factors relating to development of non-energy minerals, other than their presence, are their ease of access, their development and production costs, and their market demand. Based on the nature of the deposits of non-energy leasable mineral resources in the CRVFO, no development is expected over the next 20 years.

Locatable Minerals

The factors relating to locatable mineral development are based on the presence of mineralization, access to the deposit, ore grade and quantity, development and mining costs, market demand, and other factors. Preliminary analysis of these factors shows that the only significant locatable mining activities projected over the next 20 years would be for gypsum, based on maintaining a supply for the wallboard plant. Although mining claims exist on locatable-grade limestone, a mine would have to be developed to offer a potential source of limestone for locatable end uses, such as rock dust or power plant stack gas reduction. Although

the price of uranium, gold, and copper have risen in recent years, there is little current interest in developing any ore deposits for these minerals.

Salables

The most important factors relating to mineral material development are the geologic formations and exposures containing deposits of salables. Other important factors include access, development and mining costs, and market demand. Preliminary analysis of these factors shows that the only significant mineral material activity on BLM land projected over the next 20 years is a continuation of the cinders operation on a similar scale. Demand for decorative rock and sand and gravel should increase slightly, based on continued growth in residential and commercial construction.

3.3.7 Renewable Energy

Solar, wind, biomass, and geothermal are considered renewable energy resources. Geothermal resources are managed as fluid leasable minerals. (Fluid leasable minerals closures and restrictions are discussed in Section 3.3.6, Energy and Minerals.) Renewable energy resources all have different requirements related to economic development; however, some issues are common to all renewable energy resources, including distance to existing power transmission facilities and compatibility with existing federal land use.

As demand has increased for clean and viable energy to power the nation, consideration of renewable energy sources on BLM administered lands has come to the forefront of land management planning. In cooperation with the DOE's National Renewable Energy Laboratory (NREL), the BLM assessed renewable energy resources on BLM administered lands in the western US (BLM and DOE 2003). The BLM reviewed the potential for concentrated solar power, photovoltaic, wind, biomass, and geothermal energy on BLM, BIA, and USFS lands in the West.

Wind and solar resource facilities are permitted through ROWs through the BLM-administered lands and realty program, whereas geothermal resources are considered fluid leasable minerals. As a result, management actions related to the lands and realty program and leasable minerals could affect renewable energy resources. Special designation areas such as ACECs and WSAs could also affect the use of renewable energy resources by limiting the location of these facilities.

Current Conditions

Solar Power

Data concerning solar resources are collected for both concentrating solar power and photovoltaic systems. The DOE's National Renewable Energy Laboratory has developed a national solar resource assessment (BLM and DOE 2003). For photovoltaic systems, data for flat-plate collectors were used. This is typical for a photovoltaic panel oriented due south at an angle from horizontal equal to the latitude of the collector's location. The concentrating solar power analysis used direct normal data, which are pertinent to concentrating systems that track the sun throughout the day, such as trough collectors or dishes.

In coordination with the BLM, NREL identified the following as the most important screening criteria in locating solar resource facilities on BLM land (BLM and DOE 2003):

Concentrated Solar Facilities

1. Direct solar resource is 5 kWh/m2/day or greater.
2. Terrain slope is ≤ 5%.
3. Site is within 50 miles of transmission lines at 115-345 kV.
4. Site is within 50 miles of a major road or railroad.
5. The minimum parcel size of 40 continuous acres is available.
6. Land use is BLM-compatible.

Photovoltaic Facilities

1. Direct solar resource is 5 kWh/m2/day or greater.
2. Site is within 50 miles of transmission lines at 115-345 kV.
3. Land use is BLM-compatible.

Data from the NREL indicate that yearly average solar resources available for flat-plate photovoltaic systems in the CRVFO planning area is 5 kilowatt hours per square meter per day (kWh/m^2/day) (BLM and DOE 2003). The yearly average solar resources available for concentrating solar power systems in the CRVFO planning area is also 5 kWh/m^2/day (BLM and DOE 2003). In the CRVFO there are 447,473 acres that receive between 5 and 6 kWh/m2/day of insolation and 57,436 acres that received between 6 and 7 kWh/m2/day.

There are currently no commercial solar energy producing facilities, and no pending applications for solar facilities within the CRVFO planning area; however, with over 300 days of sunshine per year, Colorado is one of the prime locations for solar energy development. The potential for locating solar facilities on BLM land in the CRVFO and authorizing ROWs for solar resources is primarily affected by the site specific criteria listed above.

Wind Resources

The BLM Wind Energy Programmatic EIS (BLM 2005b) has determined which areas on BLM lands have high, medium, or low potential for wind energy development based on their wind power classification. The majority of BLM lands within the CRVFO have a low potential for wind energy development (BLM 2005b). A very small area in the northeastern portion of the CRVFO has medium-high potential.

Wind power classifications are used to identify wind resource potential based on wind power density at 50m above ground level. Wind power classes range from 1 (lowest) to 7 (highest). Wind power is considered economically feasible for large turbines (commercial utilities scale) at Class 3 and higher, although a small noncommercial turbine can be used at Class 1. Most of the CRVFO planning area is rated as Power Class 1 for wind energy resources. Wind resources in Class 1 have poor potential for wind energy development. Some small areas of fair-to-outstanding wind power classes (classes 3-6) exist within the planning area on non-BLM land. Localized areas of fair-to-outstanding wind power classes exist in the southern portion of the planning area in southern Pitkin County. Other small areas of fair-to-outstanding wind power classes occur in the northern portion of the planning area near the boundaries of Eagle, Garfield, and Routt Counties. Figure 3.3.7-1, CRVFO Wind Energy Potential, shows the wind classification areas in the CRVFO planning area.

There are currently no wind energy producing facilities and no pending applications for wind facilities within the CRVFO. Applications for a ROW grant may be submitted for one of the following types of wind energy projects:

- A site-specific wind energy site testing and monitoring ROW grant for individual meteorological towers and instrumentation facilities with a term that is limited to 3 years.
- A wind energy site testing and monitoring ROW grant for a larger site testing and monitoring project area, with a term of 3 years that may be renewed, consistent with 43 CFR 2807.22 and the provisions of Instructional Memorandum 2006-216 (BLM 2006b) beyond the initial 3-year term.

- Long-term commercial wind energy development ROW grant with a term that is not limited by the regulations but usually is in the range of 30 to 35 years.

Biomass

Biomass power is obtained from the energy in plants and plant-derived materials, such as food crops and grassy and woody plants, residues from agriculture or forestry, and the organic component of municipal and industrial wastes. Biomass can be used for direct heating (such as burning wood in a fireplace or wood stove) and for generating electricity, or it can be converted directly into liquid fuels to meet transportation energy needs (DOI 2007a).

There are currently no biomass facilities and no pending applications for biomass facilities within the CRVFO planning area.

In its NREL study (BLM and DOE 2003), the BLM evaluated the long-term sustainability to support biomass plants using the monthly Normalized Difference Vegetation Index (NDVI) computed from the National Aeronautics and Space Administration's Advanced Very High Resolution Radiometer Land Pathfinder satellite program. The NDVI index correlates directly to the amount of surface vegetation that could be available for biomass energy. An NDVI of at least 0.4 is considered to be the threshold for biomass potential. The number of months an area has a NDVI rating of 0.4 or above also correlates to biomass potential. For an area to have biomass development potential, it has to meet the following criteria: a NDVI rating of 0.4 for at least 4 months between April and September, a slope of less than 40 percent, proximity of a maximum of 50 miles to a town with at least 100 people, and a land use compatible with BLM and USFS uses (BLM and DOE 2003).

Areas with an NDVI rating of at least 0.4 for 5 months are scattered throughout the CRVFO. A small area with an NDVI of at least 0.4 for 6 months is located in the western portion of the CRVFO in northwestern Garfield County. Figure 3.3.7-2, CRVFO Biomass Potential, shows the availability of biomass within the CRVFO.

Geothermal

There is a Region of Known or Potential Geothermal Resource in the vicinity of Glenwood Springs (Figure 3.3.7-3, CRVFO Regions of Known or Potential Geothermal Resources). There are no hot springs (over 50 degrees Celsius), but there are a few warm springs with water temperatures between 20 and 50 degrees Celsius. Based on the presence of warm springs, approximately 254 square miles of the CRVFO planning area have been identified as prospectively valuable for geothermal energy, most of which are under the jurisdiction of the CRVFO. No geothermal leases have been issued to date. Six lease applications were filed at various times in different areas (including South Canyon, Dotsero, and on USFS lands), but all applications were rejected or denied.

Characterization

Indicators

The indicators for renewable energy in the CRVFO include the existence of current renewable energy facilities, pending or authorized applications, and renewable energy development in neighboring areas with similar geography.

Trends

The demand for alternative energy-related ROWs should increase nationally, although within the CRVFO planning area, the potential for wind and solar energy is low. The potential for biomass and geothermal energy is higher than other renewable energy resources in the CRVFO and may be of interest to commercial developers, depending on economic factors.

In the NREL study of renewable resources on BLM lands, the CRVFO was not considered to have high potential for any renewable resources (BLM and DOE 2003). As a result, development of renewable energy resources in the CRVFO may occur at a slower pace than other planning units that have been identified as having higher potential (such as Grand Junction, Kremmling, Little Snake, Royal Gorge, and San Juan).

Small scale renewable energy facilities on private lands have been increasing within the planning area in recent years and are expected to continue into the future. Private wind turbines and solar facilities are being located within the planning area to provide renewable energy to localized structures and services. There have also been increases in small distributed geothermal systems used for home heating on private lands within the planning area.

3.4 SPECIAL DESIGNATIONS

This section contains a description of the special designation areas in the CRVFO and follows the order of topics addressed in Chapter 2, as follows:

- ACECs
- Wilderness Areas
- WSAs
- WSRs
- National Trails and Scenic Byways

3.4.1 Areas of Critical Environmental Concern

An ACEC is defined in FLPMA, Public Law 94-579, Section 103(a), as an area "within the BLM lands where special management attention is required to protect and prevent irreparable damage to important historical, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards." The BLM prepared regulations for implementing the ACEC provisions of FLPMA. These regulations are found at 43 CFR 1610.7-2(b).

Current Conditions

The six ACECs within the CRVFO, totaling approximately 27,030 acres (Figure 2-59, Alternative A: Special Designations) are the Blue Hill ACEC, Bull Gulch ACEC, Deep Creek ACEC, Glenwood Springs Debris Flow Hazard Zone ACEC, Lower Colorado River ACEC, and Thompson Creek ACEC. The size of each area and the values it is designed to protect are listed in Table 3.4.1-1, Designated ACECs in the CRVFO. All were designated in 1984 (BLM 1984a), except for Thompson Creek ACEC, which was designated in 1985 (BLM 1984a).

Table 3.4.1-1
Designated ACECs in the CRVFO

ACEC	Size (Acres)	Values
Blue Hill ACEC	3,700	Sensitive area for cultural and Native American resources with the potential to yield information important to the understanding of prehistory and history. Also classified as a critical watershed because of the severe erosion hazard of area soils and the negative impact they could have on cultural resource and water quality.
Bull Gulch ACEC	10,400	Classified as VRM Class I. The area's scenic qualities (Scenic Quality A) are tied to the unique and diverse topography, the unique geologic forms, and the sharp contrasting colors.
Deep Creek ACEC	2,400	Classified as VRM Class I because scenic and geologic values of outstanding land forms within the canyon, and vegetation and hydrologic features.
Glenwood Springs Debris Flow Hazard Zone ACEC	6,100	Debris flow zone to protect against loss of life, property, and mud and debris flow.
Lower Colorado River ACEC	130	Riparian and wildlife values.
Thompson Creek ACEC	4,300	Geological, ecological, cultural values and scenic quality and to provide for educational and primitive recreation.
Total	**27,030**	

Blue Hill Archaeological District ACEC

The 3,700-acre Blue Hill Archaeological District was designated as an ACEC because it is a sensitive area for cultural and Native American resources. It is also classified as a critical watershed because of the severe erosion hazard of area soils and the negative impact they could have on cultural resources and water quality. It will be managed as a VRM Class II area and was nominated to the National Register of Historic Places as an Archaeological District.

Bull Gulch ACEC

The 10,400-acre Bull Gulch ACEC is classified as VRM Class I and has a scenic quality rating of A because of the unique and diverse topography, the unique geologic forms, and the sharp contrasting colors. The southeastern portion of the site also supports several occurrences of the BLM-sensitive plant, Harrington's penstemon *(Penstemon harringtonii)*.

Deep Creek ACEC

The 2,400-acre Deep Creek ACEC is designated to protect scenic and geologic values. The area contains outstanding landforms, hydrologic features, and vegetation, which contribute to the scenic values. Geological faults and unusual erosional formations are found along the canyon. There is also a high concentration of cave and karst resources within the canyon. It is managed as a VRM Class I area.

Glenwood Springs Debris Flow Hazard Zone ACEC

The 6,100-acre Glenwood Springs Debris Flow Hazard Zones ACEC was designated to ensure public safety because the area is prone to mass wasting processes. Additionally, debris flows, slump, and rock fall pose threats to lives and property in the area. The ACEC also contains a genetically pure population of native, wild, naturally reproducing Colorado River cutthroat trout identified as a core conservation population in Mitchell Creek. The ACEC is managed as a VRM Class II area.

Lower Colorado River Cooperative Management Area ACEC

The 130-acre Lower Colorado River Cooperative Management Area ACEC contains important riparian and wildlife habitat values, including bald eagle, great blue heron, and two endangered fish species, the Colorado pikeminnow and razorback sucker. The area is managed as VRM Class II.

Thompson Creek

The 4,300-acre Thompson Creek ACEC was designated to protect scenic, geologic, historic, and ecological values. The area has outstanding scenic qualities tied to the unique topography and geologic forms (fins) and the sharp contrasting colors adjacent to Thompson Creek. The area has approximately 12 unique geologic formations from the Mesozoic Era and the Permian and Pennsylvania Periods of the Paleozoic Era that are exposed and represent various depositional events. The formations were tilted nearly vertically, and down-cutting has exposed the formations in cross-section.

Historic values are associated with the abandoned Aspen and Western Railway, the remains of which include stone and wood bridge abutments, grading crew's quarters, and the old railroad bed.

The area's intact natural ecological state was recognized as important for environmental education and primitive types of recreation.

The area is also used recreationally by local rock climbers. While one fin has been bolted for climbing, the BLM has a verbal agreement with local rock climbing groups that no bolts or other man-made devices are permitted on identified relevant and important geologic features outside of the existing climbing fin.

Characterization

Indicators

ACECs are managed to protect identified relevant and important values. Indicators will vary by resource value and may be found under the respective resource or resource use section.

Trends

Deep Creek ACEC

An increase in recreation uses along the Deep Creek ACEC has created evident campsites along the creek bottom, particularly within the first 0.5 mile. In addition, motorized travel coming from the Onion Ridge open area continues to breach the non-motorized designation within the Deep Creek ACEC along the northern boundary.

Lower Colorado River ACEC

Protection of the fish and wildlife habitat is difficult because very few acres along the Lower Colorado River are public land.

Thompson Creek ACEC

Increased human use and surface-disturbing activities (particularly with climbing) pose a threat to the relevant and important values and preservation of the Thompson Creek ACEC's primitive setting and relatively undisturbed condition.

3.4.2 Wilderness and Wilderness Study Areas

In 1964, Congress passed the Wilderness Act, establishing 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 land considered for, and designated as, wilderness was managed by the NPS and USFS. With the passage of FLPMA in 1976, Congress directed the BLM to inventory, study, and recommend which lands under its administration should be designated wilderness. All primitive and outstanding natural areas became Instant Study Areas, a type of Wilderness Study Area (WSA). Congress gave the BLM 15 years to complete the wilderness inventory of all other BLM-administered lands, which was done on a state-by-state basis. Through this process, four areas in the CRVFO were identified as WSAs.

Section 603 of FLPMA requires the BLM to provide Congress with recommendations as to suitability or unsuitability of BLM WSAs (roadless areas greater than 5,000 acres and roadless islands) for wilderness designation. Only Congress can ultimately decide which areas, if any, would be designated as wilderness and added to the National Wilderness Preservation System.

In 1991, the Colorado BLM issued a ROD that included wilderness recommendations for 54 WSAs throughout Colorado (BLM 1991c). The recommendations were based on the findings of a 15-year wilderness study process (from 1976 to 1991) that included each area's resource values, present and projected future uses, and manageability as wilderness; the environmental consequences of designating or not designating the areas as wilderness; mineral surveys; and public input. Until Congress acts on the recommendations and either designates them as wilderness or releases them for other uses, these areas are managed under the interim management policies for WSAs (BLM Handbook H-8550-1, Interim Management Policy for Lands under Wilderness Review [BLM 1995]) to preserve their wilderness values. Activities that would impair wilderness suitability are prohibited in WSAs.

This standard applies to all uses and activities except those specifically exempted from this standard by FLPMA (grandfathered uses and valid existing rights). The BLMs IMP provides specific policy and guidance for management of most resource values and uses in WSAs. However, visual resource management decision and off-highway vehicle designations and route designations are made during land use planning.

Summaries of some aspects of WSA management are as follows:

- 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 nor 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 on that date.
- WSAs may not be closed to appropriation under the mining laws to preserve their wilderness character.
- Valid existing rights must be recognized.
- WSAs must be managed to prevent unnecessary or undue degradation.

BLM is obligated under Section 201 of the FLPMA to inventory public land resources and other values, including wilderness characteristics associated with the concept of wilderness, and to consider such

information during land use planning. Through the land use planning process, BLM will consider all available information to determine the mix of resource use and protection that best serves the FLPMA multiple use mandate. Wilderness characteristics findings are discussed in Section 3.2.12, Lands with Wilderness Characteristics.

No congressionally designated wilderness areas exist on BLM lands within the planning area. All or portions of seven wilderness areas administered by the USFS are in the CRVFO planning area.

Current Conditions

Four WSAs, approximately 27,700 acres, are in the CRVFO (Table 3.4.2-1, Wilderness Study Areas in the CRVFO) (Figure 2-58, Alternative A: Special Designations).

Table 3.4.2-1
Wilderness Study Areas in the CRVFO*

Proposal Name	Total Acres
Bull Gulch	15,200
Castle Peak	12,200
Eagle Mountain	320
Hack Lake	4
Total	**27,724**

*Acres reflect current GIS mapping technology and may be different from original acres documented in Colorado BLM Wilderness Study Report, ROD, 1991. No boundary adjustments were done as part of this plan.

A brief description of CRVFO WSAs and current uses and management prescriptions for them, are provided in Table 3.4.2-2. All WSAs are managed according to interim management policy which recognizes valid existing rights and grandfathered uses. Grandfathered uses are grazing, mining, and mineral leasing uses on lands under wilderness review in the manner and degree in which these uses were being conducted on October 21, 1976, as long as they do not cause unnecessary or undue degradation of the lands.

Characterization

Indicators

WSAs are to be managed in a manner so as not to impair the suitability of such areas for preservation as wilderness until Congress makes a determination to designate or not to designate the area as wilderness. BLM's Interim Management Policy (H-8550-1, Interim Management Policy for Lands Under Wilderness Review) sets guidelines for permitted uses in WSAs.

Table 3.4.2-2
Descriptions of WSAs in the CRVFO

Name	Natural Values	Current Uses	Management Prescriptions
Bull Gulch WSA —10 miles northwest of Eagle (Eagle County)	• Diverse landscapes, including alpine zones giving way to colorful canyons and cliffs along the Colorado River drainage. • Outstanding geologic features of sedimentary and volcanic origins. • Habitat for deer, elk, bobcat, Rocky Mountain bighorn sheep, and mountain lion. Potential habitat for lynx, prairie falcons, bald eagles, and sage-grouse. • Outstanding scenery with colorful cliffs. • Elevations ranging from 6,400 feet along the Colorado River to 10,020 feet along the rim in the Black Mountain area.	• Hiking, hunting, camping, horseback riding, wildlife viewing, floatboating, fishing, photography. • Cattle and sheep summer grazing with three permittees on two allotments. • Big game hunting/outfitting and commercial floatboating and fishing along the Colorado River on the western boundary.	• 15,200 acres are closed to motorized and mechanized travel. • 10,400 acres are designated as an ACEC for scenic values, unsuitable for utility and communication facilities. • Land within the WSA is closed to fluid mineral leasing and contains no current leases. • 8,300 acres are managed under Bull Gulch SRMA for diverse, semi-primitive recreation opportunities. • Managed for VRM Class I.
Castle Peak WSA — 8 miles north of Eagle (Eagle County)	• Subalpine Douglas-fir and spruce-fir forest, sagebrush ecosystems, and numerous aspen stands. • Stream and lake riparian and aquatic habitat. • Mountain scenery, Castle Peak geologic feature. • Elk calving, black bear, deer, and mountain lion habitat. Prime goshawk habitat and potential habitat for Canada lynx. • Elevations ranging from 8,400 feet to 11,275 feet on Castle Peak.	• Hiking, hunting, camping, horseback riding, wildlife viewing, photography. • Cattle and sheep summer grazing with three permittees on two allotments. Big game hunting/outfitting, commercial horseback riding	• 12,200 acres are closed to motorized and mechanized travel. • Land within the WSA is closed to fluid mineral leasing and contains no current leases. • Managed for VRM Class II.

Table 3.4.2-2 *(continued)*
Descriptions of WSAs in the CRVFO

Name	Natural Values	Current Uses	Management Prescriptions
Eagle Mountain WSA — 8 miles west of Aspen (Pitkin County)	• Steep, rugged slopes, including Eagle Mountain Peak, which serves as a connection to the Maroon Bells-Snowmass Wilderness Area. • Diverse vegetation cover, including aspen and spruce-fir forest and outcrops of sandstone formations. • High scenic quality of the adjacent high mountain peaks in the Maroon Bells-Snowmass Wilderness Area. • The elevation ranges from 8,280 feet up to a peak elevation of 9,937 feet.	• Hiking, hunting, wildlife viewing, camping. • Cattle summer grazing on one allotment.	• Livestock grazing on one allotment. • 320 acres are open to motorized and mechanized travel. • 320 acres are managed to provide for semi-primitive, motorized recreation opportunities. • Land within WSA is closed to fluid mineral leasing and contains no current leases. • Managed for VRM Class II.
Hack Lake WSA —22 miles northeast of Glenwood Springs (Garfield County)	• Diverse vegetation encompassing the sagebrush zone up to the aspen and spruce-fir zone, with moist swamp areas and open grassy parks. • High scenic quality of the adjacent cliffs of the Flat Tops Wilderness Area, panoramic views of distant mountain ranges. • Surrounded by glacial moraine, steep, rugged cliffs, and rocky outcrops. • Includes aquatic and riparian habitat. • Habitat for deer, elk, Rocky Mountain bighorn sheep, badger, blue grouse, beaver, and waterfowl and potential habitat for Canada lynx. • Includes part of a historic Ute Trail. • Elevation ranging from 7,700 to 11,000 feet.	• Hiking, hunting, fishing, wildlife viewing, camping, horseback riding. • Summer cattle grazing on two allotments. • Commercial horseback riding trips, and big game hunting/outfitting.	• 4 acres are closed to OHV travel (3,300 acres in the Hack Lake SRMA are closed to motorized travel). • 4 acres in the Hack Lake SRMA are managed to provide for semi-primitive, non-motorized recreation opportunities . • NSO stipulation is in place within SRMA for oil and gas development. • Managed for VRM Class II.

Source: BLM 2007j

Trends

According to WSA monitoring reports, no major impairment has occurred on any of the CRVFO WSAs. Minimal vehicle violations and fire suppression activities have been noted. However, recreational use and related impacts on naturalness and opportunities for solitude are continuing to increase within all WSAs due to increasing population occurring in adjacent communities.

While the Eagle Mountain WSA (Maroon Bells-Snowmass Addition) has an open area travel designation since 1984, the area is not experiencing any damage due to the area's topography and limited access. Motorized and mechanized vehicles are not limited to existing routes, and cross-country travel is allowed. However, because of its topography on a cliff and limited public access, motorized and mechanized travel is of little concern in the Eagle Mountain WSA.

Some travel violations continue to occur along the southern portions of the Bull Gulch WSA due to the open vegetation and topography. Several reclamation projects have occurred in Bull Gulch and Castle Peak WSAs because they were closed to motorized and mechanized uses under the Castle Peak Travel Management Plan (BLM 1997c).

3.4.3 Wild and Scenic Rivers

Wild and scenic rivers are rivers or river sections designated by Congress under the authority of the WSR Act of 1968 (WSR Act) (Public Law 90-542, as amended; 16 United States Code [USC] 1271-1287) for the purpose of preserving the river or river section in its free-flowing condition, preserving water quality and protecting its outstandingly remarkable values (ORVs). River segment ORVs are identified on a segment specific basis and may include scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values.

Section 5(d)(1) of the WSR act directs federal agencies to consider potential WSRs in their land and water planning process. To fulfill this requirement, the BLM and USFS inventories and evaluates rivers when they develop or revise Land Use Plans for BLM or USFS lands in a specified area. In order to fulfill its WSR Act Section 5(d)(1) obligations, the BLM is considering potential WSR segments within the planning area as part of this planning process. In addition, the USFS White River National Forest (WRNF) is coordinating with BLM to evaluate select river segments as part of this EIS.

In order to be eligible for inclusion in the National Wild and Scenic River System (NWSRS), a river segment must be free flowing and contain at least one river-related value considered to be outstandingly remarkable (BLM Manual 8351) (BLM 1993b) or (USFS Handbook 1909.12, Chapter 80) (USFS 1992). Eligible segments are preliminarily classified as wild, scenic, or recreational based primarily on level of development (shoreline and instream) accessibility and water quality. Once a tentative classification is assigned, the segments are studied in more detail to determine if they are suitable for inclusion in the NWSRS.

Twenty-six BLM-managed segments in the CRVFO planning area were identified as eligible in previous eligibility studies (BLM 2002c, BLM 2007f, and USFS and BLM 1995) and are being studied for suitability as part of this EIS planning process (WSR Suitability Report, Appendix C). The approach of both the WSR Eligibility Report and the WSR Suitability Report was to address the length of the Colorado River system in Colorado and, therefore, refer to stream segments within the Kremmling Field Office. This is also part of the rationale for including the WRNF segments in this planning process. Stream segments for each of these three entities are, therefore, included in Appendix C. In addition, the original intent of this RMP revision planning process was to revise the respective land use plans for both the BLM Kremmling Field Office and CRVFO in a single, joint RMP/EIS document. However, the BLM decided to separate the land use plans for these two field offices based on consideration of public comment as well as understanding that the decision process would benefit from separating these RMPs by field office. As result, this section discusses only the stream segments within the CRVFO and the WRNF.

Four segments managed by the WRNF are being studied for suitability as part of this planning process. These study segments on the Colorado River and Deep Creek were identified as eligible in the *White River National Forest Land and Resource Management Plan* (Forest Plan) (USFS 2002). As part of that planning process, standards and guidelines were developed to protect the river segment's resource values.

Activities that would adversely affect eligible WSR stream segments include those that would adversely affect the ORV(s) or the free-flowing nature of the segment. Similarly, activities that affect the preliminary classification of a stream segment, such as construction of a road in a segment with a wild classification, would impact the segment.

The BLM and WRNF are conducting an interagency suitability study as part of this planning process. The Draft Suitability Report and subsequent determinations can be found in Appendix C. The report contains detailed information on the suitability study process and draft suitability determinations. In conformance with WSR Act direction and related agency guidance, a full range of alternatives will be analyzed in Chapter 4 (Environmental Consequences).

Colorado River Valley Field Office

Current Conditions

There are no rivers in the CRVFO planning area designated as a WSR or authorized as a Study River by the WSR Act. Table 3.4.3-1, Eligible Stream Segments in the CRVFO, displays the 26 eligible segments and their preliminary classification assigned during eligibility (Figure 3.4.3-1, Stream Segments Eligible for Inclusion in the National Wild and Scenic River System). The Draft Wild and Scenic River Suitability Report can be found in Appendix C.

Characterization

Indicators

All eligible stream segments must be managed to protect the free-flowing nature of the segment and the river-related values of the segments. These values must be maintained so that they continue to exist at the "outstandingly remarkable" level. If the BLM determines that one or more of the ORVs appears to be at risk of no longer meeting the outstandingly remarkable criterion, it can rely on available monitoring information or initiate new monitoring efforts (possibly in concert with partners) to determine if the river-related value has been or is at risk of being impaired.

Trends

River-related recreation is increasing in the CRVFO and relies on certain flow rates to support the activity. For example, fishing requires a certain flow rate to support the fisheries, and white-water boating relies on certain flow rates to create a white-water experience. Flow rates that are necessary to support river-related recreation may become at risk as demand for additional water diversions occurs at upstream locations to satisfy growing populations on the Western Slope and Eastern Slope. Accordingly, gathering data about flow rates required to support recreation will be critical for managing the ORVs.

Energy and mineral development is a large part of the local economy and pressure is growing for more development. Equipment associated with extraction could impact scenic ORVs, especially on the Roan Plateau. With energy and mineral extraction, there is a risk for water contamination that could affect fish, riparian vegetation, and other botanical ORVs related to water. The majority of oil and gas development is concentrated west of the Grand Hogback, while all segments being studied for suitability, with the exception of those on the Roan Plateau, are east of the Grand Hogback.

Table 3.4.3-1
Eligible Stream Segments in the CRVFO

River or Creek	Segment	Total Segment Length (miles)	Length on BLM Land (miles)	Preliminary Classification	ORVs
Abrams Creek	One segment	3.44	3.44	Recreational	Fish
Battlement Creek	One segment	2.88	1.66	Recreational	Fish
Colorado River	Total of two segments	71.38 (total)	33.10 (total)		
	Segment 6	45.38	27.30	Recreational	Scenic, Recreational, Wildlife, Botanical
	Segment 7	26.00	5.80	Recreational	Scenic, Recreational, Geologic
Deep Creek	Total of two segments	4.46 (total)	4.46 (total)		
	Segment 2	3.60	3.60	Wild	Ecologic, Scenic, Geologic
	Segment 3	0.86	0.86	Recreational	Ecologic, Scenic, Geologic
Eagle River	One segment	25.69	5.46	Recreational	Recreational
Egeria Creek	One segment	8.31	7.78	Recreational	Historic
Hack Creek	One segment	2.42	1.63	Scenic	Historic
Mitchell Creek	One segment	0.89	0.89	Recreational	Fish
No Name Creek	One segment	0.08	0.08	Recreational	Historic
Rock Creek	One segment	4.78	3.17	Recreational	Historic
Thompson Creek[1]	One segment	4.76	4.76	Scenic	Scenic, Geologic, Historic
East Middle Fork Parachute Creek complex					
East Middle Fork Parachute Creek	One segment	1.10	1.10	Wild	Fish, Botanic
Northwater Creek	One segment	3.20	3.20	Wild	Fish, Botanic
Trapper Creek	Total of three segments	5.98 (total)	5.98 (total)		
	Segment 1	0.78	0.78	Wild	Fish
	Segment 2	3.40	3.40	Recreational	Fish
	Segment 3	1.80	1.80	Scenic	Fish

Table 3.4.3-1 *(continued)*
Eligible Stream Segments in the CRVFO

River or Creek	Segment	Total Segment Length (miles)	Length on BLM Land (miles)	Preliminary Classification	ORVs
East Fork Parachute Creek complex					
East Fork Parachute Creek	Total of two segments	7.57 (total)	7.57 (total)		
	Segment 1	5.36	5.36	Wild	Fish, Scenic, Botanic
	Segment 2	2.21	2.21	Scenic	Fish, Botanic
First Anvil Creek	Total of two segments	2.25 (total)	2.25 (total)		
	Segment 1	0.60	0.60	Wild	Fish, Botanic
	Segment 2	1.65	1.65	Scenic	Fish, Botanic
Golden Castle Creek	One segment	1.05	1.05	Wild	Fish, Botanic
JQS Gulch	One segment	1.14	1.14	Scenic	Fish, Botanic
Second Anvil Creek	Total of two segments	1.77 (total)	1.77 (total)		
	Segment 1	1.46	1.46	Wild	Botanic
	Segment 3	0.31	0.31	Recreational	Botanic

[1]Thompson Creek also includes a portion of the North Fork of Thompson Creek where it occurs on BLM land near the confluence with Thompson Creek.
Sources: BLM 2002c; BLM 2007f; USFS and BLM 1995

Additionally, practices associated with oil shale extraction could draw groundwater that contributes to streams on the Roan Plateau. It should be noted, however, that it is unknown precisely what the impacts are to the water table from oil shale extraction.

Interested parties, including water rights holders, recreationists (such as anglers, floatboaters, and kayakers), environmental groups, and local governments, have expressed diverging interest in designating eligible segments within the CRVFO. One of the primary areas of disagreement is the best management approaches for maintaining and enhancing the ORVs, specifically whether protection would be best implemented by designating the stream segments under the WSR Act or by implementing appropriate land management prescriptions in the BLM resources management plan. Another major area of disagreement is how to best manage flows in stream segments that support ORVs, specifically whether the best management would be a federal reserved water right under the WSR Act, or by using state-based instream flow water rights and cooperative measures among water rights holders.

The presence of railroads, utilities infrastructure, and non-BLM land in the study corridor, and practices of and on those areas are outside of BLM control. While the current management of railroads and utilities infrastructure is not incompatible with protection of ORVs, a change in management practice could have an effect. It is difficult for the BLM to ensure the protection of ORVs in highly fragmented stream segments.

Refer to the Trends Section of the White River National Forest Segments below for an expanded description of trends potentially affecting the Colorado River and Deep Creek segments.

White River National Forest

Current Conditions

There are no rivers in the White River National Forest designated as a WSR or authorized as a Study River by the WSR Act. Detailed information relating to the four eligible segments being analyzed for suitability can be found in the White River National Forests Land and Resource Management Plan Revision in 2002 (USFS 2002).

It is expected that the current condition of these segments is the same as it was at the time of the eligibility determinations, due to subsequent administrative management area direction prescribed in the Forest Plan to protect and perpetuate eligible and designated river segments. The four eligible segments being studied in this EIS are displayed in Table 3.4.3-2, Eligible Stream Segments in the WRNF. The Draft Wild and Scenic River Suitability Report can be found in Appendix C.

Table 3.4.3-2
Eligible Stream Segments in the WRNF

River or Creek	Segment	Total Segment Length (miles)	Length on USFS Land (miles)	Preliminary Classification	ORVs
Colorado River	Two segments Found within BLM Segment 7 [1]	6.48 (total)	5.43 (total)		
	Segment 1	3.35	2.97	Recreational	Recreational, Scenic, Geologic
	Segment 2	3.13	2.46	Recreational	Recreational, Scenic, Geologic
Deep Creek	Two segments	4.46 (total)	4.46 (total)		
	Segment 1	0.24	0.24	Scenic	Ecologic, Scenic, Geologic
	Segment 2a	10.53	10.53	Wild	Ecologic, Scenic, Geologic

Note:
[1] The WRNF segments on the Colorado River are found within BLM's CRVFO segment 7.

Characterization

Indicators

WSR studies done under 5(d)(1) of the Act (Agency-Identified Studies), are required to have all eligible stream segments managed to protect the free-flowing nature, water quality of the segment, the preliminary classification, and ORVs related to the segment to the level that they existed when the segment was found eligible. Through regular monitoring of the ORVs, the Forest Service can assess whether or not all the values above are present at the same level that they were when the segment was found eligible.

Details on eligibility findings for the White River National Forest (WRNF) four segments, (Colorado River and Deep Creek) can be found in the WRNF Land and Resource Management Plan (Forest Plan) (USFS 2002) or can be found in the suitability report in Appendix C.

Trends

With over 9.6 million annual visits to forest recreation facilities, the WRNF is the most visited national forest in the nation (2002 National Visitor Use Monitoring Survey [Kocis et al. 2003]). While, much of the WRNF's visitation is related to its world-class ski resorts, more recently much of the growth in visitation now occurs as non-skiing related activities during the summer and winter. River-related visitor use is expected to continue to increase on WRNF lands and related waters. Currently 14 commercial outfitters operate on the segments in Glenwood Canyon where current estimates show permitted commercial rafting numbers and capacity at approximately 70,000 visitor days a year, with another 40,000 people conducting private trips. Local businesses within the adjacent communities rely on the rafting industry related income that generates millions of dollars in direct and indirect expenditures. Scenic driving accounts for an additional 11 million visits annually on the WRNF (Kocis et al. 2003). Glenwood Canyon contributes a large part of those visits given its central location and key role in connectivity to other parts of the forest and related opportunities. The intrinsic value of viewing water within the canyon contributes to experiences related not only to scenic driving, but for other activities as well.

With increasing recreational use, assumptions can be made that ORV's on all four of the WRNF segments could experience negative effects without monitoring and subsequent management actions that would maintain and preserve those values.

River-related recreation as well as various natural process and ecological values rely on an instream flow to support them. For example, white-water boating relies on flows to create a white-water experience. As demand for water increases from front-range communities and western slope stakeholders, the Colorado River and other rivers and streams on the western slope will continue to see increased supply issues and potential impacts from projects. Subsequent to the increased water demand there is likely to be an increased threat to ORVs that rely on certain instream flows.

While Deep Creek has generated interest for years regarding its need for protection and some type of special designation or preservation mechanism, no river has generated as much interest in the WSR process as the Colorado River.

Colorado River Segment 7 benefits from the increased reliability of flows that result from the intersection of major tributaries with the upper Colorado River. Currently, there are no state instream flow water rights in this reach that help ensure sufficient flow for the ORVs. The relatively senior water right associated with the

Shoshone hydroelectric plant in Glenwood Canyon helps insure flow through these segments year-round. However, there are periods when this plant has not operated. As part of an agreement between Excel Energy (owner of the Shoshone Power Plant) and the City of Denver, the City of Denver is allowed to dictate a reduction in the Shoshone water right. Consequently, the water right associated with the Shoshone Power Plant cannot guarantee flow through this segment in all situations. In addition, many of the senior downstream rights that help ensure flow through this stream reach are irrigation rights, and as such they can only affect flows during the irrigation season.

Continuing upstream water development and increasing water demands associated with population growth may jeopardize the flows necessary to support the ORVs in the Colorado River segments. This risk is amplified by the lack of any instream flow protection in these segments. In this environment, adequate flows for ORVs may only be available with careful design for future water projects and close coordination of operations of existing water uses.

Interested parties, including but not limited to water rights holders, recreationists (such as anglers, floatboaters, and kayakers), commercial rafting companies, environmental groups, and local and state governments, have expressed diverging interest in the designation of eligible segments, particularly on the Colorado River on both Forest Service and BLM lands. For the Colorado River the major disagreement is how much water is needed and how it should or should not be federally reserved to support ORVs associated with stream segments.

In Glenwood Canyon, the presence of the railroad, Interstate 70, utilities infrastructure, and other land-based development on non-USFS land in the study corridor, is outside of USFS control and was not mapped as part of the study segments. While those activities are not incompatible with the protection of ORVs, a change in management practice could have an effect. However, within Glenwood Canyon it is unlikely, as there is a history of great cooperative efforts (i.e., construction of Interstate 70) that will likely continue in Glenwood Canyon to maintain and preserve the environmental aesthetics, geologic, recreational, and scenic integrity of the whole corridor. In addition, management standards and guidelines set forth in the forest plan will have to be adhered to on USFS lands.

3.4.4 National Trails and Scenic Byways

The National Trails System Act of 1968 (Public Law 90-543, as amended) authorized the creation of a national trail system composed of National Recreation Trails, National Scenic Trails, and National Historic Trails. Only Congress may designate National Historic Trails and National Scenic Trails. The Secretary of the Interior or the Secretary of Agriculture may designate National Recreation Trails to recognize exemplary trails of local and regional significance in response to an application from the trails' managing agency or organization. Through designation, these trails are recognized as part of America's National Trails System.

Byways include All-American Roads, National Scenic Byways, Colorado State Scenic and Historic Byways, and BLM-designated Backcountry Byways. The National Scenic Byways Program is part of the US Department of Transportation, Federal Highway Administration. The program seeks to recognize, preserve, and enhance selected roads throughout the US. The US Secretary of Transportation recognizes 126 All-American Roads or National Scenic Byways based on one or more archaeological, cultural, historic, natural, recreational, or scenic qualities (National Scenic Byways Online 2007).

The National Backcountry Byway Program is BLM's contribution to the larger National Scenic Byways Program. BLM State Directors designate BLM Backcountry Byways on BLM public lands. Since many BLM-designated byways cross other federal, state, county, and private lands, their designation and management can vary based on the agency responsible for the management of the byway. While most BLM-designated Backcountry Byways are native surface or gravel base roads, byways fall into one of four category types. These categories range from "Type I" paved all-weather roads suitable for normal passenger vehicles, to Type IV single-track trails suitable only for dirt bikes, mountain bikes, or snowmobiles during winter season. The Colorado Scenic and Historic Byways program is intended to provide recreational, educational, and economic benefits to Colorado residents and visitors. The system of roads affords the traveler interpretation and identification of key points of interest and services while providing for the protection of significant resources. Colorado Scenic and Historic Byways are nominated by local partnership groups and designated by the Colorado Scenic and Historic Byways Commission for their exceptional scenic, historic, cultural, recreational, and natural features (Colorado's Scenic and Historic Byways, undated).

Activities which will not substantially interfere with the nature and purposes of National Trails and which, at the time of designation, are allowed by administrative regulations shall be permitted. Motorized vehicle use is prohibited by the National Trails System Act of 1968 with some exceptions. Installation of offsite outdoor advertising (e.g., billboards) is not allowed along national or state scenic byways.

Current Conditions

The BLM has designated no Backcountry Byways within the CRVFO planning area. Portions of the Continental Divide National Scenic Trail occur in the CRVFO planning area, but none of the trail is on BLM land. While there are no BLM-designated Backcountry Byways within the CRVFO, National and State Scenic Byways include within the planning area the Top of the Rockies National and State Scenic Byway and the West Elk Loop State Scenic Byway, neither of which are managed by BLM.

The Top of the Rockies National and State Scenic Byway begins approximately 10 miles southeast of Vail near the town of Copper Mountain, and runs along State Highway 91 south of the junction with Interstate 70 to its intersection with US Highway 24 near Leadville. The scenic byway also runs along US Highway 24 south of the Interstate 70 junction approximately 5 miles southwest of Vail at Dowd Junction to its intersection with State Highway 82 at Balltown.

A small portion of the West Elk Loop State Scenic Byway is present south of Carbondale and extends southward crossing National Forest land and into the Uncompahgre and Gunnison Field Office.

Characterization

Indicators

The Continental Divide National Scenic Trail Comprehensive Plan contains guidelines for trail management, completion of new segments of trail, and trail monitoring (US Forest Service 1985). Consideration is given to carrying capacity of the trail, motorized vehicle use, cultural sites, budget constraints, physical environment and resources (including wildlife and wildlife habitat, soil, vegetation, water quality, and air quality), existing ROW, private landownership, and public safety hazards. The effects on visual resources, quality recreational experiences and indirect effects on local economies are relevant impact indicators for scenic trails and byways.

Trends

Driving for pleasure is on the rise. While the national and state scenic byways are not managed by the BLM, an increase in visitation could impact nearby BLM land if people are exiting their cars along the byways and recreating on BLM land.

3.5 SUPPORT

3.5.1 Transportation Facilities

The BLM transportation system represents one of the most critical assets to the accomplishment of the BLM's mission. A well-functioning transportation system is essential for the resource harvesting, energy production, and recreation that take place on BLM lands. In addition to allowing the BLM to achieve its agency goals—sustaining the health, diversity, and economic vitality of our BLM lands—transportation enables ongoing contributions to the regional and national economies (BLM 2008k). With the increase in the regional population, the continued demand for energy and ROWs, the growth in recreational use, and ongoing fire risks, it is expected that the Field Office's transportation system will continue to expand and become even more important over time.

Historically used by BLM personnel, permittees, and leaseholders, the BLM transportation system is now also extensively used by the general public for recreation, as many rural communities contiguous to BLM lands continue to experience unprecedented growth in residents and visitors. The growth of commercial activities and industries throughout the West has also brought many new economic opportunities to BLM lands. The resulting mix of recreational and commercial activities contributes further to the complex challenges in managing the BLM transportation system (BLM 2009e).

Most BLM and administratively permitted (e.g., ROWs, grazing) roads are naturally surfaced (dirt roads). The majority of roads on BLM lands, either constructed for energy developed or existing and authorized for that purpose, are gravel roads. No BLM roads in the planning areas are paved. The BLM is responsible for the associated infrastructure, such as bridges and culverts, on all BLM roads.

Comprehensive trails and travel management (Section 3.3.4) is the identification, through RMP planning, of areas where foot, pack stock, and mechanized and motorized vehicle travel is appropriate, restricted, or not allowed, depending on resource objectives and use considerations. This section addresses federal, state, county, and BLM roads within the BLM Facility Asset Management System (FAMS).

Federal, State, and County Roads

A network of federal, state, and county roads provides access throughout the CRVFO planning area. Interstate 70 bisects the adjoining planning areas; other major roads, such as US Highway 40 and Colorado Highways 9, 14, 82, 125, and 131, bring traffic to the region from throughout the US (Figure 1-1, CRVFO Project Planning Area, and Figure 1-2, CRVFO Planning Area and Land Status). Traffic volumes on the road network are highly variable. The highest volume counts are found on major roadways in or near the largest communities. Interstate 70 and state highways carry the largest traffic volumes, followed by county roads. Due to the geography of the planning areas and location of mountain communities, these routes are major thoroughfares that have moderate to high use throughout the year.

BLM Roads

BLM roads provide public and administrative (BLM and permittee) access to BLM lands, through BLM lands, and to inholdings of private land within the planning areas. The "transportation system" represents the sum of the BLM's recognized inventory of linear features (roads, primitive roads, and trails) formally recognized, designated, and approved as part of the BLM transportation system. BLM defines and categorizes its linear assets (travel routes) into the following three "Transportation Asset" designated categories: roads, primitive

roads, and trails. These terms describe specific categories of transportation linear features and represent subsets of the BLM transportation system.

Road System Maintenance

BLM road maintenance consists of blading and grading usually in the summer or fall. Additional corrective maintenance or water drainage work (installation of culverts, drains, or other water management devices) is performed as needed, such as after heavy rainfall. The BLM does not remove snow, but some access routes have portions plowed by county road maintenance, utility companies, or private entities if the roads provide access to utilities, homes, or private buildings.

BLM has changed from "Maintenance Levels" to "Maintenance Intensity" and simplified the standards for consistency across all linear features. The old "Maintenance Levels" definitions addressed both the type of road (road geometry or construction material) and the level of use but did not provide a clear standard for the actual maintenance level. As a result, the term was used inconsistently across the BLM as a means for describing everything from road construction type through appropriate maintenance standards. BLM route "Maintenance Intensities" provide guidance for appropriate "standards of care" (e.g. appropriate intensity, frequency, and type of maintenance activities that should be undertaken) for recognized routes. Recognized routes by definition include roads, primitive roads, and trails carried as Assets within the BLM FAMS. It includes four primary "Maintenance Intensity" levels that allow for removal, low, medium, and high maintenance intensities, irrespective of the type of route (road, primitive road, or trail) (BLM 2006c). Maintenance intensities must be consistent with land use planning management objectives (for example, natural, cultural, recreation setting, and visual).

Level 0

Maintenance Description: Existing routes that will no longer be maintained and no longer be declared a route. Routes identified as Level 0 are identified for removal from the Transportation System entirely.

Maintenance Objectives:

- No annual maintenance planned.
- Meet identified environmental needs.
- No preventive maintenance or annual maintenance activities planned.

Maintenance Funds: No annual maintenance funds.

Level 1

Maintenance Description: Routes where minimum (low intensity) maintenance is required to protect adjacent lands and resource values. These roads may be impassable for extended periods of time.

Maintenance Objectives:

- Low (Minimal) maintenance intensity.
- Emphasis on maintaining drainage and runoff patterns as needed to protect adjacent lands. Grading, brushing, or slide removal not performed unless route bed drainage is being adversely affected, causing erosion.

- Meet identified resource management objectives.
- Maintenance as necessary to protect adjacent lands and resource values.
- No preventive maintenance.
- Planned maintenance activities limited to environmental and resource protection.
- Route surface and other physical features not maintained for regular traffic.

Maintenance Funds: Maintenance funds provided to address environmental and resource protection requirements. No maintenance funds provided to perform preventive maintenance.

Level 2

BLM has reserved this level for possible future use. There is no current description or objective.

Level 3

Maintenance Description: Routes requiring moderate maintenance due to low volume use (e.g., seasonally or year-round for commercial, recreation, or administrative access). Maintenance Intensities may not provide year-round access but are intended to generally provide resources appropriate to keep the route in use for the majority of the year.

Maintenance Objectives:

- Medium (Moderate) maintenance intensity.
- Drainage structures maintained as needed. Surface maintenance to a reasonable level of riding comfort at prudent speeds for the route conditions and intended use. Brushing as needed to improve sight distance when appropriate for management uses. High priority removal of landslides adversely affecting drainage, otherwise removed on a scheduled basis.
- Meet identified environmental needs.
- Generally maintained for year-round traffic.
- Annual maintenance as necessary to protect adjacent lands and resource values.
- Preventive maintenance as required to generally keep the route in acceptable condition.
- Planned maintenance activities include environmental and resource protection efforts and annual route surfacing.
- Route surface and other physical features maintained for regular traffic.

Maintenance Funds: Maintenance funds provided to preserve the route in the current condition, perform planned preventive maintenance activities on a scheduled basis, and address environmental and resource protection requirements.

Level 4

BLM has reserved this level for possible future use. There is no current description or objective.

Level 5

Maintenance Description: Routes for high (Maximum) maintenance due to year-round needs, high volume traffic, or significant use. Also may include routes identified through management objectives as requiring high intensities of maintenance or to be maintained open on a year-round basis.

Maintenance Objectives:

- High (Maximum) maintenance intensity.
- Entire route maintained at least annually. Problems repaired as discovered. May be closed or have limited access due to weather conditions but generally intended for year-round use.
- Meet identified environmental needs.
- Generally maintained for year-round traffic.
- Annual maintenance as necessary to protect adjacent lands and resource values.
- Preventive maintenance as required to generally keep the route in acceptable condition.
- Planned maintenance activities include environmental and resource protection efforts and annual route surfacing.
- Route surface and other physical features maintained for regular traffic.

Administrative Access

BLM responds to public requests for land use authorizations. Reasonable administrative access is made available to persons engaged in valid uses, such as mining claims, mineral leases, livestock grazing, and energy development. Road construction maintenance for authorized roads is typically the responsibility of the permittee.

Current Conditions

The greatest change in the CRVFO transportation network is occurring in the western part of the CRVFO, resulting primarily by energy companies developing the gas resource. Native surfaced roads have been improved to accommodate the increased traffic and heavy equipment. Many new roads have also been created to provide access to gas wells and pipelines. These new roads are often open only to gas development personnel for administrative vehicle access to reduce conflicts and protect public land investments and safety.

A short-term increase in the volume of both heavy and light traffic occurs during the construction, well-drilling, and completion phases of developing gas resources. Temporary conflicts, including a potential for delays, dust, road degradation, and increased vehicle safety, occur during the well construction/drilling phase and recompletion/work over activities. Traffic level impacts are lower after gas wells are in operation because traffic levels drop.

Road capacity and use along with the associated maintenance have also surfaced with the adjoining federal, state, and county roads in the western part of the CRVFO. Table 3.5.1-1, Average Annual Daily Traffic (AADT) on Roads in Garfield County provides average daily traffic counts for CRVFO access roads at significant locations in and near the planning area. It also shows traffic counts projected to occur at the same locations for the year 2030 (CDOT 2009).

Table 3.5.1-1
Average Annual Daily Traffic (AADT) on Roads in Garfield County

Highway or Road Segment	Average Annual Daily Traffic		
	2007	2030	Percent Change (2007 to 2030)
I-70 at DeBeque	20,700	30,700	48%
I-70 at Parachute, at Battlement Parkway and CR 215	44,500	66,700	50%
I-70 at Rifle, at SH 6	41,500	62,800	51%
I-70 at Silt at 9th Street	46,800	74,600	59%
I-70 at New Castle, east of Bruce Road and CR 240	20,500	33,200	62%
I-70 at Exit 114	28,400	44,100	55%
I-70 at Glenwood Springs, at SH 82	40,900	63,100	54%
SH 13 at Rifle, north of Lions Park Circle	19,100	32,300	69%
SH 13 at Rifle, east of SH 6 West junction	4,600	6,400	39%
SH 13 at Rifle, north of SH 6 on-off ramp	5,300	8,300	56%
SH 13 at Rifle, 20th Street and Railroad Avenue	17,000	30,700	80%
SH 13 at Rifle, northeast of 24th Street and Whiteriver Avenue	9,600	17,400	82%
SH 13 at Rifle at SH 325	9,400	15,700	67%
SH 82 at Glenwood Springs, at SH6, 6th Street, and Laurel Street	60,000	82,100	37%
SH 82 at Glenwood Springs, Grand Avenue south of 6th Street	25,000	34,800	39%
SH 82 at Glenwood Springs, Glen Avenue southeast of South Grand Avenue and 23rd Street	28,600	41,800	46%
SH 82 at Glenwood Springs, Glen Avenue south of Blake Avenue	24,900	38,400	54%
SH 82 at Carbondale, west of SH 133	24,200	37,300	54%
SH 6 at Rifle, 1st Street east of SH 13	4,800	7,000	45%
SH 6 at Rifle, at CR 210	11,600	17,900	54%
SH 6 at Rifle, Main Street east of 5th Street	6,000	9,200	53%
SH 6 at Rifle, Main Street at 9th Street	12,800	19,200	50%
SH 6 east of Peach Valley Road	2,800	3,800	35%
SH 6 at New Castle, west of CR 240	7,300	11,000	51%
SH 131 at Trough Road (CR E74), just west of State Bridge (Eagle County)	1,300	2,000	56%
SH 133 at Carbondale, north of Prince Creek Road	4,400	6,800	55%
SH 133 at Carbondale, southeast of 8th Street	7,800	12,600	62%
SH 133 at Carbondale, southeast of Main Street	11,600	19,300	67%
SH 133 at Carbondale, south of SH 82	22,300	37,200	67%
SH 325 east of SH 13	1,400	2,100	53%
SH 325 east of CR 252	570	1,200	114%

Source: CDOT 2009

All traffic counts listed above are from the Colorado Department of Transportation (CDOT), which counts or estimates Average Annual Daily Traffic (AADT) for all federal and state highways in Colorado. The AADT numbers represent the average over an entire year. CDOT is able to project traffic growth for all roads within its jurisdiction using an annual growth rate based on historic population trends. The projections are intended to provide a background scale against which impacts may be measured.

Characterization

Indicators

The indicator used to measure trends of the BLM transportation system and facilities is the maintenance intensity level (1, 3 or 5).

Trends

Table 3.5.1-1, Average Annual Daily Traffic (AADT) on Roads in Garfield County provides year 2030 average daily traffic projections for CRVFO access roads at significant locations in and near the planning area.. However, while CDOT's projected traffic growth reflects a number of ongoing trends – growth in interstate traffic, population growth, and increase in local industrial and business activity – it may be low or high when compared to actual Garfield County population growth that occurs during the same period.

Appendix N, System Roads and Maintenance Levels, contains a list of CRVFO BLM roads carried as assets within the BLM FAMS. Road system maintenance in the CRVFO has focused on maintaining major recreational access roads, which generally receive most of the traffic volume. The CRVFO annually maintains approximately 80 miles of road, down from approximately 120 miles a few years ago, due to increasing cost and flat budgets.

Maintenance costs are rising and each year the BLM maintains fewer miles of BLM roads. With flat federal budgets and rising fuel and equipment costs for contractors, this trend is likely to continue.

3.6 SOCIAL AND ECONOMIC ENVIRONMENT

3.6.1 Public Health and Safety

Public health and safety topics discussed in this section include law enforcement, hazardous materials/wastes, illegal dump sites, target shooting, energy development, hydrogen sulfide wells, and geocaching. Abandoned mines are not discussed, because most mines are closed or have exclosures to keep people out. Hot springs are not addressed because the BLM does not maintain hot springs for recreational use. Recreation such as hunting, fishing, hiking, horseback riding, OHV riding, and rockhounding frequently involves public health and safety topics. Recreation is addressed in Section 3.3.3. Road safety involves public health and safety and is addressed in Section 3.5.1 (Transportation Facilities). Wildland fires involve public health and safety. Controlling the occurrence of wildland fires and responding to wildland fires is addressed in Section 3.2.11. Potential health concerns involving air quality and water quality are addressed in Section 3.2.1 and Section 3.2.4, respectively.

Public health and safety is affected by various factors such as educational outreach, access to sites containing dangerous materials or situations, and enforcement of laws, regulations, and guidelines designed to protect the public. Besides preserving and protecting natural and cultural resources, BLM's stewardship role extends to protecting public health, safety, and property (BLM 2009a). The BLM is responsible for maintaining facilities and infrastructure, reducing health and safety risks to employees and the public, and protecting BLM lands from illegal dumping of wastes, theft and destruction of Federal property, misuse of resources, and wildland fires.

BLM's Hazard and Risk Management responsibility involves managing BLM lands in a way that minimizes human exposure to hazards and risks, and reduces or eliminates threats to human health and natural resources (BLM 2009b). As a rule, the following priorities govern BLM's response to hazardous conditions:

- Mitigate and respond to risks on lands near expanding urban centers and in areas of heavy public visitation.
- Clean up contaminated lands that pose direct risks to human health and the environment.
- Consult and cooperate with communities and state and local agencies to leverage funds and prioritize needs.
- Respond to hazards, disasters, and emergencies using up-to-date risk management methodologies.
- Maintain and update internal Emergency Management Plans and comply with Departmental initiatives.
- Respond in a timely and effective manner to incidents of illegal dumping of hazardous materials on BLM lands.
- Increase attempts to identify parties responsible for illegal activities in an attempt to reduce the use of appropriated funds for cleanup of contaminated lands.
- Monitor and maintain sites that have been restored and where damage has been mitigated.

The BLM engages in hazardous material response actions, site evaluations, and prioritization of cleanups in accordance with laws and regulations (BLM 2009c). This involves working with the EPA, State environmental

quality departments, county and local governments, and potentially responsible parties (both public and private) to fund and expedite the cleanup of hazardous sites.

The BLM also mitigates or remediates hazards that are threats to public health, safety, property, or that endanger the environment (BLM 2009c). Those sites that are in imminent threat to public health and safety, as well as those sites that are under a consent order and can therefore generate penalties and fines, are a priority for the BLM.

The purpose of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Response Actions Handbook (BLM Manual Handbook H-1703-1) is to provide policy and guidance to BLM employees in the use of CERCLA authorities and responsibilities in addressing hazardous substance releases. The handbook is intended to introduce BLM personnel to the CERCLA process (BLM 2009c).

Current Conditions

Law Enforcement

The CRVFO has one certified law enforcement officer (a BLM Ranger). The BLM Ranger receives reports from BLM field managers, State, county, and local law enforcement about violations on BLM lands. The public also reports incidences to the Ranger. The BLM does not have enough staff to devote to addressing law enforcement concerns.

Typical law enforcement reports and concerns involve abandoned vehicles, illegal dumping, target shooting, and squatters. Abandoned vehicles on BLM land are difficult to address because of time and cost issues. It can be time consuming locating the owner and expensive to remove a vehicle. Illegal dumping on BLM lands increases as fees to dump at permitted facilities increase. Also, juvenile parties on BLM land generate trash that is left behind after the party. Target shooting problems involve unsafe target shooting practices and illegal dumping. Areas known for target shooting problems are areas north of Rifle, areas north of Wolcott, and the Squirrel area (approximately 7 miles north of Silt). Squatters are typically employees of oil and gas operations who camp illegally on BLM land while working temporarily in the area.

Hazardous Materials/Wastes

Hazardous materials and wastes are associated with illegal dumping and the Rulison Site. Illegally dumped wastes are both non-hazardous and hazardous. The BLM has a contract with the Grand Junction Fire Department to respond to illegal dump sites containing hazardous waste.

The Rulison Site is located 8,154 feet above sea level on the north flank of Battlement Mesa in western Colorado about 12 miles southwest of the town of Rifle and 8 miles southeast of the town of Parachute (DOE 2008). On September 10, 1969, the US Atomic Energy Commission, a predecessor agency of the DOE, detonated a 43-kiloton nuclear device 8,426 feet below the ground surface in an attempt to release commercially marketable quantities of natural gas from the fine-grained, low-permeability sandstone of the Williams Fork Formation of the Mesaverde Group. The intent of the detonation was to stimulate flow of natural gas through the fractures created by the blast and use the chimney of broken rock above the point of detonation as a collection chamber. No radiation was released at the surface at the time of the blast. Although approximately 455 million cubic feet of natural gas were produced, elevated levels of radioactivity in the gas made it unacceptable for use.

The surface of the Rulison Site was closed after cleanup and testing (DOE 2008). The DOE does not plan to remove subsurface radioactive contamination in or around the test cavity because no feasible technology exists to do so. The main contaminants in the area of the test cavity are expected to be the radioactive fission products plutonium, tritium, and uranium. The gaseous radionuclides carbon-14, krypton-85, and tritium are the most mobile in the environment. The primary radionuclide of concern today is tritium.

The federal government holds title to, and DOE is responsible for, radioactive and other hazardous materials generated by DOE and predecessor agencies at the Rulison Site (DOE 2008). The surface property within the Rulison Site is privately owned, although the federal government retains control of the subsurface rights beginning at a depth of 6,000 feet within a 40-acre area. The radiological contamination is managed under the authority of DOE. As of October 1, 2006, the DOE Office of Legacy Management has responsibility for long-term management of the Rulison Site and for enforcement of institutional controls at the site.

Illegal Dump Sites

Illegal dumping has been occurring on the BLM lands for many years (BLM 2009d). State and field offices continue to encounter many illegal dumps within their jurisdictions. Such dump sites often encourage or engender additional illegal dumping in the same area, in what has come to be called "promiscuous dumps." Illegal dumping involves mainly the dumping of solid waste such as white goods, yard wastes, household trash, vehicles, furniture, construction debris, and household hazardous waste. Illegal dumps are often created along railroads, dirt roads, routes, and in the deserts. Illegal dumps also pose a tempting opportunity to dispose of hazardous waste in violation of the Resource Conservation and Recovery Act. A major type of hazardous waste found in illegal dumps is those generated by clandestine drug labs.

There are approximately ten concentrated illegal dump sites in the area and numerous small occurrences of general litter. To prevent and reduce the occurrence of illegal waste dumping on the BLM lands, the Division of Engineering and Environmental Services provides the following recommendations for state and field offices to assist offices with their illegal waste dumping problems (BLM 2009d):

- Community outreach, education, and involvement.
- Targeted enforcement.
- Creation of legal alternatives for illegal dumpers.
- Measurement.

These recommendations have been successful at a number of field offices in preventing illegal waste dumping.

The BLM works with Eagle County to clean up BLM land with the aid of inmates. Also, the BLM works with the public to conduct clean-up days to remove nonhazardous waste from illegal dump sites.

Target Shooting

Littering, unsafe target shooting, and illegal dumping have become major issues on federal lands where recreational shooting occurs (Responsive Management 2009). Some shooters leave behind fragments of clay pigeons and spent shotgun shells, as well as metal, plastic, and glass objects brought out for use as targets. Shooters get blamed for household dumping because home appliances discarded on federal lands are used as

targets and left in place. Environmental and property damage (shooting at trees and signs) is also a significant problem.

There are no BLM-approved target shooting sites. There are approximately nine sites historically known for target shooting. The BLM has made attempts in the Squirrel area to make target shooting safer for the public and environment. The BLM relies on the public to encourage safe shooting practices.

Energy Development

Expanding and increasing energy development creates health and safety concerns and management challenges. Nationally, energy development involves wind and solar energy sites in addition to more traditional extractive industries such as coal, oil and gas, oil shale, and uranium. In the CRVFO, only oil and gas development is currently active or anticipated to be a significant source of energy expansion over the life of this plan.

In Garfield County, 14 percent of oil and gas wells access federal mineral estate under permits from the BLM, while 86 percent of the wells access private minerals under the purview of the State. The BLM requires oil and gas operators to comply with applicable regulations designed to protect the environment and the public, as well as additional requirements imposed by the BLM as part of the drilling permit or lease or right-of-way grant.

The regulation of oil and gas exploration and production activities has been exempted under a number of federal statutes, including provisions of the Clean Air Act (CAA), Clean Water Act (CWA), Safe Drinking Water Act (SDWA), and Resource Conservation and Recovery Act (RCRA), in addition to CERCLA and the Emergency Planning and Community Right to Know Act (the Toxics Release Inventory) (Witter et al. 2008).

A variety of chemicals are used and produced by oil and gas extraction processes (Witter et al. 2008). Chemicals used in producing oil and gas include a suite of additives forced into the producing formation during the process of hydrofracturing (fracking) to improve recovery of hydrocarbons from the tight pore space. Most of the fracking fluid is water, followed in volume by sand used to "prop open" the fractures. Chemical additives make up about 0.5 percent of typical fracking fluid, although this tiny fraction may amount to more than 15,000 gallons in a single fracking operation. Typical chemical additives, in approximate order of decreasing volume, are listed in Table 3.6.1-1, along with information on their other uses.

Typically in the CRVFO, hydrofracturing is conducted at 5,000 feet or more below ground surface and is unlikely to cause impacts to groundwater aquifers near the surface, including those that connect to water wells, seeps and springs, or surface waters. Casing and cementing programs are designed to protect and isolate usable water zones and potential fresh water zones. Measures are taken on drilling pads to prevent spills or leakage that could impact shallow groundwater aquifers. These include lined containment berms around tanks and stormwater controls that also capture other fluids draining off the pad.

Chemicals produced during oil and gas operations consist mostly of natural gas (methane) and produced water (a saltwater brine, the remnant of the ancient seas in which the deposits were laid), with a small amount of associated liquid constituents that are separated from the gas and produced water at the surface. Among the constituents of natural gas condensate are volatile organic compounds (VOCs) such as benzene, toluene, ethylbenzene, and xylenes (BTEX). Heavy metals are also present in small quantities, also naturally occurring in the gas-producing formation.

Table 3.6.1-1
Typical Hydrofracturing Chemical Additives

Additive Type	Main Compound	Purpose	Other Common Uses of Listed Compound
Acid	Hydrochloric acid or muriatic acid	Helps dissolve mineral cementing agents and initiates cracks in the rock	Swimming pool chemical and cleaner
Iron controller	Citric acid	Prevents precipitation of metal oxides and lime deposits	Additive in food and beverages; lemon juice is ~7% citric acid
Gel	Guar gum or hydroxyethyl cellulose	Thickens the water in order to suspend the sand	Thickener used in cosmetics, baked goods, ice cream, sauces, and salad dressings
Scale inhibitor	Ethylene glycol	Prevents scale deposits in pipes	Used in household cleansers, de-icers, paints, and caulk
Clay stabilizer	Potassium chloride	Creates a brine carrier fluid that prohibits fluid interaction with formation clays	Used in low-sodium table salt substitutes, medicines, and IV fluids
Surfactant	Isopropanol	Used to reduce surface tension of the fracturing fluids to improve liquid recovery from well after the frac	Used in glass cleaner, multi-surface cleansers, deodorants, and hair color
Breaker	Ammonium persulfate	Allows a delayed breakdown of the gel	Used in hair coloring, as a disinfectant, and in manufacture of household plastics
Antibacterial agent	Glutaraldehyde	Eliminates bacteria in the water that produce corrosive or poisonous by-products	Disinfectant; sterilizer for medical and dental equipment
Corrosion inhibitor	N,n-dimethyl formamide	Prevents the corrosion of the well casing	Used in pharmaceuticals, acrylic fibers, and plastics
Oxygen scavenger	Ammonium bisulfite	Additional corrosion inhibitor	Used in cosmetics
pH adjusting agent	Sodium or potassium carbonate	Maintains the effectiveness of other components	Used in laundry detergents, soaps, water softeners, and dishwasher detergents

If not properly controlled, spills of chemicals used in or produced by oil and gas activities can pollute groundwater, surface water, and soil. Active wells can continue to result in emissions of atmospheric pollutants as a result of any uncaptured gaseous emissions from wells or condensate tanks; exhausts from vehicles, heavy equipment, and pipeline compressor engines; and fugitive dust from access roads and other disturbed surfaces. Abandoned wells may continue to be a source of pollutant emissions if proper plugging and capping procedures are not implanted.

A recent study on natural gas operations from a public health perspective (Colborn et al. 2010) demonstrated that toxic chemicals are used during both the fracturing and drilling phases of gas operations, that there may be long-term health effects that are not immediately recognized, and that waste evaporation pits may contain numerous chemicals on EPA's Superfund list. The study findings show the difficulty of developing monitoring programs. To protect public health, the study recommends full disclosure of the contents of all products, extensive air and water monitoring, a comprehensive human health study, and regulation of hydraulic fracturing under the Safe Drinking Water Act (Colborn et al. 2010).

As a result of the increased health concerns among residents of Garfield County, the Board of County Commissioners commissioned studies intended to characterize potential exposures to oil-and-gas-related pollutants via the air and water pathways. One such study (Coons and Walker 2008) reported that emissions of VOCs from oil and gas facilities, including the known carcinogen benzene, would exceed EPA's acceptable lifetime cancer risk range for uncontrolled (uncaptured and untreated) releases at distances extending approximately 50 to 100 meters (165 to 330 feet) downwind from the source. However, this extrapolation was based on two assumed factors—a recovery rate of only 93 percent of the natural gas and an unabated release duration of 70 years—that differ considerably from actual conditions. Actual recovery rate is greater than 99 percent, including capture and use onsite to power equipment and mandated thermal destruction of excess releases of vapors from tanks. Additionally, wells seldom have an operational life of more than 30 years. This may help explain why Coons and Walker (2008) also found that residents of Garfield County were generally within or below the reported illness rates for a range of afflictions using data from four counties: Garfield, Mesa, Delta, and Montrose. Coons and Walker (2008) attributed the lower illness rates in Garfield County for certain afflictions to lower rates of obesity, diabetes, and tobacco use among its residents.

In comparing cancer rates in Garfield County to Colorado as a whole, Coons and Walker (2008) found a significantly higher rate of all cancers combined in the county than statewide for males from 1992 through 2000 and for females from 1992 through 1998. The higher rates among men in the county were driven by elevated rates of prostate cancer. The other cancers evaluated (colorectal, lung, melanoma, bladder, thyroid, and leukemia) did not differ between the county and statewide for the entire period examined of 1992 through 2005. The period 2001 through 2005, which coincided with the start of the oil and gas boom in the county, did not have higher cancer rates among either men or women in Garfield County. However, the authors cautioned that cancer has a lag time from exposure to expression and that additional monitoring is needed. Although not mentioned by the authors, it is possible that the lower rate of prostate cancer in the county after 2000 corresponded to an influx of new residents associated with that boom—most of whom are likely to be younger than the typical age of onset of this type of cancer. The authors did not report on the types of cancers driving the elevated combined rate for females in Garfield County in the 1990s, but the fact that the combined cancer rate among females also dropped below the statewide average (after 1998) could also be related to an influx of mostly younger residents.

Another human health risk study was conducted for Garfield County by Witter et al. (2008). Funded by the environmental community, this study concluded that "human health risks and social impacts are associated with oil and gas development." Witter et al. (2008) based this conclusion largely on the types of chemicals used in, or produced by, oil and gas activities and not on documented release rates of those chemicals to the environment. Thus, their study cataloged potential risks associated with uncontrolled exposures, at unspecified exposure rates, and for unspecified exposure durations. In summarizing the results of the Coons and Walker (2008) report, Witter et al. (2008) cited the higher combined cancer rate among Garfield County residents compared to statewide statistics but did not mention that the trend was true only in the 1990s and did not extend into the period 2001-2005. They also noted that Garfield County residents have higher rates than statewide residents of low birth weight, chronic obstructive pulmonary disease, and asthma, the first two of which are higher in Colorado than in the rest of the nation, despite a lower rate of tobacco use in Colorado. The authors made no speculation as to the possible contributors to these trends.

While the Witter et al. (2008) paper addressed the chemicals used or produced during oil and gas development, little reference was made to health or environmental statistics specific to oil and gas activities except in the immediate vicinity of active well pads (using the data presented by Coons and Walker 2008).

However, they did note two situations relative to environmental exposures. One was the documented occurrence of detectable levels of methane in 135 of 184 water wells, springs, seeps, ponds, and rivers sampled during a hydrogeologic investigation conducted for Garfield County in 2006 (Papadopoulos 2007). They noted that methane may be present due to natural levels in some of the bedrock formations penetrated by the water wells or recharging the seeps, springs, and surface water, and that it may also be generated by a natural (bacterial) process within the water wells. Because the study could not identify the sources of methane, Witter et al. (2008) could state only that some of the methane may be related to oil and gas activities.

Witter et al. (2008) also discussed a second situation, an earlier documented occurrence of benzene and other organic compounds in surface water at seeps along West Divide Creek (URS 2006). That occurrence, related to insufficient use by one oil and gas operator of surface casing and cement to isolate shallow groundwater from the bore of a private (non-BLM-administered) well, led to the enactment of more stringent requirements by COGCC, also adopted by BLM. The operator was fined, and the money was used to help fund the hydrogeologic investigation cited above (Papadopoulos 2007).

Witter et al. (2008) expressed the following conclusions related to risk to the community from oil and gas development:

- The lack of precise demographic data on the Garfield County population affects the ability to accurately assess current and future health of the community.
- No demographic data are available on temporary oil and gas workers, most of whom have moved into Garfield County since 2000.
- The available data suggest that approximately one-third of the population may be more susceptible to certain oil and gas industry-related exposures. Note: This conclusion is based on an estimated 27 percent of the population being children and 9 percent being elderly. The conclusion does not consider known exposure levels and durations or the proportion of these age groups living in proximity to oil and gas facilities.
- Garfield County is seeing a rising population of children, who are potentially at increased risk for adverse health effects from exposures related to oil and gas activities. Note: As indicated in the previous bullet, this conclusion does not consider the level or duration of exposure or the proportion of children living in proximity to oil and gas facilities.

In terms of worker health and safety, Witter et al. (2008) presented data indicating that the rate of illness, injury, and fatality among oil and gas workers in Garfield County is higher than in most job sectors. Looking at their data in detail shows that fatality rates among oil and gas workers are approximately the same as for agricultural workers and that illness and injury rates are lower than for both agricultural and construction workers.

Last, they reported that "rapid industrial change" can have deleterious impacts on the psychosocial welfare of the local population in terms of increased crime and drug use but added that "further study is needed to determine if industrial development, in the form of oil and gas drilling, is contributing [to an increase in these rates] in Garfield County."

Hydrogen Sulfide Wells

At this time, the only hydrogen sulfide within the boundaries of the CRVFO is associated with produced water. The most likely cause of the hydrogen sulfide is the introduction of bacteria during workover or completion activities. Mitigation of this situation is being done by injecting of biocides to reduce the bacterial action producing the hydrogen sulfide. Additionally, testing of the gas streams for hydrogen sulfide is being done during the normal sampling periods.

Characterization

Indicators

Law Enforcement

The Ranger responds to concerns regarding safety. The Ranger issues written and verbal warnings, as well as violation notices.

Hazardous Materials/Wastes

Hazardous wastes can be found at illegal dump sites. The BLM maintains a record of illegal dump sites.

The EPA monitored groundwater at and near the Rulison Site as part of a long-term hydrologic monitoring program (DOE 2008). No radioactive contamination associated with the Rulison test was detected in EPA samples taken from the nearby municipal drinking water supply springs, the water supply wells on five local ranches, or the spring and three wells on the test site.

Illegal Dump Sites

The Ranger conducts patrols for illegal dump sites. The Ranger also relies on field manager reports, state, county, and local law enforcement reports, and input from the public about illegal dump sites. The BLM maintains a record of illegal dump sites.

Target Shooting

The Ranger conducts patrols for target shooting problems. The Ranger also relies on field manager reports, state, county, and local law enforcement reports, and input from the public about target shooting problems. The BLM maintains a record of target shooting sites.

Energy Development

In order to develop on BLM land, developers are required to obtain mineral leases and ROW grants. Applications for leases and ROW grants allow the BLM to monitor interest in energy development and the location of energy development, and to control the types of activities developers are allowed to conduct.

Hydrogen Sulfide Wells

Training is being done for all personnel who could possibly come onto locations with known hydrogen sulfide in the produced water. Awareness training for other personnel is also being performed as a precautionary measure. Another precaution is posting of signs warning that hydrogen sulfide could be present at the location.

Trends

Law Enforcement

As the local population increases, the need for BLM law enforcement is expected to increase. In addition to the law enforcement issues described above, homeless on BLM land around Glenwood Springs and Carbondale and road closures are expected to become additional law enforcement challenges. Also, the need for additional BLM law enforcement is expected to persist.

According to the North-central Colorado Community Assessment Report for the BLM CRVFO (BLM 2007d), there are community concerns and interests regarding public health and safety. The most commonly cited administrative change was the need for a greater on-the-ground presence by BLM personnel. Communities stated an interest in greater enforcement of existing land use regulations and more active education by BLM staff. It is believed that an increased presence of BLM staff on the ground would help alleviate problems like the creation of bandit trails by motorized recreation users, trespass on private land, and unauthorized use of seasonally closed trails.

Hazardous Materials/Wastes

Hazardous wastes are found at illegal dump sites. Illegal dumping is increasing as the local population grows and as dump fees at permitted sites increase. BLM is proposing to reduce illegal dump sites by closing routes into frequently used dumping areas.

An increase in drilling for natural gas and in the number of area residents has raised public concern about new gas wells intercepting Rulison-related radioactivity in the subsurface (DOE 2008). The Colorado Oil and Gas Conservation Commission established drilling boundaries and procedural and operational requirements around the site.

Illegal Dump Sites

Illegal dumping is increasing as the local population grows and as dump fees at permitted sites increase. BLM is proposing to reduce illegal dump sites by closing routes into frequently used dumping areas.

According to the North-central Colorado Community Assessment Report for the BLM CRVFO (BLM 2007d), there are community concerns and interests regarding public health and safety. One of the most important issues/problems involved trash and illegal dumping. Trash on BLM lands was a common subject, with participants specifically identifying illegal dumping and trash on trails and at campgrounds as key issues. In the CRVFO, certain locations on BLM lands are reported as being overused by transient workers (squatters) and consequently are seen as quite dirty and damaged. Dumping, bandit trail creation, litter, fence-cutting, and scarring from motorized recreation were generally identified as affecting the desired landscape, public land resources, viewshed quality, and/or recreational experiences.

Target Shooting

A group of Silt Mesa residents approached BLM in 2008 and requested BLM close the Squirrel area to target shooting. Target shooting sites and occurrences are expected to remain constant. Requests from the public, however, to close target shooting sites are expected to increase.

Energy Development

The CRVFO is approaching the RFD scenario from the 1999 Oil & Gas Leasing & Development RMP Amendment/EIS (BLM 1999b). The number of applications for permits to drill (APDs) received by CRVFO has increased dramatically from 28 in fiscal year 2000 to 397 in 2007, decreased to 200 in 2009 during the economic downturn, and rose again to 327 in 2010. During that 11-year period, CRVFO approved a total of approximately 2,400 APDs, and more than 1,200 federal wells were drilled.

In addition, new issues, such as enhanced protection of greater sage-grouse habitat (a BLM sensitive species), need to be addressed in the RMP revisions. The BLM has also seen such advancements as directional drilling and modern drilling rigs in the technology used to access energy resources.

Hydrogen Sulfide Wells

At this time there are no wells within the CRVFO that qualify under Federal Regulations as a hydrogen sulfide well. If the criteria levels as stated in the "Onshore Oil and Gas Order #6, Hydrogen Sulfide Operation" are reached, then the Public Protection and Safety Requirements would be instituted and the requirements of the Onshore Oil and Gas Order for Public Protection Plans, Training Regiments, Equipment Requirements, Warning Signs and Wind Socks, and Protective Fencing would be instituted and vigorously enforced.

3.6.2 Social and Economic Conditions

Certain defining features of every area influence and shape the nature of local economic and social activity. Among these are the population size, the presence of or proximity to cities or communities, types of longstanding industries, such as agriculture and forestry, predominant land and water features, and unique area amenities. The BLM operates as a steward of many of these area resources and opportunities and thus plays a principal role in the community. This discussion gives further insight into the character and extent of these community connections.

Current Conditions

Most of the planning area lies within Eagle, Garfield, Pitkin, and Mesa Counties, with a small area in Routt County. The planning area barely crosses the southern Rio Blanco County line and includes only 955 acres of non-BLM land. In addition, the demographic and economic characteristics of Rio Blanco County differ from most of the CRVFO, so it is not included in the CRVFO discussion. Within the planning area, Eagle and Garfield Counties contain the most BLM land, so socioeconomic resources in these counties are most likely to be directly affected by BLM land management decisions.

Within the planning area, rapid population growth resulting from increased development to support resort communities and energy development has increased pressure on the local housing market. The availability of affordable housing for workers near their place of work has become an issue in many of the towns and counties in the planning area.

Population

Table 3.6.2-1 shows current and historic populations. Within the five-county planning area, Mesa County had the largest population in 2005. The two counties with the most BLM land (Garfield and Eagle Counties) had populations of about 50,000 each (Colorado State Demography Office 2007a).

Population growth can be attributed in part to natural increase (births minus deaths) and in part to net migration, which could affect the availability of housing, services, and jobs. In 2005, net migration accounted for 64.0 percent of total population change in the planning area (Colorado State Demography Office 2007b).

Table 3.6.2-1
Planning Area Population Totals (1980-2005)

Location	1980	1990	1980-1990 Percent Change	2000	1990-2000 Percent Change	2005	2000-2005 Percent Change	1980-2005 Percent Change
State	2,889,735	3,294,473	14.0	4,301,261	30.6	4,722,755	9.8	63.4
Planning Area	141,106	171,796	21.7	236,267	37.5	269,035	13.9	90.7
Eagle County	13,320	21,928	64.6	41,659	90.0	49,375	18.5	270.7
Garfield County	22,514	29,974	33.1	43,791	46.1	50,673	15.7	125.1
Mesa County	81,530	93,145	14.2	116,255	24.8	130,662	12.4	60.3
Pitkin County	10,338	12,661	22.5	14,872	17.5	16,420	10.4	58.8
Routt County	13,404	14,088	5.1	19,690	39.8	21,905	11.2	63.4

Source: Colorado State Demography Office 2007a

Age Distribution

As shown in Table 3.6.2-2, the population of the planning area in 2005 was composed of a higher percent of working people (ages 18 to 64) and of those 65 and older than the state average. Garfield County had the highest percent of children (ages 0 to 17) at 27.3 percent, while Pitkin County had the lowest (17.3 percent). Pitkin County had the highest level of working people (74.4 percent), and Mesa County had the lowest (61.4 percent). Mesa County had the highest percent of people 65 and older, while Routt County had the lowest (Colorado State Demography Office 2007c).

Table 3.6.2-2
Planning Area Regional Age Distribution (2005)

Location	Percent Ages 0 to 17	Percent Ages 18 to 64	Percent Ages 65 and Older
State	25.1	65.2	9.7
Planning Area	24.2	65.3	10.5
Eagle County	25.3	70.6	4.1
Garfield County	27.3	64.2	8.5
Mesa County	23.8	61.4	14.8
Pitkin County	17.3	74.4	8.3
Routt County	21.8	72.6	5.6

Source: Colorado State Demography Office 2007c

Housing

Housing availability has been identified as an issue of concern throughout much of the planning area, specifically the availability of affordable housing. Public input from the socioeconomic workshop held by the BLM in Glenwood Springs on September 21, 2007, revealed that a shortage of affordable housing has made it difficult for workers to live near their employment. The most current data available for the five counties within the planning area are for 2000. Although the data are over 10 years old, it shows the beginning of the trend toward a low availability of affordable housing. Table 3.6.2-3 shows housing affordability for the five planning area counties. A rating of 100 or higher under the Housing Affordability Index indicates that the median family can afford a median house.

Table 3.6.2-3
Planning Area Housing Affordability (1990-2000)

	1990			2000		
Location	Housing Unit: Median Value	% of Median Income Necessary to Buy House	Housing Affordability Index	Housing Unit: Median Value	% of Median Income Necessary to Buy House	Housing Affordability Index
Eagle County	$178,129	28%	90	$369,100	38%	65
Garfield County	$120,158	24%	105	$200,700	26%	95
Mesa County	$82,477	19%	131	$118,900	20%	128
Pitkin County	$658,762	80%	31	$750,000	71%	35
Routt County	$127,009	22%	114	$268,500	31%	82
Planning Area	$233,307	35%	94	$341,440	37%	81
State	$108,564	19%	129	$166,600	21%	119

Source: Economic Profile System 2004

Table 3.6.2-3 also shows that housing in the planning area, in general, was not affordable for the median household in 2000, with an affordability index below that of the state. Pitkin County, home to the town of Aspen and the Aspen and Snowmass ski resorts, had the least affordable housing in the planning area, followed by Eagle County, with the Vail and Beaver Creek ski resorts (Economic Profile System 2004).

The vacancy rate in the planning area (25 percent) was higher than that of the state (13 percent) in 2005 (Table 3.6.2-4). The counties with high housing values due to the presence of resort communities tended to have the highest vacancy rates, including Pitkin County with 40 percent vacancy (Colorado State Demography Office 2007d). The high vacancy rates in the areas where housing was least affordable due to the presence of resort communities increased the overall average vacancy rate for the planning area. Garfield County's low vacancy rate resulted from population pressure and migration of workers from resort areas to relatively more affordable housing.

Table 3.6.2-4
Planning Area County Housing Estimates (2005)

Location	Housing Units	Vacancy Rate	Persons per Household	Housing Units Percent Change 1990-2005
Eagle County	28,140	36	3	84.8
Garfield County	19,996	6	3	59.8
Mesa County	56,541	9	2	44.2
Pitkin County	12,626	40	2	28.4
Routt County	13,760	36	2	48.7
Planning Area	131,063	25	2	52.3
Colorado	2,075,557	13	3	40.5

Source: Colorado State Demography Office 2007d

Contributions from BLM Management

Local economies benefit directly and indirectly from expenditures and revenues generated by a variety of activities on BLM lands within the five-county CRVFO impact area. BLM lands in the planning area contribute to the livelihoods of area residents through subsistence uses, as well as through market-based economic production and income generation. Public lands provide products of value to households at no or low cost (permit fees), such as fuelwood, wood posts, and livestock. Additional products with subsistence value may include fish, game, plants, berries, and seeds. Use of these products is often part of traditions that sustain local cultures.

Contributions to the area economy through market-based production can be measured using the IMPLAN input-output model. Input-output models describe commodity flows from producers to intermediate and final consumers. The total industry purchases are equal to the value of the commodities produced. Industries producing goods and services for final demand purchase goods and services from other producers. These other producers, in turn, purchase goods and services. This buying of goods and services continues until leakages from the region stop the cycle. The resulting sets of multipliers describe the change of output for regional industries caused by a change in final demand in an industry. The IMPLAN database describes the economy in 440 sectors using federal data from 2008. These sectors are further aggregated below to better identify areas relevant to BLM management activities. Thes include recreation, livestock grazing, forest products, mineral resources, externally funded ecosystem restoration, revenue sharing from fees collected

from recreation and commercial activities on BLM lands, and the direct contribution to the local economy from BLM expenditures and employment for operations and management of each field office area.

Using the most recent data available, the BLM applied IMPLAN response coefficients to its outputs and expenditures to estimate its economic contribution within the CRVFO impact area. This analysis examines the links and interdependencies among businesses, consumers, and the CRVFO resources on which some area economic activity depends. IMPLAN allows a more complete examination of these links for the CRVFO impact area.

IMPLAN not only examines the direct contributions from the CRVFO but also indirect and induced contributions. Indirect employment and labor income contributions occur when a sector purchases supplies and services from other industries in order to produce their product. Induced contributions are the employment and labor income generated as a result of spending new household income generated by direct and indirect employment. The employment estimated is defined as any part-time, seasonal, or full-time job. In Tables 3.6.2-5 and 3.6.2-6 below, direct, indirect and induced contributions are included in the estimated BLM contributions.

Table 3.6.2-5
Average Annual Employment Contributions by Resource Program within the CRVFO (Full- and Part-Time Jobs) *

Resource	CRVFO Employment Contributions
Recreation	103
Livestock grazing	20
Forest products	0.2
Mineral resources	85
Externally funded ecosystem restoration	0.3
Revenue sharing (county payments)	62
BLM expenditures and employment	78
Total BLM management	349

*Potential employment and labor income contributions are based on estimated resource outputs from CRVFO specialists.

Table 3.6.2-6
Average Annual Labor Income by Resource Program within the CRVFO (Thousands of 2010 dollars)

Resource	CRVFO Labor Income Contributions
Recreation	$3,953
Livestock grazing	$153
Forest products	$6
Mineral resources	$6,835
Externally funded ecosystem restoration	$8
Revenue sharing (county payments)	$3,220
BLM expenditures and employment	$4,154
Total BLM management	$18,328

Revenue Sharing

The BLM collects revenues from recreation and commercial activities that take place on the nearly 8.4 million acres of public land that it administers in Colorado and redirects these revenues to the state and county governments. These revenues are collected from such sources as campground fees, recreation permits (special, competitive, organized group activity, and event use permits), mining leases and mineral revenues, grazing fees, and timber sales. The greatest revenues collected (as of FY2002) come from mineral activities, primarily from oil and gas royalties (BLM 2003).

Transfers (or returns) are payments made to the state from collections and receipts from activities on BLM land. The greatest returns to the state come from mineral activities, followed by payments in lieu of taxes, or PILT. Congress appropriates PILT annually, and the BLM disburses them to individual counties. PILT are determined according to a formula that includes population, the amount of federal land within the county, and offsets for certain federal payments to counties, such as timber, mineral leasing, and grazing receipts (BLM 2003). Table 3.6.2-7 shows the PILT that each county in the planning area received for the 2007 fiscal year. As a result of revenue sharing from BLM activities, on average, about 62 jobs and $3 million in labor income are contributed annually to the CRVFO impact area economy.

Table 3.6.2-7
PILT by CRVFO County, 2007 Fiscal Year

Location	PILT Amount
Eagle County	$234,178
Garfield County	$669,862
Mesa County	$959,994
Pitkin County	$27,318
Routt County	$84,730
Planning Area	$1,976,082
Colorado	$8,149,918

Source: DOI 2007b

Recreation

Field office staff estimate that, on average, there were 268,440 recreational visits to the CRVFO impact area annually (RMIS 2010). On their way to the planning area, and once they arrive, these visitors spend money on goods and services they would spend elsewhere if these opportunities did not exist. In this manner, the opportunities on BLM lands contribute to the local economy by attracting these visitors. (These recreation estimates do not include visits from all local use since their expenditures do not represent new money into the economy.) Within the CRVFO, it was determined that 85 percent of non-wildlife recreation use would not occur in the impact area if the opportunity on BLM lands was not provided; as a result, only 15 percent of the local use is not included in the CRVFO model. After separating the contributions made from a portion of local residents, recreation contributes the second most employment and labor income to the area economy of all resource programs (Tables 3.6.2-5 and 3.6.2-6 above).

Mineral Resources

The BLM manages 8.4 million surface acres and 27.9 million acres of subsurface federal mineral estate in Colorado. Not including the associated construction employment, mining accounted for 0.7 percent of total state employment. About a third of this was made up of oil and gas industry employment. Roughly 24 percent of the total state employment in oil and gas extraction occurs in Garfield County (Colorado State Demography Office 2007e). Most of the hydrocarbon production in the CRVFO is natural gas, with very

little associated with oil. Much of the gas production within the planning area occurs in the area west of the Grand Hogback in central and western Garfield County and western Pitkin County. Much of this area is on the Roan Plateau and is addressed in a separate RMP (BLM 2007a, BLM 2008b). Current production estimates from CRVFO staff indicate production of natural gas from BLM-managed mineral estate averages about 12.5 billion cubic feet and 37,445 barrels of condensate per year. In addition, other products are removed from BLM lands that add value to the community and provide employment and income: sand and gravel (average of 525 short tons annually), crushed stone (5,000 short tons), gypsum (625 short tons), and pumice (6,000 short tons). As a result of the removal of this mineral material from BLM lands, on average about 85 jobs and $6.8 million in labor income are supported annually in the CRVFO impact area economy (Tables 3.6.2-5 and 3.6.2-6 above).

Livestock Grazing

Livestock grazing on public lands continues to be important to local economies within Colorado, providing habitat and forage for domestic livestock, horses, and wildlife. Within the CRVFO, approximately 489,566 acres are allocated for grazing. In all counties except Mesa, livestock sales made up more than half of the total market value of agricultural production (National Agricultural Statistics Service 2007a). In 2007, the cattle and sheep inventories within the CRVFO area were approximately 31,100 and 8,900, respectively (USDA 2008). The amount of forage required to support this inventory is 186,528 and 26,709 animal-unit months (AUMs), respectivley. Between 2000 to 2009, the average annual use of BLM AUMs within the CRVFO was 19,000 cattle AUMs and 3,800 sheep AUMs (DOI 2010); this corresponds to roughly 10 and 15 percent of total forage required to support the 2007 inventory of livestock within the CRVFO impact area. As a result of this BLM forage, about 20 jobs and $153,000 on average in labor income are contributed annually to the CRVFO impact area economy (Tables 3.6.2-5 and 3.6.2-6 above).

Of the counties with the greatest amount of BLM land in the CRVFO, Garfield County generated the largest economic value from grazing. Ranchers depend on lands within the CRVFO for grazing. Table 3.6.2-8 shows the private costs of replacing the AUMs within the CRVFO by paying grazing fees to private landowners, purchasing replacement pasture land, or purchasing replacement hay. In all cases, private costs far exceed the costs to ranchers to use BLM lands. Therefore, changes in grazing policy could affect the costs of operations to ranchers and incomes from ranching.

Table 3.6.2-8
Planning Area Private Grazing Costs

AUM Replacement Method	Private Costs	Private Costs Per AUM	Amount Above Costs on BLM Lands	Amount Above Costs on BLM Lands per AUM
Grazing fees	$946,090	$14.80	$859,791	$13.50
Pasture land	$345,195,000	$103,611.00	$345,195,000	$103,611.00
Replacement hay	$3,803,538	$59.50	$3,717,239	$58.2

Sources: BLM 2007g; National Agricultural Statistics Service 2007a, 2007b; Bement and Davis, undated; Colorado Department of Agriculture 2007

BLM Expenditures and Employment

The BLM CRVFO is in the town of Silt and provides a direct contribution to the area economy. Through its operations and management, the BLM contributes directly to area economic activity by employing people who reside in the area and by spending dollars on project-related goods and services. BLM lands in the planning area are managed largely through a professional and administrative staff in the field office. In

addition to these permanent full-time employees, seasonal staff work and live in the area. Contracts for facilities maintenance, shuttling vehicles, and projects contribute directly to the area economy and social stability. On average, CRVFO expenditures and employment support 78 jobs and $4.2 million in labor income annually (Tables 3.6.2-5 and 3.6.2-6 above).

Externally Funded Ecosystem Restoration

Some of the management actions performed on BLM lands are carried out with funds not provided by the BLM. Thus, these expenditures are not accounted for under the category of BLM expenditures discussed above. Recent examples of such projects are trail work and travel management implementation funded by the Colorado State Parks, habitat improvement projects funded by the Colorado Division of Wildlife, and range improvement projects funded with a portion of royalties from grazing payments. These treatments are labor intensive and use agricultural industries and associated businesses contained within the impact area economy. As a result of these treatments, less than one job and $8,000 in labor income would be supported annually in the CRVFO impact area economy (see Tables 3.6.2-5 and 3.6.2-6 above).

Non-Market Economic Value

The value of resource goods traded in a market can be obtained from information on the quantity sold and market price; however, markets do not exist for some resources, such as recreation opportunities and environmental services. Measuring their value is important, since without estimates, these resources may be implicitly undervalued, and decisions regarding their use may not accurately reflect their true value to society. Because these recreation and environmental values are not traded in markets, they can be characterized as non-market values.

Non-market values can be broken down into use and non-use values. The use value of a non-market good is the value to society from the direct use of the asset; within the planning area this occurs through such activities as recreational fishing, hunting, and bird watching. The use of non-market goods often requires consumption of associated market goods, such as lodging, gas, and fishing equipment.

Non-use values of non-market goods reflect the value of an asset beyond any use, which can be described as existence, option, and bequest values. Existence values are the amount society is willing to pay to guarantee that an asset simply exists. An existence value of BLM lands within the planning area might be the knowledge that undisturbed wildlife habitat exists on BLM lands. Other non-use values are thought to originate in society's willingness to pay to preserve the option for future use; these are referred to as option values and bequest values. Option values exist for something that has not yet been discovered, such as the future value of a plant as medicine. In the planning area, bequest and option values might exist for numerous plant species.

Non-market use and non-use values can be distinguished by the methods used to estimate them. Use values are often estimated using revealed preference methods or stated preference methods, while non-use values can be estimated only by using hypothetical methods. While use and non-use values exist for the planning area, evaluation is not always feasible during the planning process. However, this does not preclude their consideration in the planning process.

Employment

Employment within the CRVFO impact area is distributed among industry sectors and is displayed below in Table 3.6.2-9 (IMPLAN 2008). The largest industry is the construction sector, which comprises 14 percent of

Table 3.6.2-9
Current Employment and Labor Income by Industry Sector within the CRVFO Impact Area

Sector	Employment (Full-Time and Part-Time Jobs)	Labor Income (Thousands of 2010 Dollars)
Agriculture	6,842	$95,803
Mining	13,505	$1,352,661
Utilities	1,358	$152,966
Construction	59,134	$3,384,519
Manufacturing	9,302	$521,305
Wholesale trade	8,619	$558,499
Transportation and warehousing	47,947	$1,587,764
Retail trade	11,294	$656,499
Information	4,652	$280,744
Finance and insurance	10,883	$732,593
Real Estate and rental and leasing	23,801	$1,188,998
Professional, scientific, and technical services	20,907	$1,286,276
Management of companies	914	$80,185
Administration; waste management and removal	18,826	$802,005
Educational services	4,395	$104,443
Health care and social assistance	32,022	$1,622,257
Arts, entertainment, and recreation	22,823	$699,919
Accommodation and food services	46,850	$1,339,436
Other services	23,035	$688,327
Government	43,632	$2,446,953
Total	410,741	$19,582,152

total employment. The Interior Columbia Basin Ecosystem Management Project identified communities that were specialized with respect to employment. Their method used the ratio of the percent employment in each industry in the region of interest (the five-county impact area) to an average percent of employment in that industry for a larger area (the State of Colorado). For a given industry, when the percent of employment in the analysis region is greater than in the reference region, local employment specialization exists in that industry (US Forest Service 1998). Using this criterion applied with 2008 data, the CRVFO impact area can be characterized as being the most specialized with respect to the mining sector, followed by the arts, entertainment, and recreation sector and the construction sector.

Income

Total personal income (TPI) and per capita personal income (PCPI) are useful measures of economic well being. In 2008, TPI in the five-county CRVFO impact area was $12.8 billion. PCPI was $44,560 in the impact area and $42,868 within the state of Colorado (US Department of Commerce 2008). While PCPI is a useful measure of economic well being it should be examined alongside changes in real earnings per job. Since PCPI includes income from 401(k) plans as well as other non-labor income sources, such as transfer payments, dividends, and rent, it is possible for PCPI to be relatively high, while the average wage per job is low relative to the state. In 2008, average earnings per job was $43,464 in the CRVFO impact area and $50,656 in the state (US Department of Commerce 2008).

Further examination of personal income provides insight into the area economy and its connection to the lands administered by the BLM. There are three major sources of personal income: labor earnings or income from the workplace; investment income or income received by individuals in the form of rent, dividends, or

interest earnings; and transfer payment income or income received as Social Security, retirement and disability, or Medicare and Medicaid payments.

Labor earnings were the largest source of income, accounting for 68 percent of all income in the CRVFO impact area in 2008. In Colorado, labor earnings made up 71 percent of total personal income. The government and construction sectors were the largest components of labor income in 2008 for the economic impact area (Table 3.6.2-9). (The contributions from the BLM represent only a portion of the economic activity reflected in the natural resource and other sectors in Table 3.6.2-9.)

Government Revenues and Expenditures

Table 3.6.2-10 shows the sources of revenues and expenditures for the planning area for 2000 and 2003. Taxes were the dominant source of revenue in 2003, most of which was collected from property owners (Colorado Division of Local Government 2007).

Table 3.6.2-10
Planning Area Government Revenue and Expenditures

	2000	2000 Percent of Total	2003	2003 Percent of Total	Percent Change 2000-2003
Taxes	$112,538,235	52.6	$136,239,744	53.3	21.1
Property taxes	$51,823,743	24.2	$68,602,404	26.9	32.4
Sales and use taxes	$54,582,546	25.5	$60,091,309	23.5	10.1
Other taxes	$6,131,946	2.9	$7,546,031	3.0	23.1
Licenses	$4,223,120	2.0	$4,589,024	1.8	8.7
Intergovernmental revenues	$53,115,643	24.8	$64,091,100	25.1	20.7
Charges for services	$27,948,172	13.1	$24,508,734	9.6	-12.3
Other revenues	$16,226,343	7.6	$25,953,020	10.2	59.9
Total revenues	$214,051,513		$255,381,622		19.3

Source: Colorado State Demography Office 2007f

Social Values

Recreation opportunities and scenic beauty were the most commonly cited reasons that people live in or visit the communities in the CRVFO. The quality of life and smalltown character are also reasons residents live in these communities (BLM 2007d; Northwest Colorado Council of Governments 2004). Popular recreation includes skiing, fishing, hiking, hunting, OHV use, and mountain biking. These activities contribute greatly to the quality of life and lifestyles in the planning area.

Rapid population growth, decreased housing availability and affordability, an influx of second-home owners, and increases in recreation, tourism, and construction have affected the quality of life and lifestyles, as well as attitudes toward change, throughout much of the planning area. In fast-growing areas, long-time residents and newer residents often have different values and beliefs. Problems with housing, day care, and local health care are often attributed to new residents, who are putting strains on local infrastructure and community facilities (Rural Planning Institute 2001, Northwest Colorado Council of Governments 2004; Eagle County Economic Council 2006; BLM 2007d).

Common social themes throughout most of the planning area are concern for the preservation of rural characteristics and values. Increased workforce commuting and residential development into more rural areas have raised social issues as well. It is thought that those who commute to jobs outside their communities have

less of a social connection with the places where they live and that they participate less in local affairs. In addition, residential development has increased the value of land to the extent that ranching is no longer cost effective, and the number and size of ranches is decreasing, particularly in Garfield and Routt Counties. Land consumption has raised social concerns about the preservation of open space and traditional western values and culture. Cattle ranching has a large role in this culture and in providing open areas (BLM 2007d).

The recent activity in the oil and gas industry also has raised social concerns in areas that experienced the economic boom and bust cycles that have occurred in the past, particularly in western Garfield County. The number of workers associated with energy development on BLM lands has created a burden on available hotel space, which makes it harder to accommodate hunters (an important part of the economy), tourists, and other visitors (BLM 2007d). Economic diversity, which can relieve the influence of the cyclic nature of this industry, crime, housing availability, and the preservation of open space are some of the concerns relating to oil and gas development (Kohler 2004, Eagle County 2005, Vasilakis 2007).

Energy Development Demographics in Garfield County

Hazardous chemicals are used and produced by oil and gas extraction processes (Witter et al. 2008). Spills of oil and gas wastes and/or chemicals used in production can pollute ground and surface water and soil, and gaseous emissions from wells and associated facilities have the potential, if not adequately controlled, to pose health hazards. Other potential health hazards include exhaust emissions from vehicles, heavy equipment, and pipeline compressor engines and fugitive dust emissions from access roads and other disturbed surfaces. Abandoned wells may continue to be a source of pollutants if proper plugging and capping procedures are not used. Section 3.6.1 discusses human health in more detail.

Oil and gas exploration, development, and production have been exempted from standards created to protect health under a number of federal statutes, including provisions of the Clean Air Act, the Clean Water Act, the Safe Drinking Water Act, the Resource Conservation and Recovery Act; (RCRA) the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Emergency Planning and Community Right-to-Know Act (Witter et al. 2008). These laws are designed to protect the health of Americans by ensuring clean air and water.

Issues involving risks to public health and safety associated with oil and gas activities are addressed in Section 3.6.1. In general, issues of public health and safety in Colorado are within the purview of local counties and the Colorado Department of Public Health and Environment (CDPHE). That agency, through a delegation of authority from the U.S. Environmental Protection Agency (EPA), is responsible for enforcing the Clean Air Act and Clean Water Act in Colorado, while the Colorado Oil and Gas Conservation Commission is the regulatory authority for oil and gas activities, including those on BLM or other federal lands.

Indicators

Changes in the following indicators show the relative effect on socioeconomic resources from management actions proposed by the different alternatives:

- Population trends
- Local housing market
- Total income or earnings
- Employment rates

- Access to BLM land resources

Changes that could alter these indicators represent adverse socioeconomic effects, as follows:

- Population growth would not follow the upward or downward trend currently projected.
- The local housing market could not accommodate the population growth or rebound from a loss in population.
- Total income or earnings for the region would be adversely affected.
- Total employment for the region would be adversely affected.
- Access to BLM land resources would be restricted to the extent that a perceivable change in the social well-being of a particular user group would be affected.

Trends

Population

As shown in Table 3.6.2-1 above, the population in both the planning area and the state has grown since 1980. Over the 25 years from 1980 to 2005, the population of the planning area has increased by 90.7 percent, compared to a statewide increase of 63.4 percent. Eagle and Garfield Counties experienced the greatest growth during that period. The decade between 1990 and 2000 showed the highest growth (37.5 percent for the planning area and 30.6 percent for the state).

Much of the growth in the counties in the planning area can be attributed to the success of the ski and resort industries. The construction of Interstate 70 and the growth in the oil and gas industries also have been factors in the population increase, particularly in Eagle and Garfield Counties. Eagle County experienced the greatest growth, mainly attributable to the Vail ski resort and the town of Vail (Eagle County 2003). Garfield County's population more than doubled between 1980 and 2005 (Colorado State Demography Office 2007a).

Housing costs, an increase in the number of second homes, and growth in resort-related and oil and gas employment have spurred population growth away from many of the incorporated areas to unincorporated rural areas (BBC Research and Consulting 2008).

Net migration was the dominant influence over population change in the planning area between 1980 and 2005 and played a slightly larger role in planning area population changes than it did in the state. The influence of net migration over planning area population change declined over this 25-year period, from 79.0 percent to 64.0 percent in 2005 (Colorado State Demography Office 2007b).

Between 2005 and 2030, the population of the five-county planning area is forecast to increase by about 269,250 (slightly more than 100 percent), while the population of the state is forecast to grow by 62.7 percent. Mesa County is projected to have the greatest absolute increase (106,765), but Garfield County would grow by the highest percent (171 percent). Pitkin County is forecast to have the smallest population increase (10,620) and the smallest growth rate (64.7 percent) (Colorado State Demography Office 2007h).

Age Distribution

Since 1990, the overall aging of the population has affected and is anticipated to continue to affect both the planning area and the state. As shown in Table 3.6.2-11, the population of children ages 0 to 17 declined, while the working age population, ages 18 to 64, and those 65 and older, increased. The percentage of the population made up of children is projected to increase and then level off at around 25 percent through 2030, as the working age population is forecast to decline, and the population of those 65 and older is projected to continue to increase steadily (Colorado State Demography Office 2007c).

Table 3.6.2-11
Planning Area and State Age Distribution

	Ages 0 to 17		Ages 18 to 64		Ages 65 and older	
Year	Planning Area Percent	Colorado Percent	Planning Area Percent	Colorado Percent	Planning Area Percent	Colorado Percent
1990	26.1	26.2	63.2	63.8	10.7	10.0
2000	24.3	25.6	65.2	64.8	10.4	9.7
2005	24.2	25.1	65.3	65.2	10.5	9.7
2010	24.3	24.7	65.0	64.9	10.8	10.4
2015	24.8	24.7	63.4	63.2	11.8	12.0
2020	25.1	24.7	61.8	61.4	13.1	13.9
2025	25.0	24.6	60.8	59.9	14.2	15.5
2030	25.0	24.7	60.3	58.8	14.6	16.5

Source: Colorado State Demography Office 2007c

Housing

Table 3.6.2-3 above shows that between 1990 and 2000, housing affordability decreased in the planning area and the state, and a greater percent of income was needed to purchase housing (Economic Profile System 2004). As shown in Table 3.6.2-4 above, between 1990 and 2005, the number of housing units in the planning area increased by more than the state average, with the largest percent increases in Eagle and Garfield Counties (84.8 and 59.8) (Colorado State Demography Office 2007d).

Trends in Industry Sectors Related to BLM Management

Tourism growth tends to follow a pattern similar to that of population growth in tourist destination areas. Assuming this is the case for the planning area, tourists there would generate 1,785 jobs and $35,728,470 in earnings by 2030 under current management conditions (Colorado Division of Local Government 2005, Runyan Associates 2006, Stynes and White 2006).

The oil and gas industry is enjoying an upswing, but this type of industry increase has occurred before, only to be followed by a sharp decline when oil and gas prices fell. Within Colorado this type of cycle affected Garfield County with the oil shale boom from 1979 to 1982 and the subsequent bust from 1982 to the late 1980s. The Battlement Mesa area, particularly the towns of Rifle and Parachute, were the most affected, when in 1982 Exxon and Unocal closed their oil shale operations. This resulted in a direct loss of employment and a subsequent abandonment of infrastructure, including access roads and housing, and of businesses dependent on oil and gas industry expenditures.

A recent study by BBC Research and Consulting describes the anticipated socioeconomic effects of increased oil and gas development, along with development of the oil shale potential in northwestern Colorado, including Garfield County. The trend toward energy's increased importance in the economy of northwestern Colorado has increased housing and labor costs since 2000, resulting in an increasing job gap (more jobs than

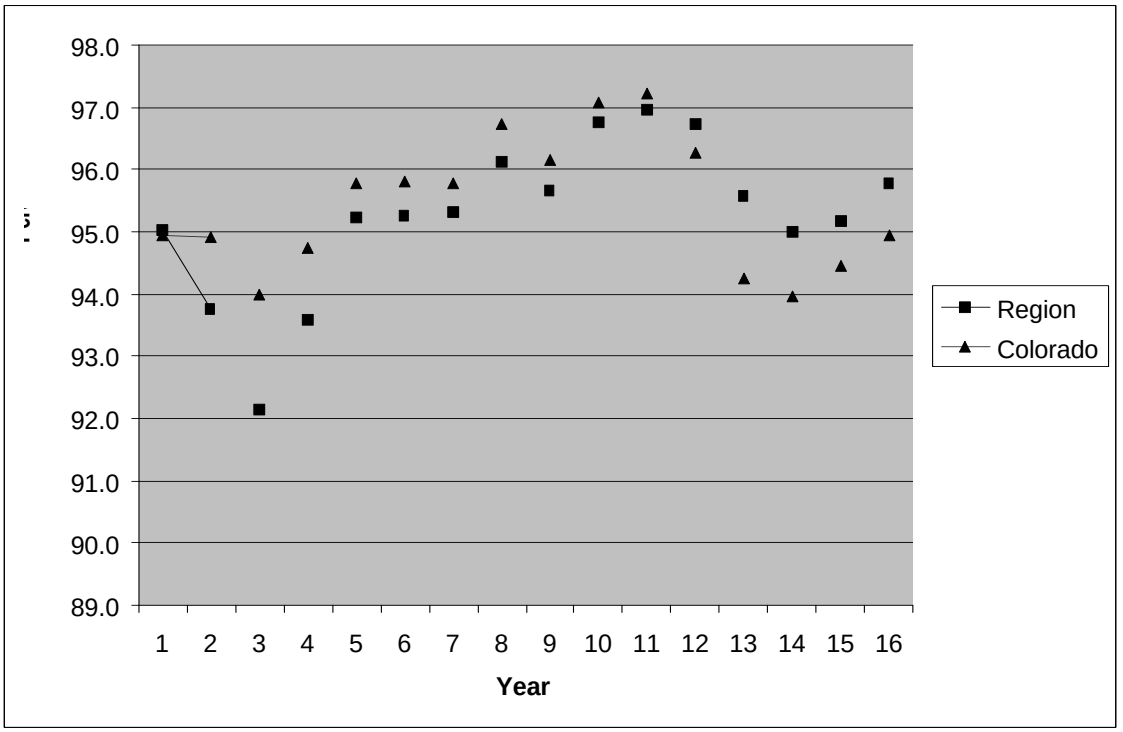
available labor) and contributed to the shortage of affordable housing. Due to these intensified pressures and projected growth in this industry, Garfield County would no longer be able to absorb the resort-driven workforce for resort and retiree communities of Eagle, Pitkin, and Routt Counties. In addition, existing communities, infrastructure, and government revenues would have insufficient capacity to accommodate the level of population increase and development that would accompany growth in oil, gas, and oil shale. The study projects that over time the focus of growth over the next two decades will move northward, away from Garfield County and into Rio Blanco County, as the number of wells that can be drilled economically in Garfield County reaches its maximum (BBC Research and Consulting 2008).

With the signing of the Energy Policy Act of 2005, which offers incentives to develop renewable energy, it is likely that the BLM will see an increase in the development of renewable energy (see Section 3.3.7, Renewable Energy).

Employment

Between 1990 and 2005, the total number of jobs in the planning area grew by 72.9 percent, while the labor force grew by 70.7 percent, indicating that job growth outpaced the growth in the available labor force over this period (Colorado State Demography Office 2007f). Chart 3.6.2-1 portrays employment growth between 1990 and 2005 for the planning area and the state, showing that employment levels in the planning area fluctuated in a pattern similar to that of the state. Between 2001 and 2005, planning area employment levels exceeded the state average (Colorado State Demography Office 2007f).

Chart 3.6.2-1
State and Planning Area (Region) Percent Employed



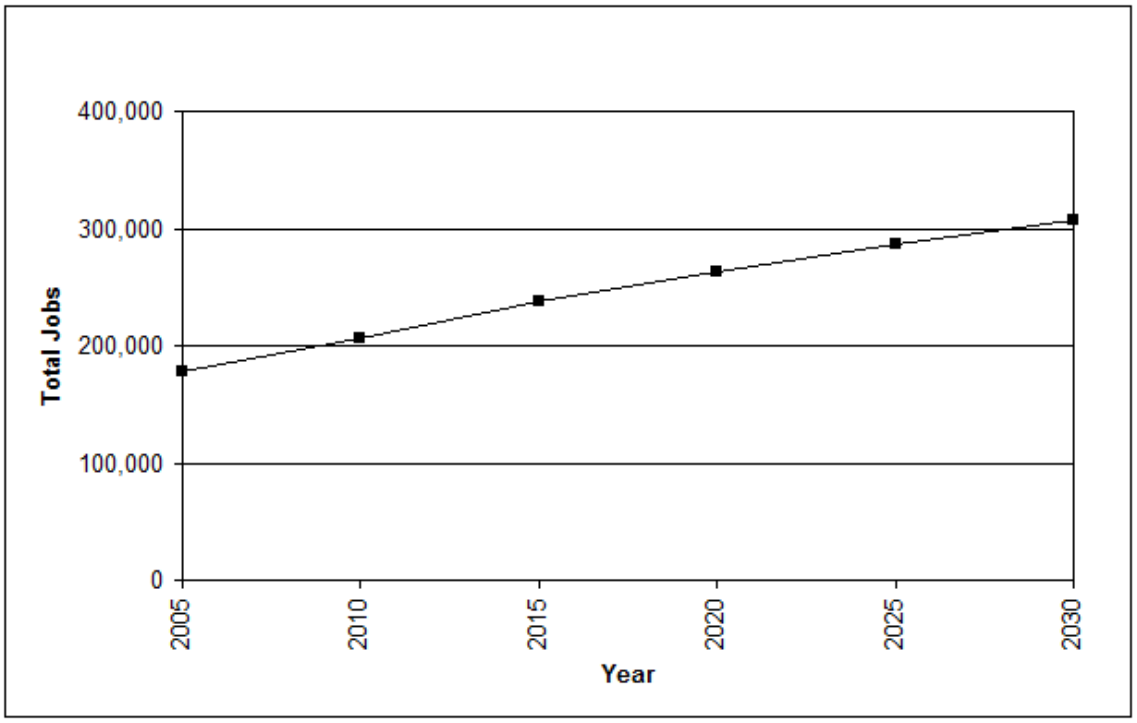
The surplus in the number of jobs (jobs minus labor force) increased by 11,104 (roughly 89 percent) between 1990 and 2005, indicating that even if all unemployed workers received jobs, there would still be a need for more employees. This job gap reached a maximum in both the planning area and the state in 2001, but the planning area increase between 1990 and 2005 was well below the state average of 190 percent (Colorado State Demography Office 2007f).

Between 1970 and 2000, the dominant source of employment in the planning area shifted from the retail sector to the services sector (including traditional hotels and accommodations services, professional services, health services, educational services, legal services, personal services, private households, repair services, and other services), which was the third-largest employer in 1970. Business services, amusement and recreation services, and repair services were the dominant service industries in 2000. Although it accounted for one of the smallest portions of jobs, agriculture and forestry experienced the largest percent increase in employment between 1970 and 2000 (1,131.0 percent), followed by construction (776.6 percent), which accounted for about 12.2 percent of jobs in 2000 (Colorado State Demography Office 2008f). The industry with the greatest relative increase in jobs in the planning area between 2001 and 2005 was mining (159.4 percent), followed by real estate (17.0 percent), health services (16.4 percent), and transportation and warehousing (16.3 percent). The largest increases in mining employment occurred in support services (547.6 percent) and oil and gas extraction (84.2 percent). Employment in management, manufacturing, utilities, information services, agriculture, and construction decreased. Even though employment in construction decreased by 1.2 percent, it employed the second-largest portion of the workforce in the planning area in 2005 (13.8 percent), while the accommodation and food sector employed the most (13.9 percent) (Colorado State Demography Office 2008f).

In contrast to the other counties in the planning area, employment growth in Pitkin County has lagged behind that of the state. It is thought that one reason for this is the relocation of mobile industries, such as construction companies, down-valley to Garfield and Eagle Counties, where business expenses are lower. Also, the growth in visitor-related services has displaced services geared toward the local population, and the demand for resident goods and services has been funneled into down-valley markets where the selection is generally better and prices are lower. In addition, the high level of commuting to jobs in Pitkin County from Eagle and Garfield Counties has displaced earnings derived from Pitkin County jobs to the counties where the workforce lives (Rural Planning Institute 2001).

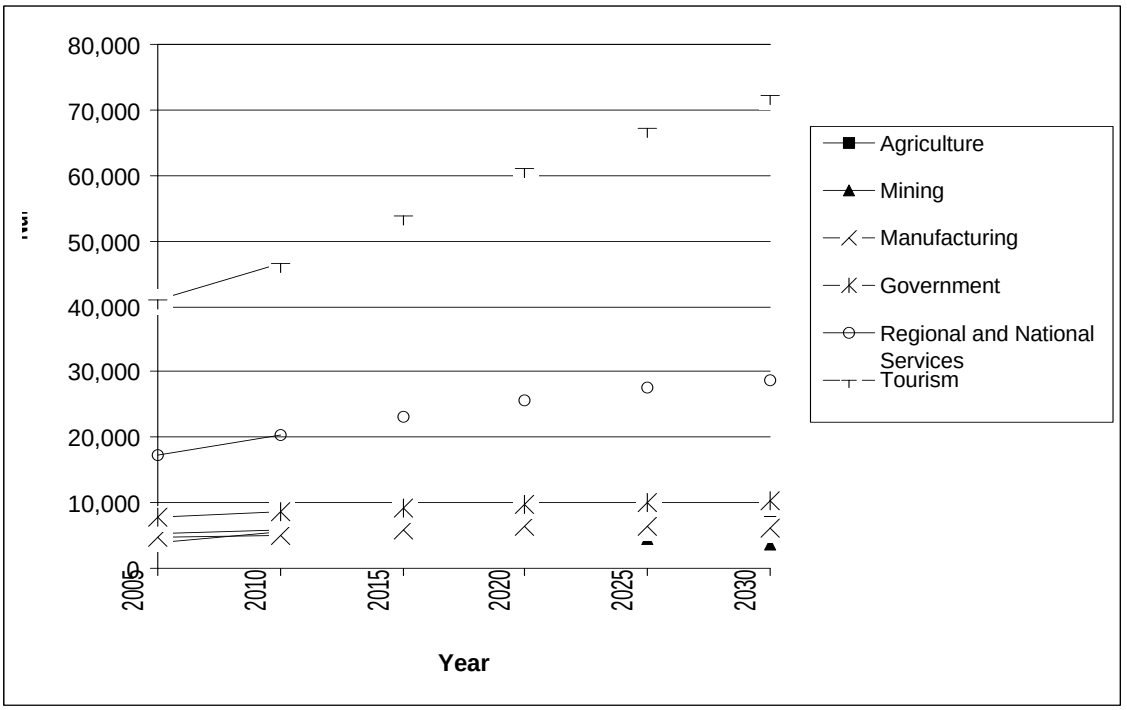
Charts 3.6.2-2 and 3.6.2-3 show the projected increase in jobs in the planning area from 2005 to 2030 and the projected change in the number of jobs in selected sectors, respectively. Between 2005 and 2030, the total number of jobs in the planning area is forecast to increase at a slower rate, by about 72.4 percent. The greatest increases are forecast in tourism (76.4 percent) and regional and national services (67.4 percent), and tourism would increase slightly as a percentage of total jobs. The smallest projected increase in jobs would occur in mining, which shows a decline from 2020 onward. Mining jobs are anticipated to decrease as a percent of total jobs from 2.3 to 1.2 percent. Jobs in agriculture are forecast to increase by 35.3 percent and to increase slightly as a percent of the total (Colorado State Demography Office 2007f).

Chart 3.6.2-2
Planning Area Projected Total Jobs (2005-2030)



Source: Colorado State Demography Office 2007f

Chart 3.6.2-3
Planning Area Projected Jobs by Sector (2005-2030)



Source: Colorado State Demography Office 2007f

Income

From 1970 to 2008, annual TPI in the economic impact area increased by $3.3 billion to $12.88 billion, and annual PCPI increased from $20,362 to $44,560 (all measures adjusted for inflation to 2009 dollars). This translates to a TPI increase of 40 percent (roughly 1 percent annually) and a PCPI increase of 40 percent (roughly 1 percent annually) over this time period (average PCPI in the economic impact area was lower than the state [$34,310] and the nation [$34,471] in 2008).

While PCPI is a useful measure of economic well being, it should be examined alongside changes in real earnings per job. Since PCPI includes income from 401(k) plans as well as other non-labor income sources like transfer payments, dividends, and rent, it is possible for per capita income to rise, even if the average wage per job declines over time. While PCPI rose between 1970 and 2005, average earnings per job also increased from $34,671 to $43,464 (values adjusted for inflation to 2009 dollars), indicating a possible decrease in area economic well being (US Department of Commerce 2008).

In 1970, non-labor income represented 28.4 percent of total personal income. By 2008, non-labor income had increased to 32.4 percent of total personal income (US Department of Commerce 2008). As the population of the area continues to age, the share of income from these non-labor sources should continue to rise as long as residents continue to stay in the area after retirement or new retirees move in. Rural county population change and the development of rural recreation and retirement destination areas are all related to natural amenities (Knapp and Graves 1989, Clark and Hunter 1992, Treyz et al. 1993, Mueser and Graves 1995, McGranahan 1999, Lewis et al. 2002). The BLM manages many of the natural amenities in the area and thus, they indirectly contribute to area labor and non-labor income.

Government Revenues and Expenditures

As shown in Table 3.6.2-10 above, property taxes increased slightly as a percentage of total revenue between 2000 and 2003. Sales and use taxes, which are a measure of expenditures within the local economy, often by tourists, decreased slightly as a percent of total revenue, while the actual value of these taxes increased from $90,881,860 to $101,092,775. Over this period, total revenue increased 22.0 percent. Spending on miscellaneous expenses and health increased by the highest percent between 2000 and 2003. During this time, spending on recreation remained stable, but it decreased slightly as a portion of total spending. Total expenditures increased by 30.1 percent (Colorado Division of Local Government 2007).

3.6.3 Environmental Justice

This section addresses specific topics related to environmental justice, as required by the NEPA. Specifically, a discussion of issues related to environmental justice is presented in accordance with Executive Order 12898, and issues related to protecting children from environmental health risks are presented in accordance with Executive Order 13045.

On February 11, 1994, President Clinton issued Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations. This order requires that "each federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities, on minority populations and low-income populations" (Executive Order 12898).

Economic, racial, and demographic information generated to identify areas of low-income and high minority populations in and around the planning area is presented to comply with this order. The distribution of persons in poverty is used as an identifier for low-income populations.

Once the presence, distribution, and percent of environmental justice populations has been identified in this section, the potential for disproportionate effects on these populations from the management actions presented in Chapter 2 is assessed in Chapter 4. Disproportionate effects would include those that would particularly harm the physical health, livelihood, or social structure of these minority or low-income populations. The following are examples of activities that could affect environmental justice populations. Management actions that reduce the availability of jobs or that induce a reduction in the types of jobs in sectors that typically employ low-income populations, such as services and retail, could disproportionately affect lower income households. Actions that could increase health and safety risks near areas where minority or low-income populations are concentrated could result in environmental justice effects. For example, increased traffic due to increases in minerals activities or activities in new locations could have environmental justice effects, depending upon the location and population characteristics of the affected area. In addition, management actions that would limit access such that they would be particularly restrictive to environmental justice populations and so that these populations would be particularly limited in their ability to participate in activities on public lands in the planning area, would result in disproportionate social effects to environmental justice populations. Management actions that could restrict access of Tribal groups to ancestral lands and cultural practices also would have environmental justice effects.

Current Conditions

As shown in Table 3.6.3-1, State and Planning Area Race and Ethnic Origin (2005), in 2005 the population of the planning area was predominantly White and non-Hispanic, which is more homogeneous than that of the state. The Black/African American group was the dominant minority in the state, but based on population percents, there are no real dominant minorities within the planning area. The percent of the state population composed of Hispanic or Latino persons was greater than that of the planning area. Eagle and Garfield Counties, the counties with the greatest percent of BLM lands, had a higher percent of Hispanic or Latino origin (26.9 percent and 22.6 percent, respectively), than the planning area as a whole, and Eagle County had the highest percent of Hispanic or Latino origin of all the counties in the planning area (Colorado State Demography Office 2007a).

Table 3.6.3-1
State and Planning Area Race and Ethnic Origin (2005)

Race/Origin	Eagle County Percent	Garfield County Percent	Mesa County Percent	Pitkin County Percent	Routt County Percent	Planning Area Percent	Colorado Percent
Race							
White	97.3	96.9	96.3	97.0	97.7	97.0	90.2
Black/African American	0.6	0.7	0.7	0.7	0.5	0.6	4.1
American Indian and Alaska Native	0.6	0.7	0.9	0.3	0.5	0.6	1.1
Asian	0.9	0.5	0.6	1.5	0.5	0.8	2.6
Native Hawaiian and Other Pacific Islander	0.1	0.1	0.1	0.0	0.1	0.1	0.1
Two or More Races	0.5	1.0	1.3	0.5	0.8	0.8	1.8
Origin							
Non-Hispanic	73.1	77.4	89.0	93.0	96.3	85.8	80.7
Hispanic or Latino	26.9	22.6	11.0	7.0	3.7	14.2	19.3

Source: Colorado State Demography Office 2007a

The US Census Bureau uses a set of money income thresholds that vary by family size and composition to determine which families are living in poverty. If a family's total income is less than its threshold, then that family, and every individual in it, is considered to be living in poverty. Poverty thresholds do not vary geographically, but they are updated annually for inflation using the Consumer Price Index. For individuals who do not live with family members, their own income is compared with the appropriate threshold (US Census Bureau 2007). Table 3.6.3-2, Planning Area Poverty and Median Household Income, shows estimated median household income and poverty levels for the five counties in the planning area. According to the US Census Bureau, the poverty threshold in 2004 was $9,973 for an individual and $19,971 for a family of four. Pitkin, Routt, and Eagle Counties had the lowest poverty levels in 2004, and Garfield and Mesa Counties had the highest. Pitkin County's median household income was the highest within the region, while Mesa County's was the lowest (US Census Bureau 1998, 2003, and 2006).

Table 3.6.3-2
Planning Area Poverty and Median Household Income

	Percent in Poverty			Median Household Income 2004
Location	1989	2000	2004	
Eagle County	5.1	6.0	6.0	$59,037
Garfield County	8.3	7.8	8.2	$50,119
Mesa County	14.1	11.0	10.8	$40,045
Pitkin County	3.9	4.4	4.6	$60,662
Routt County	7.0	6.2	6.0	$54,539
Planning Area	7.7	7.1	7.1	$52,880
Colorado	11.7	8.9	10.2	$50,105

Source: US Census Bureau 1998, 2003, and 2006

Characterization

Indicators

Changes in the ethnic composition and poverty levels in Eagle, Garfield Mesa, Pitkin, and Routt Counties since 1989 are identified as the basis for assessing trends for environmental justice populations.

Trends

Between 1990 and 2005, the percent minority population in the region decreased from 4.75 percent to 3.23 percent, a 4.23 percent decline. Eagle County had the highest percent of minorities in the planning area in 1990 at 8.44 percent and the second lowest in 2005 at 2.72 percent. The proportion of minorities in Garfield, Pitkin, and Routt Counties increased slightly between 1990 and 2005; however, all remained near or below 3 percent. Routt County experienced the greatest percent increase in minority populations with a 179.43 percent increase from 1.24 to 2.29 percent of the total county population; which was still the lowest level of minorities in the planning area. The Hispanic portion of the population in the planning area increased by 209.31 percent from 7.56 percent to 15.24 percent. Eagle County experienced the greatest increase and also had the highest percent of Hispanic people (Table 3.6.3-1, State and Planning Area Race and Ethnic Origin (2005)).

As shown in Table 3.6.3-2, Planning Area Poverty and Median Household Income, between 1989 and 2004 the poverty rate in the region and the state declined, and the poverty rate in the region was lower than that of the state. Since 1989 poverty in Pitkin County has been increasing, although it was below that of the other counties in the region for each of the 3 years shown. Mesa County consistently had the highest poverty rate, which was above the state average in 1989, 2000, and 2004. Although the percent in poverty in Garfield County decreased between 1989 and 2000, it rose again between 2000 and 2004 to just below the 1989 rate (US Census Bureau 1998, 2003, and 2006).

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