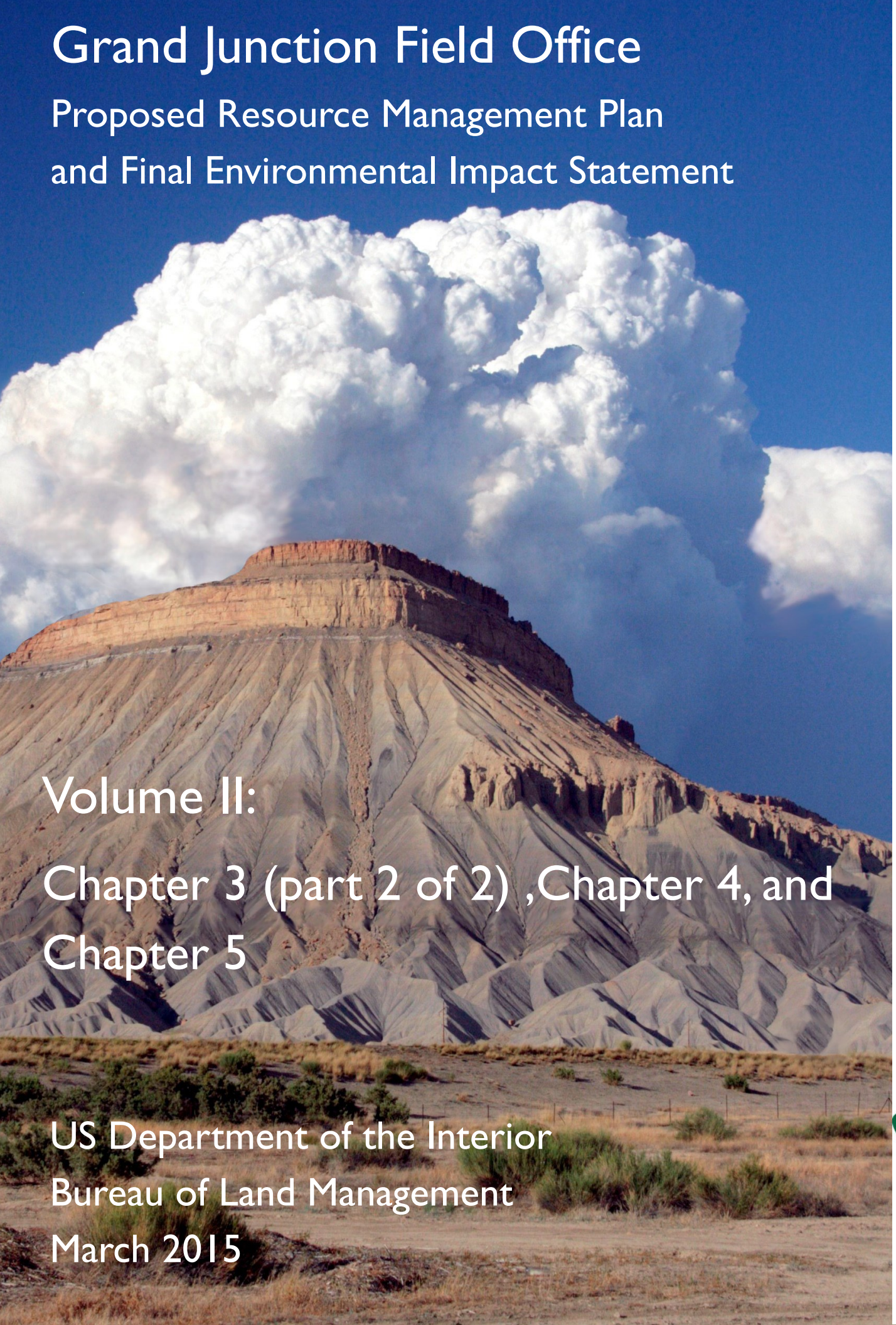
Grand Junction Field Office

Proposed Resource Management Plan and Final Environmental Impact Statement



Volume II:

Chapter 3 (part 2 of 2) ,Chapter 4, and Chapter 5

US Department of the Interior
Bureau of Land Management
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BLM

BLM Mission

To sustain the health, diversity, and productivity of America's public lands for the use and enjoyment of present and future generations.

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ACRONYMS AND ABBREVIATIONS

	Full Phrase
ACEC	Area of Critical Environmental Concern
AML	Appropriate Management Level
AMP	Allotment Management Plan
ATV	all-terrain vehicle
AUM	animal unit-month
Bbbl/sqmi	billion barrels of oil per square mile
BEA	United States Department of Commerce, Bureau of Economic Analysis
BLM	United States Department of the Interior, Bureau of Land Management
BMP	best management practices
CCR	Colorado Code of Regulations
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CIAA	Cumulative Impact Analysis Area
CMA	Cooperative Management Agreement
CNAP	Colorado Natural Areas Program
CNHP	Colorado Natural Heritage Program
COA	condition of approval
CPW	Colorado Parks and Wildlife
CSU	controlled surface use
CTTM	Comprehensive Trails and Travel Management
EA	environmental assessment
EDRR	Early Detection and Rapid Response
EIS	environmental impact statement
ERMA	extensive recreation management area
ESA	US Endangered Species Act of 1973
ESR	emergency stabilization and rehabilitation
FAR	functioning at risk
FAR-DOWN	functioning at risk downward trend
FAR-NA	functioning at risk no apparent trend
FAR-UP	functioning at risk upward trend
FLPMA	Federal Land Policy and Management Act of 1976
FLRMP	Forest Land and Resource Management Plan
FRCC	fire regime condition class
GIS	Geographic Information System
GJFO	Grand Junction Field Office
IMPLAN	Impact Analysis for Planning
IRMA	Intensive Recreation Management Area
K	soil erodibility potential factor
KPLA	Known Potash Leasing Area

LBCWHR	Little Book Cliffs Wild Horse Range
LED	Local Employment Dynamics
LN	Lease Notice
LPM	Land Parcel Model
Ma	million years before present
MOU	Memorandum of Understanding
NAICS	North American Industrial Classification System
NCA	National Conservation Area
NEPA	National Environmental Policy Act of 1969
NF	not functioning
NFRP	Normal Year Stabilization and Rehabilitation Plan
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NPS	United States Department of the Interior, National Park Service
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NSO	no surface occupancy
NWSRS	National Wild and Scenic Rivers System
OHV	off-highway vehicle
ONA	Outstanding Natural Area
ORV	outstandingly remarkable value
PFC	proper functioning condition
PFYC	Potential Fossil Yield Classification
PGH	preliminary general habitat
PPH	preliminary priority habitat
PPR	Parachute-Piceance-Roan
RAC	Resource Advisory Council
RMIS	Recreation Management Information System
RMP	resource management plan
RMZ	Recreation Management Zone
RNA	Research Natural Area
ROD	record of decision
ROS	recreation opportunity spectrum
ROW	right-of-way
RS	Revised Statute
RSC	recreation setting characteristic
SHPO	State Historic Preservation Officer
SIC	Standard Industrial Classification
SMA	Special Management Area
SOP	Standard Operating Procedures
SRMA	Special Recreation Management Area

	Full Phrase
SRP	Special Recreation Permit
TL	timing limitation
TMDL	Total Maximum Daily Load
US	United States
US BOR	United States Department of the Interior, Bureau of Reclamation
US DOE	United States Department of Energy
US DOI	United States Department of the Interior
US EPA	United States Environmental Protection Agency
US Forest Service	United States Department of Agriculture, Forest Service
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Department of the Interior, Fish and Wildlife Service
USGS	United States Geological Survey
VRI	visual resource inventory
VRM	visual resource management
WSA	Wilderness Study Area
WSR	Wild and Scenic River
WUI	Wildland-Urban Interface

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3.3 RESOURCE USE CONDITIONS

This section contains a description of the human uses of resources in the GJFO planning area and follows the order of topics addressed in Chapter 2:

- Forestry
- Livestock Grazing
- Energy and Minerals
- Recreation and Visitor Services
- Comprehensive Travel and Transportation Management
- Lands and Realty

3.3.1 Forestry

BLM manages three million acres of forest and woodland lands in Colorado, including over half a million acres in the GJFO decision area. Tree species used commercially such as Douglas-fir and ponderosa pine make up only a small percentage of this acreage. The majority of woodland forests are dominated by tree species that are not traditionally used in commercial markets, such as pinyon-juniper and gambel oak *(Quercus gambelii)*. Wood products harvested from BLM lands include sawtimber, firewood, Christmas trees, post and poles, wildings (live trees), and biomass. BLM management emphasizes forest health restoration and reducing the risk of catastrophic wildfire rather than production of commercial timber.

Current Conditions

Woodland and Forest Plant Communities

The GJFO decision area includes 586,000 acres of forest and woodland vegetation, covering approximately 55 percent of the decision area. Pinyon-juniper woodlands account for the majority of this area, covering approximately 539,900 acres or 51 percent of the decision area. Woodland and forest vegetation types are described below and in **Section 3.2.6**, Vegetation.

<u>Woodland</u>

The pinyon-juniper type is found at elevations of 4,800 to 7,500 feet. Stands at lower elevations tend to be primarily juniper, while stands at higher elevations tend to be primarily pinyon pine. The pinyon-juniper type usually gives way to the mountain shrub type at elevations above 7,500 feet. Pinyon- juniper woodlands have varying degrees of stand health. Woodlands have been altered by historic livestock grazing, vegetation treatments, roads, and fire suppression. Disease has increased, likely due to mild winters and drought-stressed pinyon. Understory herbaceous species composition has also been altered, with an increase in introduced nonnative plant species and invasive plant species such as cheatgrass.

Forests

Forested areas are located within the mountainous areas of the Uncompahgre Plateau, Grand Mesa, areas accessed by Douglas Pass, and the extreme northern areas of the Book Cliffs. These areas cover approximately 46,200 acres, or four percent of the decision area. The majority of commercial forest land is in isolated stands on slopes greater than 60 percent and with limited access. The main plant community types within this category are Douglas fir, aspen, and ponderosa pine, described below.

Douglas fir is generally found on the northern and eastern aspects of the Book Cliffs and the Roan Plateau and occupies around 31,800 acres, or approximately three percent of the decision area. This species is found on steep slopes at elevations between 7,000 and 9,000 feet. Timber sales have been proposed in Douglas-fir stands; however, due to the stands' remoteness and steep slopes, the sales were not economically feasible. The predominance of mid- to late-seral-stage stands of Douglass fir in the region increase the susceptibility to insect outbreak and stand-replacing wildfire (US Forest Service 2007).

The aspen forest type accounts for 7,800 acres, or less than one percent of the decision area. Aspen occurs in areas above 8,000 feet on northern and eastern slopes with high moisture content. Within the decision area, aspen can be found on Douglas Pass, Mud Springs, and Uncompahgre Plateau. Aspen forests across Colorado have experienced widespread severe and rapid dieback and mortality, termed Sudden Aspen Decline. One cause of Sudden Aspen Decline is drought stress, which makes trees more susceptible to disease and insect infestation. The majority of aspen in the region are in later seral stages, between 80 and 120 years old, and an increasing amount of mortality due to fungal pathogens is expected in the future (US Forest Service 2007). Conifer species will become the dominant tree species in a significant portion of the current aspen cover type if succession continues.

Ponderosa pine occurs on the higher mesas and mountains of the decision area at about 8,000 feet. The ponderosa pine forest type accounts for 6,700 acres, or less than one percent of the decision area. These stands are found on Uncompahgre Plateau, Douglas Pass, and other scattered areas, and occupied areas tend to be small. Frequent (less than 30-year interval), usually low-intensity wildland fires have burned through many ponderosa pine stands, removing competing understory vegetation and downed material. Core samples taken from the ponderosa pine stands on the Uncompahgre Plateau detected no fire history in the present stand.

Current Management and Use

Table 3-27, Woodland and Forest Acreage by Dominant Species, shows acreage for woodland and forest lands, regardless of suitability for harvest. Productive woodland or forestland is defined as an area capable of bearing vegetative products of commercial character and economically available now or

prospectively for commercial use and not otherwise withdrawn from use. Woodland and forest acreage is classified as either productive and suitable for management and harvesting on a 180-year rotation or unsuitable for management.

Table 3-27
Woodland and Forest Acreage by Dominant Species

Vegetation Type	Species	BLM Acreage	Percent of Decision Area
Woodland	Pinyon-Juniper	539,900	51
Forest	Douglas Fir	31,800	3
	Aspen	7,800	less than 1
	Ponderosa Pine	6,700	less than 1

Source: BLM 2010a

Pinyon-juniper woodlands are classified as unsuitable for management if they have the following site conditions or occur in the following locations:

- Steep slopes;
- Fragile soils;
- WSAs;
- Recreation sites;
- Wildlife areas;
- Areas containing sensitive species; and
- Areas of high cultural sensitivity.

Forest lands are classified as unsuitable for management if they occur in the following locations:

- Municipal watersheds;
- WSAs;
- Recreation areas;
- Wildlife areas;
- Special status species habitat; and
- Areas of high cultural sensitivity.

An estimated 1,300 acres of commercial forest and 111,200 acres of woodland were classified as land productive and suitable for management in the 1987 RMP. Approximately 37,800 acres of commercial forest and 424,900 of woodland were classified as nonproductive and unsuitable for management.

The BLM has developed management zones for areas likely to have forestry product harvesting, and future site-specific management actions will be organized by management zone. Areas with defined management zones include the following:

- Bangs Canyon: 59,100 acres;
- Book Cliffs: 214,300 acres;
- Gateway: 194,300 acres;
- Glade Park: 67,100 acres;
- Grand Mesa Slopes: 60,700 acres;
- Grand Valley: 155,600 acres;
- Plateau Valley: 66,800 acres; and
- Roan Creek: 243,300 acres.

Current forestry uses in the project area include personal and commercial harvest of fuel wood, poles and posts for fence building, wildings (live trees), and Christmas trees. Pinyon pine has historically been the preferred species for fuelwood harvest, though juniper and other species are also collected. Poles and posts are generally collected from pinyon-juniper woodlands, and Christmas trees and wildlings are harvested throughout the project area. The GJFO authorizes approximately 1,100 personal use permits per year, the majority of which are for Christmas trees. Based on permits issued over the past four years, current demand for Christmas trees is approximately 848 trees per year, demand for personal use firewood is 564 cords per year, and demand for juniper fence is 1,844 posts per year (see **Table 3-28**, Permits Issued for Forestry Products Fiscal Years 2007-2010). Demand for large-scale commercial harvest has been declining over the past two decades; however there is still a steady demand for small scale commercial wood harvesters.

Table 3-28
Permits Issued for Forestry Products Fiscal Years 2007-2010

Category	2007	2008	2009	2010
Fuelwood (cords)	584	745	511	416
Posts	1,703	1,400	2,180	2,095
Wildings (feet)	624	567	425	80
Christmas Trees	852	795	930	813

Biomass

Biomass resources are a byproduct of BLM actions on public lands and are not specifically cultivated for feedstock production. The BLM defines woody biomass as "the woody plants and portions of the trees, including limbs, tips, needles, leaves, and other woody parts, or rangeland environment, that are the byproducts of the management, restoration, and/or hazardous fuel reduction

treatment." Biomass can be collected and harvested from BLM lands through timber sales, stewardship, and hazardous fuels reduction.

Current Management and Use

Biomass harvest and utilization has not been a part of existing management actions within the GJFO and is not addressed in the current GJFO RMP (BLM 1987).

Resource Potential

The BLM/NREL study (BLM and DOE 2003) evaluated the long-term sustainability to support biomass plants using the monthly Normalized Difference Vegetation Index computed from National Aeronautics and Space Administration's Advanced Very High Resolution Radiometer Land Pathfinder satellite program.

The GJFO is not in the top 25 BLM planning areas having the highest potential for biomass resources. For an area to have biomass development potential, it must meet the following criteria (BLM and DOE 2003):

- Having a Normalized Difference Vegetation Index of 0.4 for at least four months between April and September;
- Having a slope of less than 12 percent;
- Being located no more than 50 miles from a town with at least 100 people; and
- Having BLM compatible land use.

Biomass potential for any given area is dependent upon: (1) vegetation type and productivity, which is determined by soil and microclimate conditions; and (2) BLM management actions that may result in the production of biomass as byproduct. Wooded landscapes have a greater potential to produce biomass than shrublands, which in turn have a greater potential to produce biomass than grasslands and barren areas. Vegetation types available for biomass production are as follows (**Figure 3-12**, Biomass Energy Potential):

- Pinyon-juniper – 520,100 acres;
- Saltbush – 174,500 acres;
- Mountain shrub – 159,300 acres;
- Sagebrush – 83,200 acres;
- Douglas-fir and white Fir – 31,700 acres;
- Greasewood – 25,500 acres;
- Riparian – 9,800 acres;
- Aspen – 7,700 acres;

- Blackbrush – 7,000 acres;
- Ponderosa pine – 6,400 acres; and
- Barren land – 10 acres.

Existing Activity

There are no current or historical biomass energy facilities on public lands within the GJFO decision area, nor has the GJFO received any ROW applications for such facilities (GeoCommunicator 2009).

Trends

There is evidence that woodland tree species, especially pinyon and juniper, are spreading and becoming established in areas that are below their historic elevation limits as a result of fire suppression and climate variation (Miller and Taucsh 2001). Should this trend continue, the availability of fuel wood and other products may continue to increase. However, the trend towards more frequent and more severe wildfire in denser stands may counter some of this increase.

The demand for Christmas tree, firewood, and posts/poles is expected to remain at current levels. However, there has been a slight increase in the demand for forestry related products. Firewood demand largely decreased over the past 15 years due to burning limitations and the availability of relatively cheap electricity and natural gas. This trend may reverse itself should further increases in natural gas and fuel oil prices occur. The supply of firewood and wood fiber for other uses is expected to increase in response to fuel management and forest health projects.

A new sector of forestry use is biomass materials. There is little potential for providing renewable biomass fuel within woodlands. Removal of forest and woodland materials as a result of energy development is expected to increase and create the greatest demand on forest and woodland products. Growth of this market sector is anticipated to continue, placing higher demand on small sawlogs and woodlands. Numerous projects and programs have been developed to identify and promote the use of small sawlogs and woody biomass in Colorado (BLM 2009g). The US DOI collaborates with the Departments of Energy and Agriculture to encourage the use of woody biomass by-products from restoration and fuel treatment projects. Legislation in 2003 expanded and extended the use of stewardship contracting by the BLM and US Forest Service (Section 323 of Omnibus Appropriations bill, Public Law 108-7). These contracts will allow private companies, communities, and others who engage in contracts to retain forest and rangeland products in exchange for the service such as thinning trees and brush and removing dead wood. Long-term contracts foster a public-private partnership to restore forest and rangeland health by giving those who undertake the contracts the ability to invest in equipment and infrastructure needed to productively utilize material generated from forest thinning, such as brush and other woody biomass, to make wood products or to produce biomass energy, all at savings to taxpayers.

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 fuel reduction. Much of the current forest management is guided by the National Fire Plan (US DOI 2000) and the Healthy Forests Restoration Act of 2003 (16 USC at 1611-6591). The National Fire Plan established an intensive, long-term hazardous fuels reduction program and provisions to hasten hazardous fuel reduction. In fiscal year 2009 alone, more than 16,000 acres of fuels on BLM-managed lands in Colorado were treated by prescribed fire and mechanical methods in part as a result of this directive. Direction for forest restoration projects is provided for in the Healthy Forests Restoration Act, which also emphasizes retaining larger trees and removing in-growth to promote healthy forests that are more resistant to fire, insects, and disease.

3.3.2 Livestock Grazing

In 1997, the BLM and the three Resource Advisory Councils, in close coordination with permittees, the environmental community, and interested members of the public, completed land health standards and grazing guidelines specifically for BLM-administered lands in Colorado (**Appendix E**). These standards and guidelines are designed to provide specific measurements of land health and to identify best management practices in keeping with the characteristics of a region, such as climate and vegetation types. These standards describe conditions needed to sustain public land health for soil, riparian systems, upland vegetation, wildlife habitat, threatened and endangered species, and water quality. They relate to all uses of public lands, including livestock grazing. Standards are integrated into the BLM's land management through incorporation into land use plans, as a basis for environmental assessments and through NEPA analysis, and as a basis for monitoring. Guidelines are integrated into land management by applying them to livestock grazing authorizations.

Current Conditions

Level of Use

Approximately 978,600 acres of BLM-administered lands are open to grazing within grazing allotment boundaries and are managed by the GJFO in accordance with the 1987 RMP (**Figure 2-11**, Alternative A: Grazing Allotments). Approximately 13,000 acres of BLM-administered lands are not currently allocated. Approximately 48,800 acres of BLM-administered lands are closed to livestock grazing on Sewemup Mesa and the LBCWHR. The establishment of allotments is a result of the grazing districts and permitting system established to manage livestock grazing in these districts by the 1934 Taylor Grazing Act.

In some cases, to make grazing management more efficient, allotment boundaries cross field office boundaries. Therefore, the GJFO administers allotments outside of its administrative boundary, and, conversely, there are

allotments within the GJFO administrative boundary that are administered by other field offices under an MOU with the parent field office. These agreements are as follows:

- The Buckhorn, Bar-X, and San Arroyo Allotments are within the GJFO planning area but are managed by the Moab Field Office and are included in the Moab Field Office RMP;
- Portions of the Prairie Canyon, Mountain Island (Lost Canyon, Lost Horse, and Fish Park pastures), Spring Creek, Hubbard, and Dolores Point allotments are within the Moab Field Office but are administered by the GJFO and are covered in this RMP;
- The Cathedral Bluff Allotment is within the GJFO planning area but is managed by the White River Field Office and is included in the White River Field Office RMP; and
- A portion of the West Salt Allotment (East Evacuation) is within the White River Field Office planning area but is administered by the GJFO; it is covered under this RMP.

Allotments/Animal Unit-Months

There are 207 allotments managed by the GJFO in the RMP planning area. Of these allotments, 186 are permitted for livestock grazing and 21 are vacant. Allotments that are vacant have been relinquished to the BLM and involve small amounts of public land, are not suitable for grazing, or have resource concerns that make repermitting undesirable. In addition to BLM-administered land, these allotments may contain National Forest System, Bureau of Reclamation, municipal, state, and private lands. There are 145 permits authorizing grazing on these allotments. Total active preference (permitted use) is 61,360 animal unit-months (AUMs), with an additional 24,344 AUMs in suspension. Total permitted numbers adjust occasionally due to conversions of the class of livestock, changes in allotment boundaries or livestock management, and changes to meet carrying capacities, as determined by vegetative inventories and monitoring. Between 2000 and 2009, an average of 36,125 AUMs were grazed annually in the RMP planning area. Some permit holders used 100 percent of their permitted use every year, while others used zero percent during the 10 year period. The reasons for partial or full non-use include but are not limited to: personal convenience, resource protection, economic conditions, and public lands access issues.

Of the 207 grazing allotments managed within the RMP planning area, 203 are used for cattle grazing, primarily cow/calf operations. The Woods and Snyder Flats allotments are used for both sheep and cattle, and the 4-A Mountain and Upper Brush Mountain allotments also include a small amount of domestic horse use. The 1987 RMP allowed sheep grazing on 30 allotments. **Appendix J**, Allotments and Allotment Management Levels, lists all of the grazing allotment names and numbers, the type of livestock, the season of use, the acres of private

and public lands, the management category, and the amount of AUMs and public land acres by alternative within the RMP planning area.

Land Health Assessments

Land health assessments use ecological site potential and interdisciplinary site evaluations to determine the current state and health of the land. For over a decade, the GJFO has been working to complete its land health assessment for the entire field office (see **Figure 3-13**, BLM Land Health Assessments). These assessments have identified concerns with land health in areas below 6,000 feet in elevation. Generally referred to as desert country, these areas receive less than 10 inches of annual precipitation. While livestock grazing (current or historical) is often not the sole factor in the cause for this land health condition, it is often a contributing factor.

There are 42 allotments with all or a portion of their area below 6,000 feet. Of these allotments, 26 have more than one-quarter of the allotment area that does not meet land health or that meets land health but with problems. In most cases, the areas not meeting or meeting with problems are suitable for grazing (e.g., they have gentle slopes and vegetation types with herbaceous forage). Areas that are meeting land health standards often are unsuitable for grazing (e.g., they have steep slopes, badlands, pinion-juniper, and shrub communities with limited herbaceous components). **Table 3-29**, Grazing Allotments Below 6,000 Feet Not Meeting Land Health or Meeting With Problems, displays the acres and percentage of allotments below 6,000 feet that are struggling to meet or that do not meet land health standards. These areas are displayed on **Figure 3-14**, Land Health Assessment Below 6,000 Feet.

Table 3-29
Grazing Allotments Below 6,000 Feet Not Meeting Land Health or Meeting With Problems

Allotment	Acres Below 6,000 Feet	Acres with Land Health Concerns	Ratio with Land Health Concerns
Ames	257	189	73.54%
Badger Wash	7,687	5,356	69.68%
Beaver Mesa	969	132	13.62%
Berry Homestead	2,510	1,155	46.02%
Big Park	11,236	1,583	14.09%
Big Salt	5,758	3,808	66.13%
Blue Mesa	7,272	308	4.24%
Bull Draw Common	3,127	118	3.77%
Casto-Lines Common	1,634	225	13.77%
Coon Hollow Common	14,845	6,456	43.49%
Cottonwood	2,646	213	8.05%
Davis Amp	4,273	1,160	27.15%
Dolores River	3,086	328	10.63%
Dry Canyon-Demaree	3,983	1,852	46.50%
EastSalt	29,877	15,446	51.70%
EHL	193	182	94.30%

Table 3-29
Grazing Allotments Below 6,000 Feet Not Meeting Land Health or Meeting With Problems

Allotment	Acres Below 6,000 Feet	Acres with Land Health Concerns	Ratio with Land Health Concerns
Garr Mesa	6,077	3,066	50.45%
G-M-L	3,176	1,240	39.04%
Hamilton	635	131	20.63%
Highway 50	884	882	99.77%
Hunter Wash	12,784	4,885	38.21%
Jerry Gulch	1,133	184	16.24%
J.L.	164	38	23.17%
Kannah Creek Common	14,319	12,390	86.53%
Little Salt	27,330	14,327	52.42%
Logan Gulch	3,466	964	27.81%
Lower Rapid-Cottonwood	2,080	37	1.78%
Lyons/Anderson	1,836	211	11.49%
Mogensen	1,396	196	14.04%
Mt. Garfield	25,527	17,876	70.03%
Mule Trail Draw	179	161	89.94%
North Fork Kannah Creek	454	194	42.73%
Salt Wash	1,349	36	2.67%
Sinbad Valley Common	5,707	3,173	55.60%
Sunnyside Common	5,195	1,424	27.41%
Tom Casto	79	79	100.00%
Ute Creek Common	4,566	3,143	68.83%
West Salt Common	15,036	7,355	48.92%
West Spears	3,599	662	18.39%
Whitewater Common	18,327	8,918	48.66%
Wild Country	3,910	531	13.58%
Winter Flats-Deer Park	20,840	13,597	65.24%
Total *(rounded to nearest 100)*	***279,400***	***134,200***	

Source: BLM 2010a

Management Categories and Allotment Management Plans

The three selective management categories for allotments are custodial, maintain, and improve. The initial categorization occurred before the 1987 RMP and was updated in 2000. Custodial allotments in the planning area are generally small parcels of public land intermingled with larger tracts of private land. These allotments generally have few sensitive resources. They generally have few issues with low controversy, and the range condition is satisfactory. Maintain category allotments generally contain more public lands than custodial allotments, as well as more diverse resources. These allotments are generally in satisfactory condition with few resource issues. Improve category allotments are either in unsatisfactory condition or contain significant sensitive resources or issues that may require investments of time and money. These allotments have the highest priority for monitoring and range improvement development. In

addition, management changes have occurred as needed on a case-by-case basis as circumstances deem necessary.

As of 2008, 42 allotments are part of implemented allotment management plans (AMPs) or grazing use agreements that identify a change in livestock management or more intensive management. Thirty-four of these allotments are in the improve category, three are in the maintain category, and five are in the custodial category. Changes in management may be due to conflicts with other uses or resources, adjustment in authorized active AUMs based on ecological site inventory, or a land health assessment where livestock grazing has been determined to be a causal factor. Although in general, improve category allotments have priority for completing AMPS, new resource issues or conflicts may require the development of an AMP for specific maintain or custodial allotments before the AMPs are completed for all improve category allotments.

Monitoring and Inventories

Monitoring continues to be an important component of the livestock management program. All allotments within the GJFO have some sort of monitoring study. Study methods include photo points, nested frequency transects, utilization, apparent trend, actual use, big game transects, allotment supervision, and land health assessments. Each allotment has one or more of these studies, depending on the issues and concerns and prioritization category. Monitoring data are analyzed during the grazing permit renewal process or as needed.

Trends

Trends in livestock grazing reflect changes in livestock types, changes in permittees and their perspectives, changes in permitted use or season of use, and changes in other resource uses and priorities. Since the early 1970s, sheep producers in the area have been converting to cattle, which has caused a conversion of sheep grazing to cattle grazing in most allotments in the planning area. Absentee ownership of 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 graze livestock have resulted in diversification of perspectives. Some permittees value other resources on their grazing allotments as much if not more than livestock grazing.

Results from the land health assessments and ecological site inventories have led to changes in livestock management. Changes in permitted use (active use), livestock numbers, and season of use are in response to changes in rangeland condition, socioeconomics, and other factors. Variations in the condition of the land are in response to climatic factors, wildlife, past and present livestock use, oil and gas development, recreational use, insect infestations, and population increases. The increases in all activities are competing for resources that limit livestock grazing. If rangeland conditions deteriorate, the BLM can reduce the

number of permitted AUMs, manage plant communities that provide forage and browse through vegetation treatments, change the season of use, require deferment and pasture rotations, and install range improvements, such as fences, water pipelines, spring developments, and reservoirs. These range improvements often enable more intensive grazing systems and encourage better livestock distribution and grazing utilization, but they also require more management on the part of the grazing permittee. Range improvement and permittee involvement may become more crucial in sustaining future resource demands. The BLM's traditional goal in managing livestock grazing is to provide sustainable forage for livestock and habitat for wildlife, which is likely to remain the primary focus of its management of livestock.

Urbanization of rural areas within the GJFO has caused conflicts with livestock grazing. New landowners are often unfamiliar with state livestock laws and associated fencing requirements. Conflicts develop when livestock authorized on public land drift onto private land. This is largely the result of public/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 maintaining boundaries bordering public 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.

Increasing elk populations have been an issue for many grazing permittees and are often in direct competition with livestock for forage resources. This resource competition occurs primarily on private lands and wintering habitat during the winter months. Further increases in elk populations may increase the potential for these forage competitions to occur on public lands as well. 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 northern portion of the GJFO planning area has increased conflicts with livestock operations on public lands. As new roads are constructed and use of existing roads increases, control of livestock has become more difficult.

Increasing recreation is also leading to conflicts with livestock operations in terms of range improvement damage, gates being left open, livestock harassment, and in some cases shooting of livestock.

3.3.3 Energy and Minerals

Energy and minerals are discussed in four separate subsections: leasable minerals (both solid and fluid), locatable minerals, mineral materials (salables), and renewable energy.

- **Leasable minerals** include oil and gas, coal, oil shale, humate, uranium, and potash. 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. The BLM additionally has the authority to lease federal lands under the Right-of-Way Leasing Act of 1930 and the Mineral Leasing Act for Acquired Lands of 1947. Geothermal heat is also considered a leasable mineral and is governed by the Geothermal Steam Act of 1970. Underground gas storage agreements and injection/disposal wells are also considered leasable minerals. All federal leasable minerals are managed and regulated through 43 CFR 3100 including On Shore Orders:
  - Order #1: Approval of Operations
  - Order #2: Drilling
  - Order #3: Site Security
  - Order #4: Measurement of Oil
  - Order #5: Measurement of Gas
  - Order #6: Hydrogen Sulfide Operations
  - Order #7: Disposal of Produced Water
  - Order #8: Well Completions/Workovers/Abandonment (Proposed Rule)
  - Order #9: Waste Prevention and Beneficial Use of Oil and Gas
- **Master Leasing Plan** includes the Shale Ridges and Canyons area.
- **Locatable minerals** include uranium, vanadium, gold, alabaster/gypsum, copper, silver, tungsten, gem minerals (amethyst, fluorite), limestone, and zeolite. Locatable minerals can be located and claimed under the Mining Act of 1872.
- **Mineral materials** include sand and gravel, limestone aggregate, building stone, moss rock, cinders (clinker), clay, decorative rock, and petrified wood. Mineral materials are sold or permitted under the Mineral Materials Sale Act of 1947.
- **Renewable energy** resources include wind, solar, biomass, and hydropower.

Figures showing oil and gas development potential in the GJFO can be found in the Reasonably Foreseeable Development Scenario for Oil and Gas Grand Junction Field Office, Colorado (BLM 2012a). Figures showing resource potential for other minerals in the GJFO including coal, oil shale, uranium/vanadium, placer gold, copper, silver, dimension stone, potash and salt

can be found in the Mineral Potential Report for the Grand Junction Resource Area, Grand Junction Field Office (BLM 2010d). Both documents are available on BLM's RMP Web site (http://www.blm.gov/co/st/en/fo/gjfo/rmp.html).

Current Conditions

The BLM was established as the responsible agency for the administration of leasing and development of the federal mineral estate in the Mineral Leasing Act of 1920. In the Planning Area, subsurface mineral estate administered by the BLM (i.e., federal mineral estate) totals 1.2 million acres. The mineral estate acres are greater than BLM surface acres (1,061,400 acres) because BLM manages federal mineral estate underlying some privately owned and State-owned lands. The BLM also manages the federal mineral estate underlying National Forest System Lands. The US Forest Service has the authority and responsibility (Federal Onshore Oil and Gas Leasing Reform Act, 1987) to determine which National Forest System lands are available for oil and gas leasing and identify the specific lands which BLM may offer to lease. Additionally, for National Forest System lands, the US Forest Service is the surface management agency responsible for prescribing lease terms that provide reasonable protection to surface resources and values, and for implementing the terms of the leases. The BLM is responsible for all subsurface activities related to exploration and development.

The GJFO manages mineral estate underlying National Forest system lands within portions of the White River National Forest and the Grand Mesa, Uncompahgre and Gunnison National Forests. Lease parcels within the Planning Area are reviewed for conformance with Oil and Gas Leasing EISs issued by those forests (see **Section 1.10.1**). The review includes a process whereby the lease parcel is reviewed to determine if it was identified as administratively open to leasing in the relevant Forest Plan and the identification of stipulations included in the plan which the US Forest Service, as the surface management agency, identified as necessary for protection of surface resources. Both forests are revising their oil and gas leasing plans and BLM is a cooperating agency. Should the plans be finalized, the BLM would adopt those documents and refer to the decisions reached to review parcels for availability for leasing subject to the stipulations identified in the plan.

Management coordination between the US BOR and the BLM on US BOR acquired and withdrawn lands (BOR lands) is spelled out in the Interagency Agreement Between the Bureau of Reclamation and the Bureau of Land Management signed March 25, 1983 (BOR and BLM 1983). Within the GJFO planning area, the US BOR administers approximately 3,700 acres of acquired lands, and approximately 4,883 acres of withdrawn lands associated with 3 constructed and active Reclamation projects (Collbran Project, Grand Valley Project, and the Grand Valley Unit of the Colorado River Basin Salinity Control Project). These lands are classified as 5A lands by the 1983 IA; the US BOR has full management jurisdiction on these lands. Approximately 3,073 acres are

withdrawn by the US BOR for the Dominguez Project, which was not authorized for construction. These lands are classified as 5B lands; the BLM has the jurisdiction for these lands, subject to coordination with the US BOR. The US BOR has identified the Dominguez Project withdrawal for revocation.

Management of BOR lands and associated resources is pursuant to BOR law, policy and regulations; other federal laws, policies and regulations; and various agreements. All US BOR withdrawn lands are withdrawn from mineral entry, but not necessarily mineral leasing. On 5A lands the US BOR determines whether federal mineral or geothermal leasing is permissible; the BLM issues such leases only upon the US BOR's consent and concurrence on all conditions and stipulations. BOR lands within Vega State Park, Highline State Park, and Horsethief Canyon State Wildlife Area are managed under agreements with the State of Colorado.

The US DOE Office of Legacy Management currently administers the US DOE's Uranium Leasing Program, managing two lease tracts containing approximately 5,800 acres within the GJFO planning area. These lands are withdrawn from mineral entry and leased by US DOE for the management of uranium and vanadium resources. The US DOE has the jurisdiction for these resources, and the surface management of other resources, such as grazing and recreation, is under GJFO's jurisdiction. The US DOE Uranium Leasing Program is managed under the authority and in accordance with Title 10 CFR Part 760, in cooperation with the BLM and the State of Colorado.

Leasable Minerals

Leasable minerals defined by the Mineral Leasing Act (February 1920; and 43 CFR 3000-3599, 1990) include the subsets leasable solid and leasable fluid minerals. Leasable solid minerals include coal, oil shale, native asphalt, phosphate, sodium, potash, potassium, uranium, and sulfur.

Leasable fluid minerals include oil, gas, and geothermal resources. The rights to explore for and produce these minerals on public land may only be acquired through leasing.

Solid Leasable Minerals

Solid leasable minerals in the planning area include coal, oil shale, potash, and uranium.

Coal. There is one idle underground coal mine operating within the GJFO along Highway 139 in the Book Cliffs. Another larger underground coal mine is proposed in the Book Cliffs near the McClane Canyon mine and is going through the NEPA/permitting process.

There are two geologic intervals of coal-bearing rocks in the GJFO planning area: The Dakota Sandstone and the Mesaverde Group. The Dakota Sandstone coals consist of localized shallow coal outcrops in bluffs above the Dolores and

Gunnison rivers. The Dakota is exposed and partly eroded on the flanks of the Uncompahgre Uplift west of Delta, Colorado.

The Mesaverde Group coals are exposed in the cliff edge of the Book Cliffs north of Grand Junction. The majority of the coal resources in this study are located in the Book Cliffs Region north of Grand Junction.

The coals present in the GJFO planning area vary from semi-bituminous to bituminous B and C in apparent rank. The coal is non-coking, non-agglomerating in nature.

The closed Cameo Mine is east of the Colorado River in the Grand Mesa coal field as are several old coal mines just east of Palisade. The Dakota Sandstone contains coal up to six feet thick in the BLM Grand Junction area. Mostly, it is an impure coal with high ash content. Small pockets of Dakota Sandstone coal represent Low to Moderate potential for mineable coal because they are on geologic trend with the New Horizon mine (BLM 2012a).

Oil Shale. Oil shale is an organic-rich sedimentary rock consisting of calcareous shale with a large amount of organic material known as kerogen. The kerogen likely originated as decaying algae and bacteria that thrived in the nutrient-rich waters of Lake Uinta. It is present throughout the lower Parachute Creek Member and the underlying Garden Gulch Member of the Green River Formation. Oil shale can be found at or near the surface within parts of 20 townships in the northeastern part of the area. Within this area resource grades can be as high as one billion barrels of oil in-place per square mile (Bbbl/sqmi) and average approximately 0.33 Bbbl/sqmi. This is lower than the resources found to the north of the planning area, where grades can exceed two Bbbl/sqmi in places. The entire Piceance Basin is estimated to contain as much as 1,525 billion barrels of oil in place (BLM 2012a).

The oil shale resources in the GJFO planning area occur in mesas that are erosional remnants of a formerly larger area of extent. While this means that the total resource may be lower on a township by township basis, the resources are well exposed and more accessible by surface or underground mining methods (BLM 2012a).

There are no active or proposed oil shale projects as of May 2010. A Final EIS was completed and a Record of Decision was issued in November 2008 amending the 1987 RMP to make lands available for oil shale leasing, but leases have not yet been issued. A NEPA analysis would be conducted prior to lease issuance (BLM 2009d).

Potash. There is a potential undefined potash resource underneath Sinbad Valley, and in 2008 a company expressed interest in exploring the area for potential development via solution mining. Prior to 2008 there had been no exploration activity for potash within the planning area (BLM 2009d).

Potash and salt (sodium chloride) are known to occur in the Paradox Formation, outcropping in the Sinbad Valley at the extreme southwest corner of the GJFO planning area. The probability of occurrence in the Sinbad Valley area is considered High (BLM 2012a).

Uranium. Uranium is considered both a leasable and locatable mineral. It is discussed in detail under Locatable Minerals, below.

Liquid Leasable Minerals

Liquid leasable minerals in the planning area include oil, natural gas, and geothermal fluids.

Oil and Gas. The GJFO planning area contains approximately 1,444,000 acres of federal oil and gas estate. Of these acres, there are 1,273,000 acres of BLM-managed surface, 166,000 acres of privately owned surface, 2,000 acres of State lands, and 7,900 acres of BOR-managed lands. In addition, there are approximately 3,580 acres of BLM-managed surface overlying private minerals.

Private surface lands, where there is no federal oil and gas mineral estate, account for 554,000 acres (BLM 2009d).

Annual leasing of oil and gas since 1992 has varied from 0 acres in 2011 to 122,937 acres in 2006, with an average of 29,522 acres per year (**Table 3-30**, Federal Oil and Gas Acreage Leased By Year). Existing mineral leases for oil and gas are shown in **Figure 3-15**, Oil and Gas – Leases and Wells. The planning area has 820 active leases containing 690,100 acres. The average size of these leases is 840 acres. Currently, there are 961,600 acres open to leasing within the planning area. The GJFO has approved an average of 13 wells per year in the past 20 years (**Table 3-31**, Wells Approved and Drilled By Year).

Table 3-30
Federal Oil and Gas Acreage Leased By Year

Year	Acres Leased	Year	Acres Leased
1992	17,596	2002	20,441
1993	17,202	2003	48,839
1994	44,169	2004	61,085
1995	32,990	2005	42,810
1996	14,893	2006	122,937
1997	13,894	2007	12,404
1998	7,927	2008	10,517
1999	5,665	2009	2,060
2000	38,395	2010	4,513
2001	72,094	2011	0
		Average Acres:	*29,522*

Source: BLM 2009d, 2010a

Table 3-31
Wells Approved and Drilled By Year

Year	Wells Aproved	Wells Drilled	Year	Wells Approved	Wells Drilled
1992	20	23	2002	4	3
1993	7	7	2003	11	10
1994	17	17	2004	20	13
1995	7	7	2005	16	19
1996	8	8	2006	43	39
1997	4	4	2007	25	18
1998	6	3	2008	35	25
1999	3	6	2009	13	3
2000	3	2	2010	0	2
2001	5	6	2011	10	5
Total	*257*	*220*	*Average*	*13*	*11*

Source: BLM 2009d, 2010a

As of January 2011 there were 30 BLM-approved multi-well pads that contain an average of five to six federal wells per pad. These pads are located on federal and private surface. A majority of the multi-well pads have been approved since 2005 and are necessary to efficiently develop high well density areas. Two underground gas storage agreements are currently leased for a total of 2,404 acres. Five injection/disposal wells have been permitted since 1987.

The BLM has approved 170 federal wells on the multi-well pads. In some cases, additional private wells are located on each multi-well pad. On average there are seven wells located on each multi-well pad. This number may be low, as additional wells are added to private surface pads without any required approval or notification to the BLM.

In the Collbran area, where wells are being drilled at a density of 10 acres per well (downhole locations), the pads may contain as many as 21 wells. See **Table 3-32,** Status of Existing Federal Mineral Estate Wells, for the status of wells in the GJFO.

Table 3-32
Status of Existing Federal Mineral Estate Wells

Status of Well Development	No. of Wells
Currently completed – producing or shut in	521
Approved applications, but not drilled	35
Plugged and abandoned	68
Abandoned – surface reclamation is pending acceptance	67
Drilling or not completed	7
Total	*698*

Source: BLM 2009d

Geothermal. The BLM has statutory authority for leasing geothermal mineral rights under the Geothermal Steam Act of 1970 (PL 91-581; 30 USC §§ 1001-1027, December 24, 1970, as amended, 1977, 1988, and 1993). Geothermal resources are a source of energy that uses the natural heat of the earth's interior, carried to the surface by steam and/or hot water. Geothermal resources have been used in Colorado since the early 1900s.

In cooperation with the National Renewable Energy Laboratory (NREL), the BLM assessed renewable energy resources on public lands in the western US (BLM and DOE 2003). The BLM reviewed the potential for geothermal energy on BLM, Bureau of Indian Affairs, and US Forest Service lands in the western US, except Alaska. In May 2008, the BLM signed a ROD for the Geothermal Leasing Programmatic EIS (BLM 2008d). This document serves as the baseline for the assessment of geothermal resources in the GJFO decision area.

Renewable energy potential within the planning area, excluding right-of-way exclusions, WSAs, and no-lease areas under oil and gas stipulations, are discussed below under Current Management. Geothermal energy potential for all lands within the planning area, including lands excluded under the Current Management discussion, are discussed below under Resource Potential.

Current Management. The GJFO RMP (BLM 1987) does not address geothermal energy; however, the RMP was amended by the 2008 Programmatic EIS for Geothermal Leasing in the Western US (BLM 2008d). The ROD for the PEIS identified 420,106 acres as being open to geothermal leasing, and 66,622 acres as being closed to geothermal leasing. The open areas generally encompass the eastern half of the GJFO.

Resource Potential. The GJFO decision area, excluding WSAs and areas closed to oil and gas leasing, has 397,500 acres of federal mineral estate identified as having geothermal potential. As shown in **Figure 3-16**, Geothermal Energy Potential, all of this acreage lies within the mid-to-eastern portion of the planning area.

The Programmatic EIS for Geothermal Leasing in the Western US (BLM 2008d) evaluated 12 states for geothermal energy potential. It focused on areas where there may be underground reservoirs of hot water or steam created by heat from the earth or that have subsurface areas of dry hot rock. These areas are where the BLM would mostly likely receive geothermal lease nominations and applications in the future. The Programmatic EIS used GIS data from the Colorado Geological Survey and included areas of both direct (non-electrical) use and indirect (electrical power) applications. This information was based on data from known hot springs combined with oil and gas basins that have potential for geothermal resources by virtue of bottom-hole temperatures. Colorado Geological Survey considered geothermal heat flow and gradient data from other sources in creating the potential area.

Existing Activity. There are no geothermal facilities, leases, or pending lease applications in the GJFO decision area (BLM 2009d; GeoCommunicator 2009). No existing hot springs or other geothermal features have been identified within the planning area (BLM 2009d).

Master Leasing Plan

The Shale Ridges and Canyons Master Leasing Plan (MLP) in Appendix P of the Draft RMP/EIS has been revised and incorporated in the Proposed RMP/Final EIS in Chapters 1, 2, 3, and 4. The condition and trend of the natural and human environments of the MLP area are the same as those described for the planning area, described in the fluid minerals discussions, below.

The MLP concept, introduced in May 2010 via the Washington Office's Oil and Gas Leasing Reform IM 2010-117, promotes a proactive approach to planning for oil and gas development. Generally, the BLM uses RMPs to make oil and gas planning decisions, such as areas closed to leasing, open to leasing, or open to leasing with major or moderate constraints (lease stipulations) based on known resource values and reasonably foreseeable oil and gas development scenarios. However, this policy acknowledged that additional planning and analysis may be necessary in some areas prior to new oil and gas leasing because of changing circumstances, updated policies, and new information.

Master Leasing Plan Proposal. In August 2010, the Wilderness Society and the Center for Native Ecosystems submitted recommendations that the BLM prepare a Shale Ridges and Canyons MLP. This proposal encompasses 908,600 acres, including 640,700 acres of BLM-administered surface land and 700,900 acres of federal mineral estate (see **Figure 3-21**, Master Leasing Plan Surface Management and Split Estate). The externally recommended MLP is within the GJFO boundary and overlaps with most of the northern half of the RMP planning area.

To determine whether or not circumstances warrant additional planning and analysis, IM 2010-117 lists numerous criteria to be considered. Specifically, the BLM must prepare an MLP when all four of the following criteria are met:

- A substantial portion of the area to be analyzed in the MLP is not currently leased.
- There is a majority federal mineral interest.
- The oil and gas industry has expressed a specific interest in leasing, and there is a moderate or high potential for oil and gas confirmed by the discovery of oil and gas in the general area.
- Additional analysis or information is needed to address likely resource or cumulative impacts if oil and gas development were to occur where there are:
    - multiple-use or natural/cultural resource conflicts;

- impacts on air quality;
- impacts on the resources or values of any unit of the NPS, national wildlife refuge, or National Forest wilderness area, as determined after consultation or coordination with the NPS, the US Fish and Wildlife Service, or the Forest Service; or
- impacts on other specially designated areas.

The BLM has the discretion to complete an MLP for areas that do not meet the MLP criteria. For example, even though a substantial portion of an area is already leased or lacks a majority federal mineral interest, additional analysis of measures to resolve potential resource conflicts may benefit future leasing decisions.

The MLP process entails analyzing likely development scenarios and varying levels of protective design features and mitigation measures in a defined area with greater detail than a traditional RMP allocation analysis but at a less site-specific level than a development plan that has been fully defined by an operator.

Chapter 3 of the RMP/EIS, Affected Environment, describes 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. Resource and resource use discussions include a description of current conditions and a characterization of trends expressing the direction of change between the present and some point in the past.

Master Leasing Plan Nominated Areas Criteria Analysis

Criterion #1: A substantial portion of the area to be analyzed in the MLP is not currently leased.

The externally recommended Shale Ridges and Canyons MLP area does not meet this criterion. There are 648,900 acres currently open to leasing within the externally recommended MLP area. As shown in **Figure 3-17**, Master Leasing Plan Oil and Gas Leases, 482,200 of those acres (74 percent) are currently leased for oil and gas development.

Criterion #2: There is a majority federal mineral interest.

The externally recommended Shale Ridges and Canyons MLP area meets this criterion. The GJFO has jurisdiction over 640,700 surface acres (71 percent of the externally recommended MLP area), and 700,900 acres of federal mineral estate (77 percent of the externally recommended MLP area).

Criterion #3: The oil and gas industry has expressed a specific interest in leasing, and there is a moderate or high potential for oil and gas confirmed by the discovery of oil and gas in the general area.

The externally recommended Shale Ridges and Canyons MLP area meets this criterion. Approximately 686,300 acres (98 percent) of the federal mineral estate within the externally recommended MLP area is considered to have development potential for oil and gas (see **Figure 4-1**, Master Leasing Plan Oil and Gas Potential). Of that area, 211,900 acres (31 percent) is unleased and would be subject to the stipulations proposed in the RMP/EIS and discussed below.

There are 400 producing federal wells within the externally recommended MLP boundary. Industry continues to express interest in leasing within the externally recommended MLP area.

Criterion #4: Additional analysis or information is needed to address likely resource or cumulative impacts if oil and gas development were to occur where there are multiple use or natural/cultural resource conflicts; impacts on air quality; impacts on the resources or values of any unit of the NPS; or impacts on other specially designated areas.

The externally recommended Shale Ridges and Canyons MLP meets this criterion. The external MLP proposal focused primarily on concerns regarding fish and wildlife, special status species, recreation, Citizen Wilderness Proposals, ACECs, and CNHP Potential Conservation Areas (PCAs). According to IM 2010-117, other important national and local resource issues that should be considered when developing an MLP include air quality; Special Recreation Management Areas; nearby state, tribal, or other federal agency lands; cultural resources; paleontological resources; visual resources; watershed conditions, including steep slopes and fragile soils; municipal watersheds; public health and safety; and the ability to achieve interim and final reclamation standards.

Potential Resource Conflicts. The external proposal identified a series of potential resource conflicts, displayed in **Table 3-33**, Potential Resource Conflicts. In addition, the BLM identified other resource concerns and values present in the MLP analysis area. All of those resources and uses are fully addressed in this MLP.

Table 3-34, Selected Leasing Constraints in the MLP Area (Alternative B), displays some allocations and designations in the MLP area that would restrict fluid mineral activities. Restrictions to be applied in these areas are displayed in the Master Leasing Plan section in Table 2-2. This list is not exhaustive; the impacts on fluid mineral development from these restrictions and additional stipulations and COAs is described in Section 4.4.5, Energy and Minerals. In addition to the areas listed in the table, the MLP analysis area is home to the Dinosaur Diamond Prehistoric Highway and the Grand Mesa Byway.

Table 3-33
Potential Resource Conflicts

Resource/Use	Not Present	Present/Not Protected	Present/May be Protected
Identified in External Proposal			
Land Ownership			X
Recreation and Tourism			X
Greater Sage-Grouse			X
Aridlands Burrowing Mammal Communities			X
Big Game and Wide-ranging Mammals			X
Raptors			X
Fish			X
Rare Plants			X
Citizen Wilderness Proposals			X
Identified by BLM			
ACECs			X
Air Quality			X
Cultural Resources			X
Watersheds			X
Fragile Soils			X
Steep Slopes			X

Table 3-34
Selected Leasing Constraints in the MLP Area (Alternative B)

Areas	Acres
Areas of Critical Environmental Concern	70,500
Special Recreation Management Areas	21,000
Extensive Recreation Management Areas	133,300
Wildlife Emphasis Areas	66,000
VRM Class I and II	230,100
National, State, and BLM Byways	15,000
Wilderness Study Areas	52,000
Closed to Fluid Mineral Leasing and Currently Unleased	54,600
NSO Stipulations (federal mineral estate)	374,800
CSU Stipulations (federal mineral estate)	378,800
TL Stipulations (BLM surface lands)	281,400
ROW Exclusion	104,500
ROW Avoidance	508,000

Locatable Minerals

Locatable minerals (metallic and non-metallic) are those that can be located and claimed under the Mining Act of 1872. Placer and lode gold, limestone (special quality/special use variety), alabaster, copper, silver, gemstones (amethyst and fluorite), and uranium are further discussed below.

Gold

Gold has been mined within the GJFO planning area from both lode and placer deposits. Most of the placer gold activity in the GJFO planning area has occurred on and off for 135 years, mainly in the terrace gravels along the Dolores River corridor in the far southwest portion of the area, with additional interest in the Gunnison and Colorado River areas.

Lode gold was reported in the copper deposits in both the Unaweep Canyon and Sinbad Valley. The deposits are reported to occur in "fissure veins" mainly in sandstone (BLM 2012a).

There are no large-scale mining operations or dredging activities within the planning area. There has been recreational small-scale placer activity along the Dolores River south of Gateway (BLM 2009d).

Alabaster/Gypsum

Historically there has been one small-scale surface mining operation south of Gateway along Highway 141. There are no active operations underway (BLM 2009d).

Uranium/Vanadium

Uranium and vanadium are considered together, because they occur together in the ores of the GJFO planning area. Within the GJFO planning area, uranium and vanadium are known to occur primarily in the Salt Wash Member of the Jurassic Morrison Formation, although mineralization has been reported from both the Chinle Formation and the overlying Wingate Sandstone and Kayenta Formation of the Glen Canyon Group.

The Chinle Formation hosts uranium deposits that have been mined in Utah and in other areas of the Uravan Mining District in Colorado; however no mining has taken place within the GJFO planning area in this formation. Uranium has been found in the Wingate and Kayenta Formations on the Colorado Plateau, but none within the GJFO planning area (BLM 2012a).

There has been extensive exploration and mining for uranium and vanadium in the Uravan mineral belt since the early 1900s. The first underground uranium/vanadium mine permitted in the planning area since implementation of the BLM 3809 regulations occurred in September 2008. There have been approximately 15 exploration drilling projects and 3 to 4 bulk sampling projects conducted between 2005 and 2008 (BLM 2009d).

Copper

Early descriptions of copper in southwest Colorado, observed that copper mineralization in the area was associated with faults and fissure-filling dikes that cut both the Paleozoic redbeds and the underlying crystalline Precambrian rocks. Copper mineralization has been found mainly at the base of the Triassic Wingate Formation (Glen Canyon Group), although it has been reported from

the Chinle Formation, the Entrada Sandstone, and even in the Salt Wash Member of the Jurassic Morrison Formation. Copper (and minor gold) mineralization was also found associated with veins in Precambrian rocks in Glade Park.

The occurrence potential for copper in the Sinbad Valley, in the extreme southwest corner of the GJFO planning area, is considered to be High as well as areas of historic small-scale copper mining in the Unaweep District northeast of Gateway. In the Unaweep Canyon area, areas away from the historic mines have a Moderate potential, as do other geologic strata in the south of the GJFO planning area that contain redbed copper deposits in adjacent states (BLM 2012a).

There is one Notice of Intent on file for collection of hand specimen quality copper minerals (azurite and malachite) from an existing underground mine. Copper was produced from some of the historic uranium/vanadium mines in the Uravan mineral belt within the GJFO (BLM 2009d).

Silver, Tungsten, Zeolite, Limestone

Silver has been found sporadically within the GJFO planning area, commonly associated with copper. The copper deposits of the Sinbad Valley have yielded silver, associated with faulting and fracturing. In the Unaweep Canyon area, silver has been described as occurring in "fissure veins in sandstones" (BLM 2012a).

The documented occurrence of silver deposits in the southwest end of the GJFO and adjacent areas of the Colorado Plateau leads to an assessment of Moderate occurrence potential for silver in the Sinbad Valley. Small, localized deposits containing silver in the Unaweep Canyon provide a Low occurrence potential (BLM 2012a).

There currently is no interest or activity related to these minerals within the GJFO (BLM 2009d).

Gemstones (Amethyst and Fluorite)

There are no approved mining operations for these minerals at the current time, but the public has been mineral collecting at a few abandoned underground mines along Highway 141 southwest of Whitewater, Colorado (BLM 2009d).

Mineral Materials

Mineral materials include sand and gravel, and construction materials that are sold or permitted under the Mineral Materials Sale Act of 1947. The mineral materials program on BLM-administered lands within the GJFO planning area centers mainly around the use of sand and gravel for concrete aggregate, road base and coverings, construction fill, and rock for aggregate, riprap, and decorative purposes (flagstone and moss rock). Other mineral materials, such as

silica sand, are also produced in Colorado but not in the GJFO planning area. Mineral materials are sold at a fair market value or through free use permits to governmental agencies. Local government agencies and non-profit organizations may obtain these materials free of cost for community purposes. County and state road construction divisions are the significant users of gravel and sand resources (BLM 2009d).

Sand and gravel, as construction aggregate, is an extremely important resource. The extraction of the resource varies directly with the amount of development nearby – road building and maintenance, and urban development, as sand and gravel is necessary for that infrastructure development. Even more so than other resources, however, the proximity of both transportation and markets are key elements in the development of a deposit.

Generally the most valuable is the gravel component, so commonly deposits are sought that contain higher proportions of gravel. Stream channel deposits are commonly sought. Flood plain and older terrace deposits are commonly utilized, along with alluvial fans. In general, flood plain areas are privately owned, including both surface and mineral estate, and not under the administration of the GJFO.

Eight areas within the GJFO planning area contain sand and gravel deposits – the Colorado River flood plain, the Gunnison River valley, upland deposits in the Whitewater area, the Plateau Creek area, the Upper Grand Valley (north of the Colorado River and south of the Book Cliffs), the Uncompahgre Plateau area, the Dolores River area, and the Roan Creek area (BLM 2012a).

There are two active commercial sand and gravel operations and three common use areas identified for disposal of decorative rock (moss rock, flagstone, and basalt boulders), bentonite clay, adobe fill, and red gravel via over-the-counter permit sales. Three common areas were closed due to a new NCA designation (BLM 2009d).

Dimension stone is a general term for rock products that are finished to specific shape and size for building, monuments, industrial applications, or other end use. Other stone of similar characteristics is sold "raw," and uncut and later sorted into shapes and sized. Flagstone consists of thin slabs of stone used for paving. Fine-grained sandstone is the most popular and common type, and the principle rock type found in the GJFO planning area.

The Wingate Sandstone, in particular, has been a popular source of dimension stone as flagstone. Quartzite within the Burro Canyon Formation tends to break into angular blocks and shows some potential for use as building stone. Boulders within glacial deposits from the Grand Mesa, just south of the GJFO planning area, can be utilized as decorative stone. In the GJFO planning area, the most common type is termed "moss rock," for the covering with lichens that give the rock an aged appearance.

Salable varieties of clay are widespread in the GJFO planning area and present in several stratigraphic units. None of the clays present have been defined or described as locatable varieties. The Brushy Basin Member of the Morrison Formation contains abundant bentonite but its occurrence is sporadic. The Mancos Shale contains layers of clay and the weathered products of clay-rich zones of the Mancos have been used in the area as adobe bricks.

The Dakota Sandstone is known to contain usable clay in other areas of Colorado, including refractory clay that has been mined commercially.

The existing Little Park Road community pit has a High occurrence potential, while the remainder of the Morrison Formation has a Moderate occurrence potential (BLM 2012a).

Renewable Energy

Renewable energy includes solar, wind, geothermal, and biomass resources. Geothermal resources are discussed under Leasable Minerals, above. Biomass resources are discussed under **Section 3.3.1**, Forestry. As demand has increased for clean and viable energy to power the nation, consideration of renewable energy sources available on public lands has come to the forefront of land management planning.

In cooperation with the NREL, the BLM assessed renewable energy resources on public lands in the western US (BLM and DOE 2003). The BLM reviewed the potential for concentrated solar power, photovoltaics, and wind energy on BLM, Bureau of Indian Affairs, and US Forest Service lands in the western US, except Alaska. In December 2005, the BLM signed a ROD for the Wind Programmatic EIS (BLM 2005b). These documents will serve as the baseline for the assessment of renewable energy resources in the GJFO decision area.

Renewable energy potential for solar and wind within the planning area is broken down into subcategories below. The potential for these resources are described below under *Current Management,* and excludes the following areas:

- Solar: areas designated as right-of-way exclusion areas and WSAs; and
- Wind: areas designated as right-of-way exclusion areas and WSAs.

The renewable energy potential for all lands (i.e., regardless of ownership) within the planning area, including lands excluded under the section *Current Management*, are discussed below under the section *Resource Potential*. Geothermal energy is discussed under the following section, *Leasable Minerals*.

<u>Solar</u>

<u>*Current Management.*</u> Solar energy development on BLM-administered lands is managed through ROW authorization under Title V of the FLPMA and 43 CFR

2800. The GJFO RMP does not address the development of solar energy resources (BLM 1987). The Office of Energy Efficiency and Renewable Energy, Department of Energy, and the BLM have completed a Programmatic Environmental Impact Statement to evaluate utility-scale solar energy development, to develop and implement Agency-specific programs or guidance that would establish environmental policies and mitigation strategies for solar energy projects, and that amended relevant BLM land use plans with the consideration of establishing a new BLM Solar Energy Program.

Resource Potential. Excluding unsuitable public utility areas (ROW exclusions) and WSAs, the GJFO planning area has solar potential as follows:

- 220,569 acres with moderate concentrated solar power potential or very good photovoltaic potential (five to six kilowatt-hours per square meter per day).
- 589,660 acres with good concentrated solar power potential or excellent photovoltaic potential (six to seven kilowatt-hours per square meter per day) (BLM 2012a).

Based on resource availability, portions of the GJFO have potential for utility-scale solar energy development; however, based on feasibility for industrial production, the planning area did not rank among the top 25 BLM planning areas in the US having the highest concentrated solar power or photovoltaic potential. An area was considered to have high potential as a solar emphasis zone if it met the following criteria (BLM and DOE 2003):

- A minimum direct solar resource of six kilowatt-hours per square meter per day;
- Terrain slope of less than or equal to five percent for concentrated solar power or one percent for photovoltaic;
- Within 50 miles of 115- to 345-kilovolt transmission lines;
- Within 50 miles of a major road or railroad;
- A minimum parcel size of 40 contiguous acres;
- On Bureau of Indian Affairs, BLM, or US Forest Service lands; and
- BLM and US Forest Service compatible land use.

While strong solar resources are available across the planning area, there are limited areas with the above-listed appropriate conditions for utility-scale solar emphasis zones. As shown in **Figure 3-17**, Solar Energy Potential, the area with the most notable appropriate conditions for utility-scale solar energy development is the desert north of Grand Junction, from Mt. Garfield to the Utah state line. The Solar Energy Development Programattic EIS (PEIS; BLM 2012e) has been prepared for solar energy on BLM-administered lands.

The PEIS identified 285,000 acres in 17 Solar Energy Zones (SEZs) that allow for development of projects that would produce more than 20 megawatts (MW) of power. Under the PEIS projects that would produce more than 20 MW of power are allowed unless they are located in SEZs. BLM has determined that development of new SEZs will be necessary in order to meet the reasonably foreseeable development scenario for solar energy. The RFDS for Colorado identifies the need to provide an additional 2,194 MW by 2030, which would require approximately 19,746 acres of public land managed by the BLM.

Criteria for adding creating new SEZs are outlined in the PEIS ROD (BLM 2012e). The BLM will use the following criteria when considering whether to identify new or expanded SEZs. In most situations, SEZs should be:

- Relatively large areas that provide highly suitable locations for utility-scale solar energy development;
- Locations where solar energy development is economically and technically feasible;
- Locations where there is good potential for connecting new electricity-generating plants to the transmission distribution system; and
- Locations where there is generally low resource conflict (BLM 2012e).

Existing Activity. No applications for solar power have been received by the GJFO (GeoCommunicator 2009), though several parties have made inquiries and BLM held one pre-application meeting in 2009.

Wind

Current Management. Wind energy development on BLM-administered lands is managed through ROW authorization in accordance with the terms and conditions of BLM's Wind Energy Development Policy (IM 2009-043 [BLM 2009h]). This policy provides guidance on processing ROW applications for wind energy site testing and monitoring facilities, as well as applications for wind energy development projects on BLM-administered lands. The GJFO RMP does not address the development of wind energy resources (BLM 1987) and it was not amended by the Wind Programmatic EIS (BLM 2005b).

Resource Potential. The Wind Programmatic EIS (BLM 2005b) categorizes public lands into areas having a low, medium, or high potential for wind energy development from 2005 through 2025. Wind resources in Class 3 and higher areas could be developed economically with current technology over the next 20 years. Class 3 resources have medium potential; Class 4 and higher resources have high potential. The Wind Programmatic EIS (BLM 2005b) identifies public land parcels in the following areas with medium or high wind

resource potential that might be developed economically with current technology:

- Cow Ridge, approximately 10 miles northwest of the town of DeBeque;
- Garfield Mesa, approximately 21 miles west of DeBeque;
- Pike Ridge, approximately 33 miles northwest of DeBeque;
- Unnamed mountain ridge around the town of Atchee; and
- Upper 4A Mountain, approximately 23 miles northwest of DeBeque.

These areas, which are concentrated along ridgetops, are shown in **Figure 3-18**, Wind Energy Potential.

In general, lands within the GJFO do not have high potential for wind energy. The GJFO planning area has 106 acres identified as having excellent (500 to 600 W/m^2) wind energy potential and 10 acres identified as having outstanding (600 to 700 W/m^2) wind energy potential (BLM 2005b). These areas are concentrated along Cow Ridge towards the eastern side of the ridge. Other areas with marginal (200 to 300 W/m^2), fair (300 to 400 W/m^2), and good (400 to 500 W/m^2) wind energy potential are concentrated on ridges along either side of Route 139 in the northwest portion of the planning area (acreages provided below). Additionally, ridges along the Colorado-Utah border in the southwestern corner of the planning area also have areas with marginal and fair energy potential.

Acreages by wind power potential class in the GJFO planning area, excluding unsuitable public utility areas (ROW exclusions) and WSAs, are as follows:

- Class 1 (unsuitable for utility-scale wind development) (0 to 200 W/m^2) – 803,516 acres
- Class 2 (marginal) (200 to 300 W/m^2) – 3,130 acres
- Class 3 (fair) (300 to 400 W/m^2) – 1,930 acres
- Class 4 (good) (400 to 500 W/m^2) – 458 acres
- Class 5 (excellent) (500 to 600 W/m^2) – 106 acres
- Class 6 (outstanding) (600 to 700 W/m^2) – 10 acres

Existing Activity. A 2,620-acre wind energy testing site in the Horse Mountain area south of Palisade, authorized under COCO 73717, has been approved and one meteorological tower was constructed in 2009.

Trends

Solid Leasable Minerals

Coal

The Mesaverde Group coals in the GJFO planning area are the main source for potential future development. The development potential for Mesaverde coals at less than 3,000 foot depth is High; for Mesaverde coals at greater than 3,000 feet is Moderate. The development potential for coals in the Dakota group is Low. Coal development activity is expected to result in three new underground mines in the Book Cliffs near the now active McClane Canyon coal mine (BLM 2012a).

Oil Shale

The potential for increasing prices for petroleum and the constantly developing technological advances are interpreted to give the area a Moderate level of probability for development. This development will probably involve small, experimental pilot operations (BLM 2012a).

Potash

Recent inquiry about an exploration permit for the area supports the conclusion that development potential within the next twenty years is High (BLM 2012a).

Fluid Leasable Minerals

Oil and Gas

Swings in the natural gas market price are the likely driver in the industry's interest for oil and gas leases and the resulting requests for drilling permits. As prices rise, more interest in oil and gas development is expected (BLM 2009d).

Recently there has been increasing interest in horizontal drilling in the Mancos/Mowry shale play. Approximately 50 percent of the drilling proposals received by the GJFO since 2010 have been for horizontal wells targeting the shale formation. GJFO mineral lessees indicate there will be little interest in development of conventional or shale gas at current prices. However, exploration is expected to continue.

Geothermal

There is some potential for geothermal energy throughout the eastern part of the planning area. The potential for geothermal energy may be of interest to commercial developers, depending on economic factors. No interest has been shown for geothermal development.

Locatable Minerals

It is unlikely that any significant metallic (gold or other metallic minerals) mining, except uranium, will be present in the planning area in the next 20 years. Casual

use and recreational gold mining activities have increased and will likely increase more in the future (BLM 2009d).

Gold

The occurrence potential for gold in the GJFO planning area is High (High D) as placer deposits along the Dolores River corridor. The development potential on the alluvial plain and the benches above the Dolores River is considered High also. There is considered to be No potential for occurrence or development of lode gold within the GJFO planning area (BLM 2012a).

Uranium/Vanadium

The areas of historical mining are considered to have a High potential for development, the NURE Favorable Area has a Moderate potential for development, and the Morrison Formation in the GJFO planning area, outside those two areas, is considered to have Low potential.

The assumption is made that the price of uranium will encourage mine development in the GJFO planning area in the next twenty years (BLM 2012a).

Copper

Copper resource development potential in the Sinbad Valley is Moderate and development potential is Low in the other areas (BLM 2012a).

Silver, Tungsten, Zeolite, Limestone

There is considered to be no reasonably foreseeable development for silver alone. It is more likely that silver would be a by-product of copper mining, noted above (BLM 2012a).

Mineral Materials

As the population of the Grand Valley and surrounding areas continues to grow, demand for mineral material resources will increase from current conditions. Increased emphasis on xeriscaping will also likely increase demand. The GJFO planning area will be the best source for the regional market since it is the closest source (BLM 2009d).

The potential for sand and gravel development is Moderate for any specific area within the GJFO planning area.

Decorative stone development potential for the Glen Canyon Group (and specifically the Wingate Sandstone) is Moderate, as are the glacial deposits. The development potential of the Burro Canyon Formation is Low.

Clay resources development potential at the existing pit is High, while it is Moderate for the rest of the Morrison Formation and Mancos Shale in the planning area (BLM 2012a).

Renewable Energy

The demand for renewable energy-related ROWs should increase nationally, although within the GJFO planning area, the potential for wind and solar energy is low.

Based on available acreage, the potential for solar energy is greater than for wind energy, although the only project application received to date from the GJFO has been for wind energy.

3.3.4 Recreation and Visitor Services

The following section describes recreation and visitor services on BLM-managed lands in the GJFO planning area.

Current Conditions

The primary recreational activities in the GJFO are mountain biking, trail running, all-terrain vehicle use, off-road motorcycling, motorized vehicle touring, hiking, big and small game hunting, backpacking, horseback riding, sight-seeing, rock climbing, and river boating. Recreation-based visitor use in the GJFO has increased in most areas, with the greatest increase in the North Fruita Desert, Bangs Canyon area, and most recently, the Gateway area. In accordance with BLM's multiple-use mandate, per the FLPMA, the agency seeks to provide recreational opportunities that include dispersed, organized, competitive, and commercial uses.

Recreation-Tourism Elements

Western Colorado is a world-renowned destination for outdoor recreation enthusiasts. Recreation visitors to the GJFO planning area come from not only the local Grand Valley area (which includes the City of Grand Junction, as well as other smaller communities such as Fruita and Palisade) and other regions of Colorado, but also from other national and international locations.

<u>Grand Valley Visitors</u>

An increasing number of people are living near or seeking local public lands for diverse recreational opportunities. The Grand Valley area is visited by recreationists year-round resulting in increased recreational demands on BLM lands. Grand Junction, Fruita, Loma, Mack, Palisade, Whitewater, Gateway, and DeBeque all have public lands bordering them that are used as community-based recreation assets by local residents. Due to the proximity of these lands to local communities and the heavy use by their residents, these public lands experience the greatest use on a daily basis. In local communities where populations are increasing rapidly, such as Grand Junction and Fruita, recreation demands on public lands are also intensifying.

<u>Visitors From Outside Grand Valley but Within Colorado</u>

During the spring and fall, many Colorado residents who seek relief from the long winters come to the Grand Valley to recreate on public lands in the GJFO planning area. The Grand Valley's relatively mild climate allows recreationists to

participate in outdoor activities that are otherwise not possible due to unfavorable weather conditions in other regions. While visitors to the area come from all parts of the state, a large portion come from the Denver metropolitan area and other Front-Range Colorado communities because it is easily accessible via Interstate 70.

National (Outside Colorado) and International Visitors

The GJFO planning area is located in a popular tourist corridor that connects Moab, Utah to the high country of the Rocky Mountains via Interstate 70. Visitors outside of Colorado are attracted to this area because of the first-class recreation opportunities it provides. The range of year-round recreation opportunities in the GJFO includes mountain biking, horseback riding, OHV use, hiking, rock climbing, camping, skiing, and water-sports, such as kayaking, fishing, and rafting.

Recreation Management Areas

Special Recreation Management Areas

Current BLM guidance identifies SRMAs 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. SRMAs are managed to protect and enhance a targeted set of activities, experiences, benefits, and desired recreation setting characteristics. SRMAs may be subdivided into recreation management zones (RMZs) to further delineate specific recreation opportunities. Within SRMAs, recreation and visitor service management is recognized as the predominant land use planning focus, where specific recreation opportunities and recreation setting characteristics are managed and protected on a long-term basis. SRMAs/RMZs must have measurable outcome-focused objectives. Supporting management actions and allowable use decisions are required to: 1) sustain or enhance recreation objectives, 2) protect the desired recreation setting characteristics, and 3) constrain uses, including non-compatible recreation activities that are detrimental to meeting recreation or other critical resource objectives (e.g., cultural or threatened and endangered species).

The 1987 GJFO RMP identified the Gateway area (41,000 acres) and Grand Valley area (176,000 acres) as Intensive Recreation Management Areas[1] (IRMAs) to protect high value recreation sites and sensitive areas. Since that time, approximately 58,106 acres of the Grand Valley IRMA was carved out to create Bangs Canyon SRMA (**Figure 2-18**, Alternative A: Special Recreation Management Areas) and 72,656 acres as the North Fruita Desert Planning Area. Plans written for both of these areas provided for enhanced recreational

[1] The term "Intensive Recreation Management Area" is no longer used by BLM. An area where recreation is the management focus is now referred to as a "Special Recreation Management Area (SRMA)."

opportunities, made travel management decisions, and took a community-based planning approach.

The Bangs Canyon SRMA management plan designated six recreation management zones, which collectively provide opportunities for a diverse set of recreation opportunities and outcomes. The Lunch Loop Trail System provides mountain biking, hiking and trail running opportunities in close proximity to Grand Junction. Multiple trails, including Butterknife, Third Flats, the Tabeguache, and Billings Canyon, provide routes designated for motorcycles, ATVS, rock crawlers and 4x4 OHVs. Parts of Rough Canyon and Bangs Canyon are managed for non-motorized/non-mechanized recreation opportunities.

The North Fruita Desert area plan designated three distinct recreation management zones, one focused on mountain biking opportunities (18 Road), one on foot and horse use, and one on motorized OHV recreation.

Extensive Recreation Management Areas

Current BLM guidance defines Extensive Recreation Management Area (ERMAs) as administrative units that require specific management consideration in order to address recreation use, demand or recreation and visitor service program investments. ERMAs are managed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA. Management of ERMA areas is commensurate with the management of other resources and resource uses. Supporting management actions and allowable use decisions must facilitate the visitors' ability to participate in outdoor recreation activities and protect the associated qualities and conditions. Non-compatible uses, including some recreation activities, may be restricted or constrained to achieve interdisciplinary objectives.

More than half of the lands within the GJFO planning area are managed as the GJFO ERMA, which is characterized by a diverse range of natural resource settings and variety of recreation opportunities (**Figure 2-15**, Alternative A: Extensive Recreation Management Areas). This area is managed under previous BLM guidance for ERMAs, where recreation is unstructured and does not require intensive management or significant investments in trails or facilities. Within the ERMA, recreation management is reactive and custodial, addressing visitor health and safety, resource protection, and use and user conflicts. This type of undirected, or dispersed, recreation management affords visitors the opportunity to create their own adventure. Visitors receive little in the way of services or developed recreational facilities.

Use Figures

Most public land use and activity participation estimates depend on a mix of computerized trail counter data, field observations, and professional judgment of the recreation staff and hence are not scientifically based. The general trend across the GJFO has been a 3-7 percent increase in visitation each year. Recreation data are recorded in the BLM's Recreation Management Information

System, which is a web-based application used to track, store, and retrieve data. Estimated recreation-related visits during fiscal year 2002 (October 1, 2001 to September 30, 2002) totaled 502,860, and increased to 839,252 for fiscal year 2011 (October 1, 2010 to September 30, 2011) (BLM 2009j), resulting in an approximately 4 percent annual increase. In 2011, there were an estimated 30,117 visits at the Bangs Canyon Trailhead in Bangs Canyon SRMA and 67,156 visits at the Tabeguache Trailhead for the Lunch Loops Trail System (also in Bangs Canyon SRMA). There were an estimated 68,029 visits to the North Fruita Desert SRMA (BLM 2009j).

River Recreation Management

The GJFO has management responsibilities on the Gunnison River from the Whitewater river access to its confluence with the Colorado River, and the Dolores River from the Montrose-Mesa County line to the Colorado-Utah state line. The third river is the Colorado River, the majority of which crosses private land in the GJFO planning area.

Management and Use – Gunnison River

The section of the Gunnison River within the planning area is primarily used by private boaters for day use boating from Whitewater to Redlands Dam and from Redlands Dam to the confluence with the Colorado River. The Whitewater public river access is just upriver from the Highway 141 bridge and is co-managed by the GJFO, Dominguez-Escalante NCA, and Mesa County. It consists of a basic boat ramp, parking lot and restroom. There are two other public river access points, one just upriver and one just downriver of the Redlands Dam, but no developed public facilities are provided. The section of the Gunnison River managed by the GJFO is approximately 15 miles long and is mostly Class I with a few sections of Class II water. Most of the six commercial outfitters currently permitted on the lower Gunnison River exit the river at the Whitewater access, only occasionally utilizing the final two segments within the GJFO planning area.

Management and Use – Dolores River

The Dolores River is less developed than the Gunnison River and receives much less use. There are no official put-ins or identified campsites and the river use is generally limited to 2-3 weeks per year. River flow is regulated by releases at the McPhee Reservoir. The GJFO manages approximately 23 miles of the Dolores River between the Montrose-Mesa County line and the Colorado-Utah state line. There are no designated launches on this section of river due to its irregular and unpredictable flow (i.e., it is dam controlled and not floatable in relatively dry years). There is one undesignated launch on county highway property near the bridge on Highway 141 in Gateway that is suitable for trailer and raft use, although most recreational use of this section is via kayak or canoe. Many people put in at this location and float to Dewey Bridge in the BLM's Moab Field Office.

There is a diversion dam west of Gateway that requires a portage in all but the highest flow, and the Stateline Rapids are generally Class III or Class IV depending on water volume. Recreational use in low water is virtually impossible; however, the river receives light use between May and July during high water years.

Management challenges exist on both the Dolores and Gunnison Rivers because recreation sites (e.g., campgrounds and picnic areas) have not been developed to meet the activity demands of the users. Additional infrastructure and maintenance resources may be required to meet the additional recreation demand created by residents and visitors.

Developed Recreation Facilities

Developed recreation sites and facilities have been constructed to enhance recreation opportunities, protect resources, manage activities, or reduce recreation use conflicts. These infrastructure developments range from designated campgrounds to trailheads with simple bulletin boards. The GJFO manages more than 30 developed sites that provide a wide variety of recreation opportunities. Among these sites are two campgrounds, 13 trailheads, 19 restrooms, three river access points, two developed shooting ranges, two picnic areas, and two scenic overlooks (**Figure 3-19**, Developed Recreation Sites).

BLM upgrades recreation facilities as demand for such upgrades increases. These upgrades will be managed in accordance with the prescribed setting character for each particular area. The need for any upgrades or development of additional facilities is overshadowed by a shortfall in maintenance and rehabilitation funds for existing facilities and the high cost of construction for new facilities. Developed recreation sites are maintained by BLM park rangers, seasonal staff, and volunteers.

Developed Campgrounds

Within the GJFO planning area, the GJFO manages two developed campgrounds that contain 53 individual campsites and three group campsites (**Table 3-35**, GJFO Developed Campgrounds). Some of the campgrounds receive heavy use during the shoulder seasons (spring and fall). Most of the developed campgrounds have basic infrastructure, including toilets and picnic tables.

Table 3-35
GJFO Developed Campgrounds

Name	Location	Number of Sites	Fee (2011)
18 Road	North of Fruita	35	None
Mud Springs	South of Glade Park	18	$10

Mud Springs Campground typically has a volunteer host and collected fees of approximately $2,500 each of the past two years from between 800 and 1,100 recreational visits annually. While the fees collected are used for maintenance, the maintenance costs far exceed the revenue collected.

Recreation Administration

Special Recreation Permits

As authorized by 43 CFR 2932, the following four types of uses require Special Recreation Permits (SRPs): commercial use, competitive events, organized groups, and recreation use in special areas. The BLM can issue SRPs for noncommercial use in certain special areas, including rivers, backcountry and camping areas. Most SRPs issued by the GJFO are related to big game and mountain lion hunting outfitters, and mountain bike and OHV tours. Requests for competitive event SRPs are on the rise as well. No permanent camps and facilities are authorized by SRPs on BLM-administered public lands.

The GJFO administers an average of 80 to 85 SRPs (approximately 55 for activities within the planning area) each year. Approximately 40 percent of those permits are for upland guide and outfitter services, including mountain bike and OHV tours and training, rock climbing, horseback riding, and educational tours. Approximately 30 percent of the GJFO permits are issued for big game and mountain lion hunting, 25 percent for competitive events and organized groups, and five percent for river outfitters. Demand for SRPs on public lands within the GJFO has been steadily increasing over the past 20 years, and this trend is expected to continue.

The GJFO currently collects about $30,000 to $35,000 per year in SRP fees from permittees operating in the planning area. Roughly 15 percent of this revenue is expended in program administration with the remainder spent on visitor services, monitoring, and maintenance.

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 continually improves facilities to make them more accessible to people with disabilities, and to provide easier access to public lands and better 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.

Environmental Education and Interpretation

Marketing and Tourism

For many communities within the GJFO planning area, tourism provides a significant portion of the economic base. Typically, BLM staff does not directly market recreation activities on public lands, but recreation and heritage tourism opportunities available on public lands are often marketed by the local communities to increase visitation, which in turn increases dollars spent in their communities.

It is incumbent upon the BLM to identify information and marketing service providers and educate those providers how the BLM is managing an area for recreation opportunities so that the providers can identify the niche they inhabit to produce beneficial personal outcomes. Marketing is not simply the act of increasing use, it is putting people in the right place so they can achieve their desired recreation experiences.

Interpretation and Education

No formal education or interpretation program exists in the GJFO. Education and interpretation on recreational opportunities and land stewardship is conducted informally through brochures, signs, and the GJFO web site. The GJFO staff participates in school programs, attends user groups/club meetings, and participates in the Grand Junction Convention and Visitors Bureau.

Recreation Monitoring and Evaluation

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

Recreation Setting Character Conditions

Recreation Setting Characteristics (RSCs) are an expression of recreation setting conditions in the future that are expected to result if objectives are achieved and land use plan and implementation decisions are executed. Three recreation setting components are considered: a) the desired future recreational qualities of the landscape (physical), b) the qualities associated with use (social), and c) the conditions created by management (operational). These components influence the kinds of recreation activities that are emphasized and recreation outcomes realized. The BLM establishes these criteria in the land use plan to guide management action and allowable use decisions as well as the identification of site-specific use levels for activities during plan implementation (BLM H-1601-1, Page 13). Proposed initial allocations are provided in **Appendix K**, Recreation and Visitor Services Management Framework. RSCs

can be adjusted over time to meet recreation objectives as a result of monitoring and evaluation.

Physical Setting Character Conditions

The fundamental physical setting character trends for the GJFO planning area are clear and predictable, realizing the physical changes in the region. The Grand Valley has experienced rapid growth since the 1987 RMP. During this time, the natural resource recreation settings have generally become physically less remote due to many factors, including energy development, urban growth, and mechanized/motorized use on public lands.

This change in the physical setting has accelerated change in the social setting character of GJFO public lands.

Social Setting Character Conditions

Public visitation to BLM-administered lands has increased over the past 25 years. This is especially true near communities and around popular destinations like the Gunnison River, LBCWHR, the North Desert, and Bangs Canyon. On weekends and in the evenings, interactions with other people are very common in the more popular recreation areas.

Many upland areas (e.g., Glade Park, LBCWHR, Uncompahgre Plateau) receive low levels of visitation (especially weekdays) and offer uncrowded social settings. However, many residents and nonresident hunters utilize GJFO public lands during big game hunting seasons, and the number of contacts with other visitors dramatically increases throughout the GJFO. In addition, more people are seeking out these less-visited areas for relief from some of the crowded areas and are modifying the social setting of the less crowded areas. With use levels growing, the evidence of visitation is also increasing. Evidence of alteration, including vehicle use, litter, manmade structures, tree damage, surface vegetation impacts, vandalism to cultural resources, hardened campsites, human-caused wildfires, and compacted soils, can be found in more and more places.

Administrative Setting Character Conditions

The GJFO has rules and regulations in place to assist in achieving the following goals: maintain natural resource settings; direct recreation use; and protect resources. To achieve these goals, the GJFO has also implemented administrative tools such as limiting motorized use in specific areas and by season, increasing signage, increasing field staff, and improving visitor services by creating new brochures and maps. Many of these actions were precipitated by increased accessibility and crowding. Within some recreation areas and in urban-interface areas, new issues such as social trails, domestic animals, noise, and visual aesthetics have necessitated additional administrative remedies to address recreation-related use. No individual user fees for recreational activities are charged on public lands within the GJFO.

User Interactions

In addition to the recreational settings described above, interactions between visitors during an outing can also influence visitor experiences. How visitor experiences are influenced by other visitors can be subjective and varies between individuals. Some user interactions are positive (i.e., visitor experiences are enhanced), and some interactions are negative (i.e., visitor experiences are degraded).

Research on the topic of recreational user interactions has been conducted for more than 30 years. The most commonly used definition of user interaction focuses on user conflict. Jacob and Schreyer (1980) defined user conflict as goal interference that can be attributed to other recreational users. Using this definition, negative user interactions (i.e., conflict) occur when one visitor's expectation or experience is diminished, and that visitor can attribute the negative impact to another visitor's behavior.

Other definitions of user interactions are broader and include not only negative interactions (conflict), but also positive interactions where interactions with other users enhance visitor experiences (complementary interactions). See Marcouiller, Scott, and Prey (2008).

The research literature suggests visitor perceptions about other users influence whether interactions are complementary or conflicting. Perceptions about a variety of factors (e.g., use of technology, modes of travel, environmental ethics, etc.) influence whether interactions with other visitors have a positive or negative impact on a visitor's experience.

Not only are the results of user interactions complementary, conflicting, or something in between, they can also be asymmetrical. That is, a visitor that interacts with another visitor might see the interaction as complementary, while the other visitor might see the interaction as conflicting. For example, a motorcycle rider that is enjoying a ride at high speeds might encounter a family riding ATVs. The motorcycle rider might enjoy seeing the family out enjoying time together which enhances his/her experience. On the other hand, the family riding ATVs might see the motorcycle traveling at high speeds as a threat to the safety of younger riders. In this case, the motorcycle rider experiences a complementary user interaction and the ATV family experiences a conflicting user interaction. The bulk of the past studies related to user interactions suggests this asymmetry occurs with many types of user interactions.

> "…there is a tendency for one group (mostly traditional and nonmotorized users) to perceive more problems than the other group with whom they are in conflict. This other group, which typically holds an asymmetrical view of the level of conflict, is typically composed of nontraditional, mechanized or motorized users. This finding of differential levels of perceived conflict holds for cross-country skiing versus snowmobiling in Minnesota (Knopp and Tyger 1973), for oar-

> powered versus motor-powered whitewater boating in the Grand Canyon (Shelby 1980), for anglers versus water-skiers on Midwest reservoirs (Gramann and Burdge 1981), for paddling canoeists versus motor boaters in the Boundary Waters Canoe Area (Adelman et al. 1982), and for hikers versus mountain bikers in the Rattlesnake National Recreation Area (Watson et al. 1991). Ramthun (1995) found that one-third of hikers on a trail near Salt Lake City, Utah, sensed conflict with mountain bikers, while less than 6 percent of bikers perceived conflict. Gibbons and Ruddell (1995) found that helicopter skiers in the Wasatch National Forest in Utah reported no conflict, while nonmotorized backcountry users reported high levels of conflict."

The research also shows visitors adapt when they encounter conflicting situations (Kuss et al. 1990). They may 1) re-evaluate their perceptions about what is acceptable; 2) change their behavior (visit the area less frequently or visit at different times); or 3) stop using the area.

The BLM considers different recreational uses non-compatible when conflicting user interactions reach a point where visitors choose to stop recreating in an area and decide to find other areas where the conflicting interactions do not occur (i.e., displacement).

During public scoping for the planning process, the BLM received comments from the public about the desired future condition of recreation within the planning area. The BLM received comments from the public supporting recreation areas that did not include motorized uses to protect specific types of recreation opportunities. The BLM also received comments to manage recreation for all types of activities (motorized and non-motorized), so the public would have to opportunity to share "multiple-use" trails. The BLM interpreted these comments as 1) an indicator that some user interactions in the planning area are conflicting and 2) there is a desire from the public to develop management that provides recreational opportunities that promotes positive user interactions and reduces conflict.

Based on the literature, the BLM understands complementary user actions are occurring where visitors are participating in similar activities (e.g. ATV riding and jeeping or hiking and backpacking) or where asymmetrical user interactions occur with complementary results for one group of users.

Conversely, the BLM generally assumes conflicting user interactions are likely to occur where activities have a greater degree of difference (e.g. motorcycle riding and hiking), and the BLM assumes some of these interactions are asymmetrical. In the case of a motorcycle rider and a hiker, only the hiker might see the interaction with the motorcycle rider as a conflicting interaction; the hiker may not have any impact on the motorcycle rider.

The BLM also assumes in some parts of the planning area different uses are non-compatible and visitor displacement is occurring.

Outcomes Focused Management

Landscape attributes affect recreational activities and the outcomes for people, communities, economies, and the environment. For example, an area's remoteness, naturalness, or facilities may facilitate different opportunities for hiking, wildlife viewing, or camping. The outcome of engaging in one of those opportunities in a particular setting may have an impact on the individual, the community, the economy, and the environment. The BLM focuses on providing specific, positive outcomes while at the same time attempting to minimize negative outcomes by engaging recreation-tourism participants, non-participating but affected community residents, and national and international visitors. This holistic approach attempts to satisfy the ever increasing and competing demands which are difficult to manage utilizing a traditional activity-based recreation management model (Driver 2008).

Trends

Five key issues are causing the setting character of the GJFO to change:

1. Increased urbanization as a result of population growth and changing demographics;
2. Changing public expectations and demand for outdoor recreation opportunities, especially for dispersed recreation;
3. Increased energy development in portions of the GJFO;
4. Close proximity of BLM public lands to private property, specifically in the Grand Valley, and the growing use of public lands as a community-based recreation asset; and
5. Technological advances, such as all-terrain vehicles (ATVs) and mountain bikes, affordable GPS units, as well as better outdoor equipment and clothing.

All of these natural resource setting trends are likely to continue. At the broadest level, the physical, social, and administrative recreation character of BLM public lands is potentially changing from natural to more developed, from less crowded to more contacts with others, and from less restrictive to more rules and regulations. These changes will impact the activity opportunities that can be offered and the recreation experience and benefit opportunities that can be produced by land managers and partners.

3.3.5 Comprehensive Travel and Transportation Management

Transportation is an integral part of virtually every activity that occurs on public lands. Comprehensive Travel and Transportation Management (CTTM) is the BLM's proactive interdisciplinary planning, on-the-ground management, and administration of roads and trails for both motorized and non-motorized travel

to ensure that public access, natural and cultural resources, and regulatory needs are considered. The CTTM process must address variability among landscapes, users' interests, equipment options, and cultural and biological resource constraints. The primary goal of the CTTM process is to develop a systematic network of routes with appropriately designated uses that provides opportunities for a diverse set of activities to occur on public lands, such as recreation, energy development, grazing, and wildlife management.

Traditionally, the BLM's travel management program focused primarily on motor vehicle use. However, the introduction of CTTM significantly expanded the planning scope to include 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 ATVs, cars, and trucks), and travel by motorized and non-motorized boats.

There is considerable overlap between travel management and all other uses on BLM lands. For example, many people visit public lands for recreation purposes. For these visitors, a route system may serve as either a means to reach a destination where the activity occurs (e.g., a road to a trailhead or parking area) or as the focus of the recreation activity itself (e.g., a four-wheel driving, hiking, or horseback riding trail).

To reduce the duplication of narrative between travel management and the other sections of this document, this section addresses only public travel and access (i.e., management area designations, route designations, types of travel, and seasonal area limitations).

Off-highway Vehicle Management Areas

Off-highway vehicle is synonymous with off-road vehicle. Off-road vehicle 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 non-amphibious 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. Types of OHVs commonly used on public lands include dirt motorcycles, dune buggies, sand rails, jeeps, four-wheel drive vehicles, snowmobiles, and ATVs.

In the context of the BLM planning process, it is important to note definitions of the most common OHV types. A four-wheel drive vehicle is a passenger vehicle or light truck having power available to all wheels. A Utility Type (or Terrain) Vehicle (UTV) refers to any recreational motor vehicle other than an ATV, motorbike, or snowmobile, designed for and capable of travel over designated unpaved roads, traveling on four (4) or more low-pressure tires, maximum width less than seventy-four (74) inches, usually a maximum weight less than

two thousand (2,000) pounds, or having a wheelbase of ninety-four (94) inches or less. UTV does not include vehicles specially designed to carry a person with disabilities. An ATV is a wheeled vehicle, other than a snowmobile, which has a wheelbase and chassis of 50 inches in width or less, is steered with handlebars, generally has a dry weight of 800 pounds or less, travels on three or more low-pressure tires, and has 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.

The BLM's regulations for OHV management, 43 CFR 8342.1, stipulate "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 and/or resource use objectives. In accordance with BLM Travel and Transportation Manual 1626, 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, and motorized; limited to existing roads and trails; limited to time or season of use; limited to certain types of vehicles (e.g., motorcycles, ATVs, high clearance); 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 prohibit any and all motorized 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. Non-motorized uses are permitted in these areas.

Emergency Closures

Emergency closures are sometimes necessary to protect public health and safety or prevent unnecessary or undue resource degradation due to unforeseen circumstances. Where off-road vehicle travel is causing or will cause considerable adverse effects upon soil, vegetation, wildlife, wildlife habitat, cultural resources, historical resources, threatened or endangered species, wilderness suitability, other authorized uses, or other resources, the affected areas shall be immediately closed to the type(s) of use causing the adverse effect until the adverse effects are eliminated and measures implemented to prevent recurrence.

Per IM 2010-028, Change 1 (Requirements for Processing and Approving Temporary Public Land Closure and Restriction Orders) (BLM 2009k), temporary closures and restrictions should be implemented for the shortest time and in the smallest area necessary to protect resources, public health, and safety.

Existing Route Systems

Many routes within the planning area were created to access BLM lands for timber/vegetation management projects, 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 become part of the roads and trail system frequently used by visitors who are engaged in recreation activities.

Many more recreation-based routes have been created, or pioneered, by users themselves. Open travel designations that allow cross-country travel, coupled with high levels of use and improvements in mechanized and motorized technology, have allowed users to gain access through rough terrain. The repeated passage of users creates and maintains these routes. Because these routes were not designed, but rather created by consistent use, these routes often cause conflict with public land resources and other public land uses.

Current Conditions

Emerging travel management issues within the GJFO planning area include:

- Rapid expansion of recreational use and visitation on public lands outstripping the travel planning framework in the 1987 GJFO RMP (BLM 1987);
- User-created, non-system routes causing adverse impacts on other resources;
- Routes and areas open to public use but are accessible only to adjacent landowners; and
- Increasing conflicts among recreational users over route use.

Motorized Travel

Approximately 43 percent of the planning area is designated as open to cross-country travel, 44 percent is limited to existing or designated roads and trails, 11 percent has seasonal limitations, and 3 percent is closed to motorized use. Travel Management designations for the planning area are summarized in **Table 3-36**, Off-Highway Vehicle Designations in the GJFO Planning Area, and depicted on **Figure 2-22**, Alternative A, Comprehensive Travel and Transportation Management.

Table 3-36
Off-Highway Vehicle Designations in the GJFO Planning Area

OHV Designations	Acres
Closed	35,300
Limited to designated roads and trails	220,000
Limited to existing roads and trails	234,700
Seasonal limitations (existing routes only)	108,000
Seasonal limitations (designated routes only)	5,500
OHV Intensive Use Areas	12,500
Open	445,400
Total	**1,061,400**

Source: BLM 2010a

Foot and horse travel is not limited to existing or designated routes, except within the Bangs Canyon and North Fruita Desert SRMAs. Areas closed to motorized use and seasonal limitations currently do not apply to foot, horse, or bicycle travel.

High Use/Interest Areas

The following information provides a basic profile of high use areas in the GJFO planning area.

27¼ Road

This area is very popular for OHV use, recreational target shooting and hiking/dog walking by neighboring residents. A portion of the area east of 27¼ Road is open to cross-county travel, while travel in the area west of 27¼ Road and north of the open area is limited to existing routes. 27¼ Road is heavily used as the only access to two developed shooting ranges at the base of the Book Cliffs. Also, due to its location adjacent to an open area, this area sees frequent illegal cross-county use. Although an entrance kiosk was constructed near the BLM boundary on 27¼ Road, very little additional signage has been installed.

Bangs Canyon SRMA

The Bangs Canyon SRMA provides for multiple uses in close proximity to the urban center of Grand Junction. The Lunch Loops is a heavily used system of non-motorized singletrack trails. These trails are highly valued for their location only minutes away from downtown Grand Junction and are used by mountain bikers, hikers, trail runners, and dog walkers. The Free Lunch trail is open to mountain bikes only. There are also several non-mechanized trails in this area, including East Creek, Bangs Canyon, Rough Canyon, and Ladder Canyon. Rough and Ladder Canyons are very popular, year-round recreation destinations and are accessed from the Bangs Canyon trailhead on Little Park Road. The Mica Mine in Ladder Canyon is the primary destination in that area for hiking, especially for family groups.

The Bangs Canyon Management Plan (BLM 1999b) is the implementation-level plan written to manage the Bangs Canyon SRMA. The plan established a system of designated travel routes and called for a significant amount of trail construction and rehabilitation (specific projects are outlined in the Bangs Canyon Management Plan Implementation EA [BLM 2004b]). The Tabeguache Trail is an important recreation route that crosses public land for 142 miles, from Montrose to Grand Junction. A portion of the route is located within Bangs Canyon SRMA, including a non-motorized section from Monument Road to Little Park Road and a motorized section from Little Park Road to Highway 141. The existing trail crosses private property at Highway 141 and the BLM has identified acquisition of an access easement as a priority.

DeBeque Area and Coal Canyon

This high-use area has experienced a significant increase in use in recent years. The DeBeque area is designated as open to cross-country travel, and the predominant recreation activities are OHV, mountain bike, and equestrian use. There is moderate ATV and equestrian use in Coal Canyon. However, this area has seasonal limitations (motorized use is prohibited between December 1 and May 1), and during the remainder of the year (between May 2 and November 30), motorized vehicles are limited to existing roads and trails.

Castle Rock, an area southwest of DeBeque, has become a popular destination for those seeking singletrack motorcycling or mountain biking opportunities, or a trials motorcycle riding experience. The Castle Rock travel network is comprised mainly of user-created routes, some of which are in conflict with cultural resources and/or threatened and endangered plant species sites. The area has high value cultural resources, Tribal concerns, and sensitive plants that would require avoidance or other mitigation. In addition, oil and gas exploration and development is prevalent in the area. Recreationists have expressed interest in a diverse mix of recreation activities and experiences, including intermediate to expert level singletrack motorcycling and mountain biking, motorcycle trials riding, 4x4 and ATV touring, utilizing the area's unique natural topography and scenery to enhance users' experiences. There has also been interest in shared compatible uses such as 4x4 and ATV touring, hiking, and horseback riding.

North Fruita Desert SRMA

Visitation is highest mid-March to May and mid-September to mid-November with OHV use and mountain biking as the predominant uses. The North Fruita Desert Management Plan (BLM 2004a) outlined a multiple use trail system that features many loop routes, most of which are signed. The mountain bike emphasis area (approximately 4,000 acres) contains approximately 35 miles of singletrack mountain bike trails. This area also has a 400-acre designated open OHV area, designated staging area, a system of designated motorized loop routes, and several routes open to administrative use only. The plan also identified a polygon east of Q.5 Road for non-motorized, non-mechanized uses.

North Desert

This high-use area is in close proximity to Grand Junction, located east of the North Fruit Desert Planning Area and south of the Book Cliffs. Similar to the North Fruita Desert Planning Area, this area receives the highest use during the shoulder seasons (i.e., spring and fall). The North Desert draws visitors for a wide variety of activities. The Grand Valley OHV Area, an 11,400-acre OHV open area, has the highest use of any area in the GJFO planning area, over 250,000 visitor days per year. The Grand Valley OHV Area is highly valued by the local community and visitors from around the region for motorcycle and ATV use. It contains a large, unofficial motocross area that is maintained by a local motorcycle club. There is also a fair amount of mountain bike use in this area, which is influenced by local guidebooks advertising routes. Most of the non-mechanized use is from area residents who enjoy the close-to-home location for dog walking or daily exercise. There is also light equestrian use in this area, most of which also originates from the nearby residents.

Grand Mesa Slopes

The 1995 Grand Mesa Slopes RMP amendment addressed travel management and recreation issues in the Grand Mesa Slopes area. This RMP amendment was intended to curtail the proliferation of new roads and trails, provide continued motorized access, and provide specificmanagement for motorized and non-motorized recreation and travel (BLM 1995a).

Gateway

The Gateway area is a popular multiple-use recreation destination. Travel management in this area consists of designations of open, closed, limited to existing roads and trails, and limited to designated roads and trails. There is light non-mechanized use in the area mostly consisting of climbing in the Palisade WSA or hiking from the nearby Gateway Canyons Resort. A stacked loop trail system (currently eight miles in length) designed for mountain biking and hiking lies immediately south of Gateway Canyons Resort at the mouth of Lumsden Canyon.

In the area east of Highway 141, there is an extensive system of old mining routes, many of which receive light to moderate recreational use. The major constraint in this area is the potential for future mineral exploration and effective management of existing routes due to the density. This area is popular during hunting season but is also becoming a year-round recreation destination. Gateway Canyons Resort rents ATVs and Jeeps for visitors to tour this area and facilitates climbing, equestrian, and float trips.

John Brown Canyon provides motorized access into Utah BLM's Moab Field Office and receives heavy recreation use. Uranium exploration and development has the potential to increase truck traffic that can present a safety hazard to recreational users. There is existing motorized access into the Palisade WSA via

Bull Draw and Wright Draw, which has resulted in some illegal cross-country use within the WSA.

Seasonal Travel Limitations

Seasonal limitations are in place on several areas and routes within the GJFO planning area. OHV travel is subject to seasonal limitations on existing routes on 108,833 acres and on designated routes on 5,496 acres. **Table 3-37**, Seasonal Travel Management Limitations, summarizes the roads within the planning area that have restrictions.

Table 3-37
Seasonal Travel Management Limitations

Type of Limitation	Area or Road
Limited: Between December 1 and May 1, motorized vehicle use is prohibited. Between May 2 and November 30, motorized vehicle use is limited to existing roads and trails.	• Coal Canyon portion of LBCWHR
Limited: Between December 1 and May 1, motorized vehicle use is prohibited, except on county-maintained roads. Between May 2 and November 30, motorized vehicle use is limited to existing roads and trails.	• The Beehive • Lands End/Grand Mesa Slopes • Chalk Mountain • Sunnyside • Big Salt Wash/Coal Gulch/16 Road • Blue Mesa • Demaree

Types of Routes

The majority of the existing route system in the GJFO was not built with consideration for sustainability, resource concerns or conditions, or recreation experiences. Most routes either follow historic routes, such as those for grazing, mining, or administrative access, or were user created. As a result, these trails do not always provide desirable recreation experiences and can have unmitigated impacts on natural or cultural resources.

There are approximately 3,996 miles of routes in the planning area. Approximately 94.5 percent of those are open to motorized travel.

Mechanized Travel

Mountain biking is becoming increasingly popular on public lands, and several areas in Colorado are considered top national destinations. Mountain bike use is occurring on old motorized routes, game trails, and user-created mountain bike trails, as well as on planned singletrack routes. Popular mountain bike areas for both community and destination visitors in the GJFO include the North Fruita Desert Trailhead (18 Road north of Fruita), the Gateway area, areas near the Town of Palisade, and areas around Grand Junction, such as the Lunch Loops trail system. The Lunch Loops trail system includes the BLM's first designated mountain bike-only trail, Free Lunch, which was constructed with challenging features for downhill-specific travel.

Non-Mechanized Travel

Hiking and horseback riding has been increasing on BLM lands bordering municipalities within the GJFO. The communities of Grand Junction, Fruita, Loma, Mack, Palisade, Whitewater, Gateway, and DeBeque have all experienced population growth and, consequently, the BLM lands adjacent to them have become community-based recreation assets.

Popular hiking trails and areas include Gunnison Bluffs/Old Spanish Trail, Mt. Garfield, Book Cliffs, Little Book Cliffs Wild Horse Area, the North Desert, and Bangs Canyon. Horseback riding is common but dispersed throughout the GJFO on existing trails and roads.

Trends

Local population growth and an increasing awareness of the GJFO as a recreation destination are expected to drive the trend toward additional recreational use and accompanying requests for improved access.

In the past, comprehensive and proactive transportation planning has not been an emphasis area for the BLM in RMPs. The development of transportation routes, whether planned through projects such as oil and gas developments or created by recreation users, has traditionally been viewed as an acceptable part of the development of BLM lands. Research from the past 20 years on the impacts of roads to resources, wildlife, and other users, and actual experience by the BLM on these impacts, is increasing the need for well-designed and integrated transportation planning.

Mountain biking has continued to increase in popularity over the past 15-20 years. Trail systems within the North Fruita Desert and Bangs Canyon SRMAs are expected to experience a continued increase in mountain bike use. New trails in the Palisade and Gateway areas will also likely increase mountain bike use in those areas. At the same time, advances in mountain bike technology have resulted in riders' ability and desire to access more remote and technically challenging terrain throughout the GJFO, sometimes contributing to the widening, deepening, braiding, and eroding of existing routes, and the creation of new social trails. Increasing mountain bike use is also resulting in the displacement of other trail users (primarily pedestrians and equestrians) in some locations as those other users seek to avoid frequent encounters with mountain bikers.

Hiking, trail running and dog walking continue to grow in popularity, especially on BLM lands in close proximity to the local communities of Grand Junction, Fruita, Palisade and Gateway. Pedestrian use is highest in the Bangs Canyon SRMA at the trailheads off of Monument Road and Little Park Road. Other popular hiking destinations include the Mount Garfield trail and the Palisade Rim trail. The increasing use of these close-to-home areas frequently results in the proliferation of undesignated social trails as pedestrians seek easy access from adjacent residences and neighborhoods, or as they seek alternative routes and experiences. These social trails typically do not meet BLM design criteria or

management objectives. Increasing congestion and user conflicts on popular trails has also resulted in shifting use patterns. For example, hiking and dog walking use has increased at the Little Park Trailhead as trail users seek to avoid traffic and congestion at the Tabeguache Trailhead.

Equestrian use in the GJFO is light to moderate, and demand for equestrian opportunities has not grown significantly over the past 20 years. A flat or declining trend in equestrian use is expected to continue. Most local equestrian use is concentrated in the adjoining McInnis Canyons NCA and Dominguez-Escalante NCA. The exception is the LBCWHR, which is a popular riding destination for local equestrians. Many trails in that area do not meet BLM design criteria, and exhibit deepening, widening, braiding and erosion. Other equestrian use is generally scattered throughout the field office and tends to avoid areas where other recreation use is concentrated. The North Fruita Desert SRMA receives some equestrian use away from the bicycle trail system and the OHV Open Area. The Gunnison Bluffs Area receives a moderate amount of equestrian use as well. Much of the equestrian use in the GJFO is local in nature, versus users seeking this area as an equestrian destination. Some use conflicts have arisen as horse owners with property adjoining BLM-managed lands seek riding opportunities on trails not designed or managed for equestrian use (i.e., the Lunch Loop trail system).

There are several paragliding and hang gliding sites in the planning area that are flown year-round by pilots from across the western United States. Popular sites include Otto's Ridge, Reeders Mesa, and Peanut Point. These sites are expected to continue to be used throughout the life of the plan.

Current OHV use exceeds historic levels and new, more-powerful vehicles are capable of accessing steeper and rougher terrain. In the past, visitors drove principally Jeeps, trucks, and motorcycles. Today the BLM has seen an increase in use of OHVs of all types and sizes. As with all types of use, increased visitation has contributed to the widening, deepening, braiding, and eroding of some existing routes. The increased demand for cross-country opportunities has also led to an increasing number of hill-climb, play, and camping areas. The Grand Valley OHV area is the most heavily used area in the GJFO planning area; use is expected to continue increasing, as is OHV use in the Bangs Canyon area, the Gateway area, and near DeBeque.

Some of the key drivers for the increase in travel in the GJFO planning area include:

- Increasing visitation on all public lands within the GJFO planning area;
- A longer season of use in comparison to many Colorado locations; and
- Increasing urban and suburban populations proximate to the planning area.

3.3.6 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 ROWs, communication sites, and other leases or permits. Lands and realty actions help ensure that BLM-administered lands are managed to benefit the public.

BLM public 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, ROW corridors, and communication sites. Wind and solar renewable resource production is also permitted by ROWs through the lands and realty program.

The goals of the lands and realty program are to manage public lands to support the goals and objectives of other resource programs, provide for uses of public lands in accordance with regulations and compatibility with other resources, and improve management of public lands through land tenure adjustments.

The following section describes the current conditions and characterization of lands and realty within the planning area.

Current Conditions

Land Tenure

Surface land ownership within the planning area is summarized in **Table 1-1**, Land Status within the GJFO Planning Area (refer to **Section 1.3**, Description of the Planning Area). Acreages for the McInnis NCA, Dominguez-Escalante NCA, and Colorado National Monument are not included in this table because they are not within the planning area boundary and will be managed under separate land use plans.

Land Tenure Adjustments

Land tenure adjustments are used to consolidate the BLM's land ownership patterns through various disposal and acquisition authorities:

- Disposal. Public lands have potential for disposal when they are isolated or difficult to manage or are suitable for public purposes or community expansion. Disposals result in a title transfer, wherein the lands leave the public domain. **Figure 2-30,** Alternative A: Land Tenure Adjustments, shows lands in the planning area that are designated for disposal. Lands may be disposed of via sale or exchange, as discussed below. In addition, the Recreation and Public Purposes Act of 1926 was established as a means for state and local government or non-profit organizations to acquire or lease public lands at a reduced or no cost. The transferred land must be used

for an established or proposed public project, need, historic monument, or recreational purposes.

- Sale. 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 (refer to Chapter 2, Table 2-2, Lands and Realty, Disposals). Public land must be sold at not less than fair market value and must meet the disposal criteria of FLPMA.
- Acquisition. Acquisition of lands can be pursued to facilitate various resource management objectives. Acquisitions, including easements, can be completed through exchange, Land and Water Conservation Fund purchases, donations, or receipts conducted in accordance with other Congressional Acts and special legislation.
- Exchange. Land exchanges are initiated in direct response to public proposals, or by the BLM to improve management of public lands. Lands need to be formally determined as suitable for exchange. In addition, lands considered for acquisition through exchange would be those lands that meet specific land management goals identified in the RMP. Non-federal lands are considered for acquisition through exchange of suitable public land, on a case-by-case basis, where the exchange is in the public interest and where the non-federal lands to be acquired contain higher resource or public values than the public lands for which they are exchanged.
- Withdrawal. Withdrawals are used to preserve sensitive environmental values, protect major federal investments in facilities, support national security, and provide for public health and safety. Withdrawal segregates a portion of public lands and suspends certain operations of the public land laws, such as mining claims. Federal policy now restricts all withdrawals to the minimum time and acreage required to serve the public interest, maximize the use of withdrawn lands consistent with their primary purpose, and revoke all withdrawals that are no longer needed.

Since approval of the RMP in 1987, the GJFO has disposed of 2,271 acres and acquired 2,253 acres through exchange, issued patents for 440 acres through the Recreation and Public Purposes Act, purchased 2,096 acres, and acquired 375 acres through donation. The RMP placed 14 tracts in a cooperative management agreement (CMA) category, which offers the tracts to qualified federal, state, or local agencies or entities for management, transfer, or exchange. Nine CMA tracts totaling approximately 500 acres in the Horsethief State Wildlife Area have been withdrawn to US BOR and are managed by CPW under a CMA.

The BLM and the Grand Junction Regional Airport (GJRA; previously known as Walker Field Airport) entered into a Memorandum of Understanding (MOU) in July 1991 to recognize the airport's need to acquire public lands in their long-term expansion plans, and to acknowledge BLM's intent to make such lands available to the airport when needed. The MOU encompasses 2,163 acres north of the airport. The area was withdrawn from location and entry under the mining laws in January 1994. This withdrawal expired in January 2014 and an application for a new withdrawal is not expected to be filed until after the GJRA master plan is approved by the Federal Aviation Administration.

Over 23,000 acres of public lands within the GJFO planning area are managed as withdrawn from mineral entry through BLM protective withdrawals and other Federal agency withdrawals. Approximately 7,900 acres are withdrawn by the US BOR. Of these 7,900 acres, approximately 4,900 acres are within three active US BOR projects operated and maintained for primary BOR project purposes under agreements with the Collbran Water Conservancy District (Collbran Project), the Grand Valley Water Users Association and the Orchard Mesa Irrigation District (Grand Valley Project and Grand Valley Unit, Colorado River Basin Salinity Control Project), and the Western Colorado Wildlife Habitat Association (Grand Valley Unit, Colorado River Basin Salinity Control Project wildlife mitigation lands). Approximately 3,000 acres are withdrawn by the US BOR for the Dominguez Project, which was not authorized for construction. The US BOR has identified the Dominguez Project withdrawal for revocation. Other US BOR withdrawn and acquired lands are within the Grand Mesa National Forest and managed under agreement with the US Forest Service, and within Vega State Park, Highline State Park, and Horsethief Canyon State Wildlife Area and are managed under agreements with the State of Colorado.

The BLM has moved toward the consolidation of BLM-administered public lands to benefit the public. To achieve this goal, candidates for land ownership adjustment through disposal, sale, exchange, or acquisition include parcels that are difficult to manage or that do not have public access, relatively small parcels adjacent to other federally or state-managed lands, parcels that would increase conservation of natural resources, and parcels that increase access and use of public lands.

The enactment of the Federal Land Transaction Facilitation Act of 2000 placed an increased emphasis on public land sales. Until it expired in 2011, the Act, which may be reauthorized in the future, authorized a portion of revenue generated from the sale of public lands identified for disposal to fund acquisition of land in federally designated areas, and for administrative expenses necessary to carry out the transactions.

Land Use Authorizations

The most common form of authorization to permit uses of public lands by commercial, private, or governmental entities is the ROW, which is used to permit private and public roads that cross public lands, pipelines not eligible for authorization under oil and gas lease rights, public utilities, communications facilities, reservoirs, and a variety of other purposes (**Table 3-38**, Active Right-of-Way Authorizations in the GJFO Planning Area). Short-term permits (not to exceed three years), and long-term leases for uses such as agricultural, industrial, and commercial, are authorized under 43 CFR 2900. Leases are also issued to federal, state, and local governments, special district or non-profit groups under the authority of the Recreation and Public Purposes Act of 1926.

Table 3-38
Active Right-of-Way Authorizations in the GJFO Planning Area[1]

Facility Type	Number of Authorizations
Roads	275
Power Lines	104
Telephone/Fiber Optic Lines	62
Irrigation Ditches/Canals	88
Water Facilities (e.g., spring development, water pipelines, salt water disposal wells)	62
Communication Sites	55
Natural Gas Pipelines	220
Oil and Gas Facilities (e.g., meter stations, compressor stations)	38
Other Pipelines	5
Short-term Authorizations (short-term ROW and temporary use permits)	19
Wind Facilities	1
Railroad	16
Easements (FLPMA)	16
Other	31
Total	**992**

Source: BLM 2010g

[1]Data may include some ROWs within the GJFO but outside the planning area, and may include small acreages of non BLM-administered lands. There may be additional pre-FLPMA facilities (such as historic irrigation ditches) that are not recorded or accounted for in this table.

The planning area covers 2.2 million acres of federal, state, and private land in Mesa, Delta, Montrose, and Garfield Counties in northwestern Colorado. Eighty-six percent of BLM-administered public lands in the planning area border private land. Authorizations to permit uses on BLM-administered public lands are in high demand.

In the GJFO planning area, the placement of major linear facilities depends on meeting the following location criteria:

- Concentrate linear facilities within or next to existing ROW corridors where possible;
- Avoid locations in sensitive wildlife habitat;
- Avoid steep topography, poor soils, or other fragile areas such as threatened and endangered species habitats; and
- Avoid cultural sites that are listed on or eligible for listing on the NRHP.

Designated ROW Corridors

Many electricity, telephone, water, and railroad corridors (above and below ground) serve the public throughout the planning area (**Table 3-39**, Right-of-way Corridors in the GJFO Planning Area). ROW applicants are encouraged to use these designated corridors.

Table 3-39
Right-of-way Corridors in the GJFO Planning Area

Location	Type of Utility	Approximate Corridor Width
Unaweep Canyon	Telephone and small electrical lines	0.50-mile
Between Colorado National Monument and Black Ridge WSA (most of this corridor is located outside the planning area)	Small water, telephone, and electrical lines	0.25-mile
Along Mid-American pipeline company pipeline in West Salt Creek	Major pipelines and power lines	0.50-mile
Along Northwest Pipeline and State Highway 139	Major pipelines and power lines	0.50-mile
Coal Canyon	Major power lines	0.50-mile
From DeBeque to Southern Boundary of Resource Area*	Major power lines	4.0 miles
Along Roan Creek from DeBeque to the Community Center*	Railroads; power lines; major water and oil and gas pipelines	1.0 mile
Along Clear Creek from Community Center to Northern Resource Area Boundary*	Major power lines and pipelines	0.50-mile
Westwide Energy Corridor (US DOE and BLM 2009) along I-70 and Highway 50 to Delta	Oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities	0.50- to 4.0 miles

Source: BLM 1987 (Table 21)
* These corridors are part of the West-wide Energy Corridor

Additionally, 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 electricity transmission and distribution facilities. In accordance with that act, the Approved RMP Amendments/ROD for Designation of Energy Corridors on BLM-Administered Lands in the 11

Western States was published in January 2009 (US DOE and BLM 2009). The approved RMP amendments designate multiple-use corridors within the planning area that vary only slightly from the corridor designations of the 1987 Grand Junction RMP. Near the northern boundary of the planning area, the corridor designated in US DOE and BLM 2009 was moved a few miles east of the 1987 RMP location to follow the TransColorado pipeline route.

A total of 234,113 acres in the planning area are designated unsuitable (exclusion) for ROWs, and proposals in these zones are denied on the basis that project impacts could not be mitigated to prevent undue damage to the resources of concern. Another 606,456 acres are designated sensitive (avoidance) to development, and ROW and projects in these zones are designed to protect resources of concern from undue damage. Remaining public lands are suitable for consideration for ROW authorizations, and proposals are considered in these zones. In sensitive (avoidance) and suitable zones, use of existing corridors or upgrading of existing facilities is encouraged.

Communication Sites

Communication site applications, on both existing and new sites, have increased on BLM-administered lands within the planning area. Communications facilities are authorized under the 43 CFR 2800 ROW regulations, and the authorizations are granted through a Communications Use Lease.

Several sites within the planning area host communications equipment for various public and private tenants such as telephone companies, cellular and internet service providers, local utilities, and local, state, and federal agencies. There are three multiple-facility communication sites on BLM-administered land within the planning area: Lands End, Nine Mile Hill, and Lee's Point. Individual communication site plans have been written and approved for each of these sites. In addition, the GJFO has issued communication site authorizations for six single-facility communication sites within the planning area. **Table 3-40**, Communication Sites in the GJFO Planning Area, lists the communication sites authorized by the GJFO.

Table 3-40
Communication Sites in the GJFO Planning Area

Site Name	Site Type	Township, Range, Section
Lands End	Multiple facility	11 South, 97 West, 15
Nine Mile Hill	Multiple facility	13 South, 99 West, 19 and 30
Lee's Point	Multiple facility	51 North, 19 West, 32
Crawford Point	Single facility	14 South, 103 West, 27
DeBeque	Single facility	8 South, 97 West, 24
Douglas Pass	Single facility	5 South, 101 West, 26
East Orchard Mesa	Single facility	1 South, 2 East, 30
Gunnison Bluffs	Single facility	2 South, 1 East, 6
Highway 50	Single facility	2 South, 1 East, 3

Rights-of-Way

The BLM issues ROWs, permits, and leases under the authority of FLPMA (Section 302 and Title V) for surface-disturbing activities on public lands that are not eligible for authorization under mining laws and regulations. The GJFO manages approximately 1,000 ROWs on public lands within the planning area.

ROWs are the most common form of land use authorizations issued to permit the use of public land by private, commercial, and governmental entities. ROWs are authorized under 43 CFR 2800 and 2880. ROWs are most often granted for private and public roads, natural gas pipelines, water pipelines, power lines, telephone lines, communication facilities, reservoirs, and irrigation ditches and canals. Facilities located within an oil and gas lease are authorized under the NEPA analysis of the proposed action to develop the lease (if the point of sale or custody transfer point is within a lease boundary, a ROW is required for the portion of the pipe past the transaction point).

Land use permits authorized under 43 CFR 2800 and 2880 are another form of land use authorization that permits the use of public land. Land use permits are often used to authorize short-term uses that are temporary in nature. Temporary Use Permits are authorized under the Mineral Leasing Act or 43 CFR 2880. Temporary Use Permits and short-term ROWs are used to authorize temporary workspace during the construction of facilities that are authorized under ROW grants. Permits comprised approximately 20 percent of the new land use authorizations in the GJFO during 2007 and 2008.

Increased exploration and development of natural gas resources, along with increased land development and population growth within the GJFO, have increased the number of land use authorization applications received for commercial and private uses. The GJFO has processed approximately 30 applications annually for new land use authorizations over the past few years. The types of new applications typically received included those for new facilities, changes or amendments to existing facilities, and short-term or temporary authorizations for short-term use or construction. Applications for new facilities typically accounted for 50 percent of the new authorizations granted each year. Approximately 13 percent of the applications for new authorizations received each year were from private parties. The remaining 87 percent of these types of applications were from commercial parties. Over the last five years, the majority of the ROW applications received have been for roads and pipelines. Other common ROW applications received were for power lines, telephone lines, and water pipelines. Applications for saltwater disposal wells were also received in 2008. An application for a carbon sequestration facility was received in 2009.

The majority of the ROWs are in the northern portion of the GJFO, as shown in **Figure 3-21**, Right-of-Way Locations. Two of the ROW corridors extend across the full width of the GJFO and provide a continuous route. Approximately 300 ROWs are currently contained by these corridors, and

approximately 120 ROWs are partially within or pass through these corridors. The GJFO has strived to co-locate multiple facilities in adjacent locations when possible to reduce the amount of new surface disturbance in previously undisturbed areas. The majority of ROWs in the GJFO are located in the West Salt Creek Corridor, Highway 139 Corridor, and the West-wide Energy Corridor. These corridors are in the northwest and southeast portions of the GJFO. The corridors that were identified in the 1987 RMP, and amendments thereto, are shown in **Figure 2-26**, Alternative A: Right-of-Way Corridors, Exclusion and Avoidance Areas.

Trespasses are unauthorized use of public land that require the removal of facilities and reclamation, or authorization for continued use. The GJFO has worked to resolve trespass cases as they have been identified through removal and reclamation or authorization. A current inventory of trespasses within the field office has not been completed, but the GJFO has been working to develop a list of existing trespasses. Trespass cases are prioritized based upon human health and safety and severity of resource damage.

Trends

As with other BLM field offices in Colorado, the GJFO is consolidating its lands to benefit the public. To achieve this, candidates for land ownership 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 or of special importance to local communities or 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, exchange, or transfer have been limited to those identified for disposal in the 1987 RMP. Lands available for disposal in this RMP, and the criteria used to determine eligibility for disposal are identified in Table 2-2. Considerations for disposal are also continuing to account whether the action would adversely affect or conflict with existing uses or management of renewable resources.

Other federal, state, and local governments have indicated a continued interest in cooperative management agreement tracts which are offered for management, transfer, or exchange to qualified agencies or entities for purposes such as riparian and wildlife habitat management, community open space, and recreation.

Many of the management decisions related to lands and realty in the GJFO are increasingly driven by growth and urbanization issues. Other driving issues include the interface between private landowners and the demands on BLM-administered lands to locate the facilities (e.g., access roads, communication sites, pipelines, and water tanks) needed to support the fast-growing infrastructure.

Most utility type ROWs and associated facilities have been in place over 30 years, so it is likely that the infrastructure would require replacement or upgraded technology. There are many ROWs throughout the GJFO that could be utilized to upgrade existing infrastructure. As communities continue to expand in the planning area, it is likely that requests for the use of BLM-administered land for facilities would increase.

3.4 SPECIAL DESIGNATIONS

This section is a description of the special designation areas in the GJFO planning area and follows the order of topics addressed in Chapter 2:

- Wilderness Study Areas
- Areas of Critical Environmental Concern
- Wild and Scenic Rivers
- National Trails
- National, State, and BLM Byways

Special Recreation Management Areas and Extensive Recreation Management Areas are discussed in **Section 3.3.4**, Recreation and Visitor Services.

3.4.1 Wilderness Study Areas

In 1964, Congress passed the Wilderness Act, thereby 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 the US Forest Service. With the passage of FLPMA in 1976, Congress directed the BLM to inventory, study, and recommend which public lands under its administration should be designated wilderness. Section 603 of FLPMA specifically required the BLM to provide Congress with recommendations as to the suitability or non-suitability of roadless areas greater than 5,000 acres and roadless islands for wilderness designation. Congress gave the BLM 15 years to complete the wilderness inventory, which was done on a state-by-state basis. Only Congress can ultimately decide which areas, if any, will be designated as wilderness and added to the National Wilderness Preservation System.

In 1989, the BLM Grand Junction Resource Area issued its Final Wilderness Environmental Impact Statement that included analysis and recommendations for seven WSAs within the GJFO (BLM 1989). Three areas have since been designated as wilderness and are not within the planning area for this RMP. The recommendations were based on the findings of the 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 consistent with BLM Manual 6310 to preserve their wilderness values. Activities that would impair wilderness suitability are prohibited in WSAs. There are six primary provisions of FLPMA with regard to interim management of WSAs:

- WSAs must be managed so as not to impair their suitability for preservation as wilderness;
- Activities that are permitted in WSAs must be temporary uses that create no new surface disturbance 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, even if this would impair wilderness suitability of the WSAs;
- WSAs may not be closed to appropriation under the mining laws to preserve their wilderness character;
- Valid existing rights must be recognized; and
- WSAs must be managed to prevent unnecessary or undue degradation.

In summary, WSAs must be managed in a manner that would not impair the suitability of the area for preservation as wilderness and to prevent unnecessary or undue degradation. Except for grandfathered uses and valid existing rights, permitted activities in WSAs are temporary uses that create no new surface disturbance and don't involve placement of permanent structures.

The BLM's authority to conduct wilderness reviews, including establishing new WSAs, expired in 1991. However, BLM has authority under Section 201 and 202 of FLPMA to maintain an inventory of all BLM lands and their resources, including wilderness characteristics, 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 3.2.14**, Lands with Wilderness Characteristics.

Current Conditions

Three WSAs within the GJFO have been designated as Wilderness. The Black Ridge Canyons and Black Ridge Canyons West were combined and designated as the Black Ridge Canyons Wilderness Area in 2000 (Public Law 106-353) and are managed as part of the McInnis Canyons NCA. In 2009, Congress designated the Dominguez Canyon Wilderness Area (Public Law 111-11), which is managed as part of the Dominguez-Escalante NCA. These areas are outside of the planning area for this RMP.

Four WSAs totaling 96,400 acres are within the GJFO RMP decision area: Demaree Canyon, Little Book Cliffs, the Palisade, and Sewemup Mesa (**Figure 2-69**, Alternatives A, B, C, and D: Wilderness Study Areas). In 1991, the BLM recommended as nonsuitable for wilderness designation all of Demaree Canyon, Little Book Cliffs, and the Palisade WSAs. Sewemup Mesa WSA was recommended as suitable for wilderness designation except for approximately 130 acres (BLM 1991). It should be noted that the Sewemup Mesa WSA extends into the Uncompahgre Field Office to the south. The acreages discussed here are only for the portion of the WSA in the GJFO. As such, acreage figures differ slightly from the 1991 study report and recommendation.

A description of each WSA is provided in **Table 3-41**, Wilderness Study Area Characteristics. All WSAs are managed according to BLM Manual 6310 which recognizes valid existing rights and grandfathered uses. Grandfathered uses include grazing, mining, and mineral leasing conducted 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 under wilderness review.

Table 3-41
Wilderness Study Area Characteristics

Demaree Canyon WSA	
Location:	Approximately 25 miles northwest of Grand Junction in Garfield County.
Size:	22,700 acres
Natural Values:	• A series of north-south-trending canyons separated by narrow ridges. • The southern boundary of the WSA is defined by the base of the Book Cliffs. • Vegetation is scattered pinyon-juniper on the canyon slopes and ridges. • Sagebrush, saltbrush, and various grasses are found in the five major canyon bottoms. • Outstanding opportunities for solitude.
Current Uses/ Management Prescriptions:	• Very light hiking and equestrian use except for during hunting season. • Energy development. • Big game hunting and outfitting.
Valid Existing Rights and Grandfathered Uses:	• Cattle grazing. • As of October 1990, there were 20 oil and gas leases and 220 acres of a coal leases all dating from before FLPMA. Two of the leases expired in June 2009 due to lack of production, leaving 18 held by production leases. There are three active wells within the WSA boundary.
Current Management Issues:	• Increasing energy and road development may begin to threaten opportunities for solitude and recreation. • Illegal OHV incursions into the WSA from illegal social routes beginning at Colorado Highway 139 and adjacent private land.
Little Book Cliffs WSA	
Location:	West of DeBeque in Mesa County.
Size:	29,300 acres

Table 3-41
Wilderness Study Area Characteristics

Natural Values:	• The WSA is a gently upward sloping plateau dissected by four major canyon systems. • The canyons are characterized by steep cliff walls up to 1,000 feet high. • The base of the Little Book Cliffs defines the southern boundary of the WSA. • Vegetation is scattered pinyon-juniper on the canyon slopes and ridges. Sagebrush, saltbrush, and rabbitbrush are found in the canyon bottoms. • Outstanding opportunities for solitude except in the area of oil and gas development. • Outstanding opportunities for primitive and unconfined recreation.
Current Uses/ Management Prescriptions:	• Hiking, backpacking, camping, equestrian use, wildlife viewing, photography. • Energy development. • LBCWHR overlaps much of the WSA.
Valid Existing Rights and Grandfathered Uses:	• Two miles of roads have been built inside the WSA to support pre-FLPMA oil and gas leases having valid existing rights. • As of October 1990 there were 25 oil and gas leases and 1,934 acres in three coal leases all dating from before the passage of FLPMA. Currently there are 17 authorized oil and gas leases within or partially within the WSA boundary and four producing or shut-in wells within the WSA boundary.
Current Management Issues:	• Motorized and mechanized incursions into the WSA from private property near Cameo. • Proliferation of social trails at the southern access point near Cameo. • The northern access to the WSA consists of a series of cherry-stemmed roads, off of which branch social trails that provide illegal motorized access into the WSA. • Main Canyon has been temporarily closed to motorized use as the way has deteriorated such that the way is no longer passable by most motorized vehicles. • Management of horses (e.g., fences and structures) and the vegetation community (e.g., vegetation treatments) while complying with BLM Manual 6310.
The Palisade WSA	
Location:	North of Gateway and approximately 60 miles south of Grand Junction in Mesa County.
Size:	26,700 acres
Natural Values:	• Vertical cliffs, deep rugged canyons, and rolling to flat desert valley bottoms varying from rolling terrain to flat terrain dissected by gulches. The most prominent feature is the Palisade, which is a three-mile-long, rocky, butte-like spine that cuts the unit north and south. • Higher elevations consist of open sloping-to-flat grasslands varying from rolling terrain to flat terrain and meadows with moderate to heavy stands of intermixed pinyon-juniper and oak brush; lower elevations are characterized by pinyon-juniper and desert shrub vegetation. • Upper drainages contain aspen and ponderosa pine, while the North Fork of West Creek and Fish Creek have riparian vegetation.

Table 3-41
Wilderness Study Area Characteristics

Current Uses/ Management Prescriptions:	• Hiking, climbing, camping, equestrian use, photography. • Moderate ATV use. • Big game hunting and outfitting. • Power line ROW. • 1,920 acres closed to OHV use.
Valid Existing Rights and Grandfathered Uses:	• Cattle grazing. • Motorized use on Bull Draw and Wright Draw roads.
Current Management Issues:	• Motorized use of Bull Draw and Wright Draw ways. • The area is seeing an increase in recreational rock climbing. There is one permit for guided climbing trips into the area, and safety and access issues are increasing in prominence. Wilderness characteristics of this area are threatened by the increase in use and the desire of some climbers to add permanent bolts within the WSA. Depending on the future amount of use that occurs, the main Palisade climbing route may require a permit system with use restrictions to protect wilderness character and experiences.
Sewemup Mesa WSA	
Location:	Approximately ten miles south of Gateway in Mesa County.
Size:	17,800 acres
Natural Values:	• Sewemup Mesa (approximately 73 percent of the WSA) is an isolated mesa top surrounded by sheer 500- to 700-foot cliffs on three sides. • The southern edge of the mesa has a broken, rocky slope rather than a solid cliff face. • The Sinbad Valley portion of the WSA is part of a collapsed salt dome which, over geologic time, has created a deep valley nearly circular in shape. • Numerous parallel canyon systems create a complex and varied topography. • Mostly pinyon-juniper woodland on the mesa top, with relatively high tree density. • Outstanding opportunities for solitude. • Outstanding opportunities for primitive and unconfined recreation.
Current Uses/ Management Prescriptions:	• Light hiking and backpacking use. • Big game hunting. • 17,775 acres closed to OHV use. • 17,775 acres designated as unsuitable for public utilities.
Valid Existing Rights and Grandfathered Uses:	None.
Current Management Issues:	• Montrose County has a Colorado Revised Statute (RS) 2477 claim to improve an old route that runs along the western boundary of the WSA. This improved access route, coupled with an overall increase in use in the Gateway area, may lead to a significant increase in visitation to this area.

3.4.2 Areas of Critical Environmental Concern

An ACEC is defined in FLPMA, Public Law 94-579, Section 103(a), as an area "within the public lands where special management attention is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards." The BLM prepared regulations for implementing the ACEC provisions of FLPMA. These regulations are found at 43 CFR 1610.7-2(b).

Restrictions that arise from an ACEC designation are determined at the time the designation is made and are designed to protect the values or serve the purposes for which the designation was made. In addition, ACECs are protected by the provisions of 43 CFR 3809.1-4(b)(3), which requires an approved plan of operations for activities resulting in more than five acres of disturbance under the mining laws.

Existing Areas of Critical Environmental Concern

There are five ACECs totaling 32,208 acres on BLM-managed land in the planning area: Badger Wash ACEC, the Palisade ACEC/Outstanding Natural Area (ONA), Pyramid Rock ACEC/Research Natural Area (RNA), Rough Canyon ACEC/RNA, and Unaweep Seep ACEC/RNA (**Figure 2-65**, Alternative A: Areas of Critical Environmental Concern). The size of each area and the values it is designed to protect are listed in **Table 3-42**, Existing Areas of Critical Environmental Concern. The values for which the ACECs were designated to protect are still present and require continued management attention.

Each of the five existing ACECs is also a designated Natural Area under the CNAP. Such areas are designated through voluntary land management agreements between the CNAP and a landowner (in this case, the BLM) who agrees to work cooperatively with the state to assure the protection of the site's significant features.

Table 3-42
Existing Areas of Critical Environmental Concern

Badger Wash ACEC	
Location:	Approximately nine miles northwest of Loma in Mesa County.
Size:	1,900 acres
Natural Values:	• Small drainage system entirely within the desert. • Contains one of the best condition sites in the state of a remnant saltbush community, gardner saltbush/salina wildrye. • Provides important habitat for two rare plant species, grand buckwheat (*Eriogonum contortum*) and Ferron's milkvetch (*Astragalus musiniensis*). • Provides habitat for sensitive wildlife, including burrowing owl and kit fox.

Table 3-42
Existing Areas of Critical Environmental Concern

Current Uses/ Management:	• The ACEC has been used for USGS hydrologic studies since the 1950s. The study area within the ACEC is comprised of four paired watersheds, 1A and 1B to 4A and 4B. The study examines sediment and erosion impacts of cattle grazing between the four pairs of grazed (unfenced) and ungrazed (fenced) watersheds. • Cattle grazing exists, except within the fenced portions of the paired watersheds. • Light to moderate recreational use (e.g., hiking, OHV use). • No Surface Occupancy (NSO) stipulation within the hydrologic study area (685 acres). • Closed to mineral materials disposal.
Valid Existing Rights:	• No private in-holdings (surface or subsurface) within the ACEC. • As of January 2010, there were three permitted wells. The status of these wells are: o East Bar X-2: drilled and abandoned in 1956. o Government #2-A: completed and currently shut-in. o Federal #5: producing gas well. • Eleven valid federal leases. • One road ROW. • Two pipelines for wells within the ACEC and one pipeline ROW running through the far northeastern corner of the ACEC. • One telephone ROW.
Current Management Issues:	• Increasing new energy exploration, development, and access roads may threaten native plant communities and long-term hydrologic studies. • The ACEC spans two grazing allotments with different management and permittees. • Partial NSO oil and gas stipulation does not cover the entire ACEC.
The Palisade ACEC/ONA	
Location:	North of Gateway and approximately 60 miles south of Grand Junction in Mesa County.
Size:	23,600 acres
Natural Values:	• Vertical cliffs, deep rugged canyons, and rolling to flat desert valley bottoms dissected by gulches; the most prominent feature is The Palisade, which is a three-mile-long, rocky, butte-like spine that cuts the unit north and south. • Higher elevations consist of open sloping to flat grasslands and meadows with moderate to heavy stands of intermixed pinyon-juniper and oak brush; lower elevations are characterized by pinyon-juniper and desert shrub vegetation. • Upper drainages contain aspen and ponderosa pine, while the North Fork of West Creek and Fish Creek have riparian vegetation. • Contains peregrine falcon and golden eagle breeding areas and Gunnison Sage-Grouse habitat. • Contains Horseshoe milkvetch, Fisher milkvetch, Kachina daisy, Dolores River skeleton-plant, Utah beardtongue, and Osterhout cat's eye.

Table 3-42
Existing Areas of Critical Environmental Concern

Natural Values *(continued)*:	• Contains numerous rare plants including Osterhout's cryptantha, Dolores River skeletonplant, horseshoe milkvetch, and Fisher Tower's milkvetch.
Current Uses/ Management Prescriptions:	• Hiking, climbing, camping, equestrian use, photography. • 1,920 acres closed to OHV use. • 1,920 acres designated as VRM Class I. • 17,258 acres designated as VRM Class II. • Big game hunting and outfitting. • Cattle grazing. • No Surface Occupancy stipulation.
Valid Existing Rights:	None.
Current Management Issues:	• The Palisade ACEC/ONA falls within the Palisade WSA, deemed nonsuitable for wilderness based on marginal manageability (BLM 1987).
Pyramid Rock ACEC/RNA	
Location:	Approximately two miles west-southwest of DeBeque in Mesa County.
Size:	550 acres
Natural Values:	• Eroded sandstone pinnacle. • Important habitat for the federally-listed Colorado hookless cactus (formerly Uinta Basin hookless cactus, federally-listed DeBeque phacelia, adobe thistle *(Cirsium perplexans)*, Naturita milkvetch, aromatic Indian breadroot (*Pediomelum aromaticum*), and DeBeque milkvetch.
Current Uses/ Management:	• Conservation area for the federally-listed Colorado hookless cactus. • Proposed critical habitat for DeBeque phacelia. • Rare plant monitoring and study site. • Cattle grazing. • Closed to mineral material disposal. • No Surface Occupancy stipulation. • Closed to motorized vehicles. • Closed to public utilities.
Valid Existing Rights:	• V.20 Road along west side of ACEC boundary. • Natural gas pipeline ROW east of V.20 Road.
Current Management Issues:	• Open areas surround the ACEC, making OHV incursions a continuous problem. • Cheatgrass invasion of adjacent landscape. • Current and future energy development. • Current boundary does not fully include adjacent cultural resources.

Table 3-42
Existing Areas of Critical Environmental Concern

Rough Canyon ACEC/RNA	
Location:	Seven miles south of Grand Junction in Mesa County.
Size:	2,700 acres
Natural Values:	• Habitat for two BLM special status plants: Grand Junction milkvetch and Osterhout's cryptantha. • Significant breeding area for the canyon tree frog and red-spotted toad *(Bufo punctatus)*. • Habitat for peregrine falcon and midget faded rattlesnake. • Visual and geologic resources including the Ladder Creek Monocline, Ladder Canyon fault, and a portion of the Bangs Canyon fault. • Historic quartz/mica mine. • High concentration of prehistoric archaeological sites.
Current Uses/ Management:	• Hiking, mountain biking, equestrian use, photography, camping. • Motorized vehicles allowed only on the Tabeguache Trail. • Cattle grazing. • Designated as VRM Class II. • Unsuitable for public utilities. • No Surface Occupancy. • Closed to mineral material disposal. • Withdrawn from locatable mineral entry.
Valid Existing Rights:	None
Current Management Issues:	• Continued increase in use, braiding of routes in canyon bottom, and lack of interpretive educational efforts puts protected resources at risk. • ACEC boundaries are not depicted on any of the BLM 1:100,000 maps.
Unaweep Seep ACEC/RNA	
Location:	In Unaweep Canyon, eight miles northeast of Gateway in Mesa County.
Size:	80 acres
Natural Values:	• Habitat for the Great Basin silverspot butterfly *(Speyeria nokomis nokomis)* and 67 other species of butterflies. • Large hillside spring complex consisting of at least 22 springs and seeps. • Riparian plant species including the giant helleborine *(Epipactus gigantea)*. • Designated as a Colorado "Important Bird Area" by Audubon Colorado. • Bordered on the south by the Unaweep-Tabeguache Scenic and Historic Byway (Highway 141) (see Section 3.4.5, National Byways).
Current Uses/ Management:	• Sightseeing, fishing, photography. • Cattle grazing. • Designated as VRM Class II. • No Surface Occupancy stipulation. • Withdrawn from mineral entry. • Closed to mineral material disposal.

Table 3-42
Existing Areas of Critical Environmental Concern

Valid Existing Rights:	None
Current Management Issues:	• Spread of noxious weeds, particularly Canada thistle and bull thistle.

Potential Areas of Critical Environmental Concern

In accordance with BLM Manual 1613, Areas of Critical Environmental Concern (BLM 1988), the GJFO ID Team reviewed all BLM-managed land in the planning area to determine whether any areas should be considered for designation as ACECs. The BLM reviewed both internal and external nominations, as well as areas identified through inventory and monitoring, and adjacent designations of other federal and state agencies. Areas determined to meet the relevance and importance criteria, as defined by 43 CFR 1610.7-2(a)(1) and 43 CFR 1610.7-2(a)(2), and guidance in BLM Manual 1613 (BLM 1988), are provided temporary management to protect human life and safety or significant resource values from degradation until the area is fully evaluated through the RMP process.

The review found 24 proposed ACECs (167,400 acres) to meet the relevance and importance criteria. Upon further review of the Rapid Creek ACEC, it was determined that the fish species initially thought to be present and meet the relevance and importance criteria do not occur within the creek that crosses BLM-administered land. As such, 23 ACECs totaling 168,000 acres were brought forward for analysis. **Table 3-43**, Potential Areas of Critical Environmental Concern, displays such proposed ACECs. Where an expansion of an existing ACEC is proposed, the total acres presented includes the existing ACEC. See **Figure 2-67**, Alternative C: Areas of Critical Environmental Concern, for the location of all ACECs that met the relevance and importance criteria for at least one value. More information on the evaluation of proposed ACECs, including methodology for analysis, can be found in **Appendix D**, Summary of Areas of Critical Environmental Concern Report on the Application of the Relevance and Importance Criteria. Each of the potential ACECs is evaluated for designation in at least one alternative of the EIS (see **Chapter 2**, Alternatives, and **Chapter 4**, Environmental Consequences).

Table 3-43
Potential Areas of Critical Environmental Concern

ACEC	Natural Values	Acres
Atwell Gulch	Plants, Wildlife, Scenic, Cultural	6,100
Badger Wash ACEC and Expansion	Plants, Wildlife, Hydrological	2,200[1]
Colorado River Riparian ACEC	Wildlife, Fish, Scenic, Riparian Habitat	880
Coon Creek ACEC	Fish	110
Dolores River Riparian ACEC	Plants, Wildlife, Fish, Scenic, Riparian Habitat	7,400
Glade Park-Pinyon Mesa ACEC	Wildlife	27,100

Table 3-43
Potential Areas of Critical Environmental Concern

ACEC	Natural Values	Acres
Gunnison River Riparian ACEC	Plants, Wildlife, Fish, Riparian Habitat	460
Hawxhurst Creek ACEC	Fish	860
Indian Creek ACEC	Cultural	1,700
John Brown Canyon ACEC	Wildlife	1,400
Juanita Arch ACEC	Plants, Geologic	1,600
Mt. Garfield ACEC	Scenic	5,700
Nine-mile Hill Boulders ACEC	Paleontological	90
The Palisade ACEC/ONA and Expansion	Plants, Wildlife, Scenic	32,300[1]
Plateau Creek ACEC	Fish	220
Prairie Canyon ACEC	Plants, Wildlife	6,900
Pyramid Rock ACEC/RNA and Expansion	Plants, Cultural	1,300[1]
Reeder Mesa ACEC	Plants	470
Roan and Carr Creeks ACEC	Fish, Riparian Habitat	33,700
Rough Canyon ACEC/RNA and Expansion	Plants, Wildlife, Cultural, Geologic	2,800[1]
Sinbad Valley ACEC	Plants, Scenic, Cultural, Geologic	6,400
South Shale Ridge ACEC	Plants[3], Wildlife, Scenic	28,200
Unaweep Seep ACEC/RNA and Expansion	Wildlife, Fish, Plants, Riparian Habitat, Hydrologic	85[1]
Total		**168,000**

Source: BLM 2010a
[1]Acreage includes existing ACEC
[2]During BLM's initial review of the proposed ACEC, the BLM identified fish species that met the relevance and importance criteria. Upon further review of the area, it was determined that the fish species are not present but that the area does provide habitat that supports the presence of riparian-obligate bird species.
[3]Plant value includes federally threatened DeBeque phacelia, which was inadvertently omitted from the ACEC report (BLM 2010c).

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 (Public Law 90-542, as amended; 16 USC 1271-1287) to protect outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values and to preserve the river or river section in its free-flowing condition.

Designation affords certain legal protection and prevents development that would impact the outstandingly remarkable values, free-flowing nature, or classification of the stream segment. Where private lands are involved, the federal managing agency works with local governments and owners to develop protective measures. 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 inventories and evaluates rivers when it develops an RMP for BLM lands in a specified area.

To be eligible for inclusion in the National Wild and Scenic Rivers System, a river segment must be free flowing and contain at least one river-related value considered to be outstandingly remarkable (BLM Manual 6400) (BLM 2012h). Eligible segments are tentatively classified as wild, scenic, or recreational based

on the current level of human development and activity within the corridor. The general definitions provided by the WSR Act are as follows:

- Wild river areas. Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
- Scenic river areas. Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
- Recreational river areas. Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Following the eligibility phase, BLM-managed river segments that have been determined to meet the eligibility criteria for WSR are evaluated for suitability. The purpose of the suitability study is to determine whether eligible rivers would be appropriate additions to the National Wild and Scenic Rivers System. The study includes an evaluation of each eligible segment in regards to the 12 suitability criteria factors. **Appendix C**, Final Wild and Scenic River Suitability Report, describes the methodology, data, and determinations made during the suitability phase.

Activities that would adversely affect eligible and suitable WSR stream segments include those that would diminish the outstandingly remarkable values or impair the free-flowing nature of the segment. Because many outstandingly remarkable values rely on a certain instream flow, activities that decrease instream flow may have an adverse effect on eligible and suitable WSR segments. Similarly, activities that affect the tentative classification of a stream segment, such as construction of a road in a segment with a wild classification, would impact the segment.

It is BLM policy to manage all eligible segments to preserve their free-flowing nature and identified outstandingly remarkable value(s) and tentative classification to the extent that the BLM has the authority to do so (BLM Manual 6400) (BLM 2012h). Should a nonsuitable determination be made in the RMP process, then the river shall be managed in accordance with management objectives as outlined in the plan document.

Current Conditions

There are no designated WSR streams in the GJFO planning area. Twenty BLM-managed segments in the GJFO were identified as eligible in the Wild and Scenic River Eligibility Report for BLM, GJFO (BLM 2009c). On March 30, 2009, after the release of the eligibility findings, Congress designated the Dominguez-Escalante NCA, which includes the Dominguez Canyon Wilderness. All or

portions of five segments identified as eligible fall within the Dominguez-Escalante NCA: Dominguez Creek, Big Dominguez Creek, Little Dominguez Creek Segments 1 and 2, and Gunnison River Segment 1. These segments will be considered for suitability during development of the RMP for the Dominguez-Escalante NCA. In addition, the Little Dolores River was removed from further consideration due to land status that was verified through an updated cadastral survey. This was addressed in an amendment to the eligibility report in September 2011.

A suitability study was done for the remaining 14 eligible stream segments, resulting in a preliminary suitability determination for each segment. The methodology and detailed analysis are in **Appendix C**, Final Wild and Scenic River Suitability Report.

Table 3-44, Summary of Wild and Scenic River Study Segments, lists the 14 eligible segments, their preliminary classification assigned during eligibility, lengths, and acreages (**Figure 2-70**, Alternatives A and C: Stream Segments Eligible [Alternative A] or Suitable [Alternative C] for Inclusion in the National Wild and Scenic Rivers System). While there are no management measures currently in place to specifically protect the free-flowing nature and outstandingly remarkable value(s) of eligible stream segments, overlapping ACECs, Wilderness or WSAs, SRMAs, and stipulations for oil and gas leasing (i.e., no surface occupancy, controlled surface use, and timing limitation) provide protection to some areas. For more details, refer to **Appendix C**, Final Wild and Scenic River Suitability Report.

Interim Protection

All eligible stream segments must be managed to protect the preliminary classification (wild, scenic, or recreational), free-flowing nature, and outstandingly remarkable values related to the segment to the level that they existed when the segment was found eligible. The preliminary classification restricts certain types of development depending upon the classification. Proposed developments must comply with those permitted by the WSR Act. Through regular monitoring of the outstandingly remarkable values, the BLM can assess whether or not they are present at the same level that they were when the segment was found eligible.

Table 3-44
Summary of Wild and Scenic River Study Segments

River or Creek	Total Segment Length (miles)	Length on BLM Land (miles)	Total Wild and Scenic River Study Corridor (acres)	Area on BLM Land (acres)	Tentative Classification	Outstandingly Remarkable Values
Blue Creek	11.2	10.0	3,200	2,900	Scenic	Scenic, Fish, Cultural
Carr Creek	9.8	5.1	3,100	1,700	Scenic	Fish
Colorado River Segment 1	17.8	7.3	5,600	2,200	Recreational	Scenic, Fish, Wildlife
Colorado River Segment 2	3.5	1.3	1,200	100	Recreational	Fish
Colorado River Segment 3	19.7	19.1	6,400	5,700	Scenic	Scenic, Recreation, Fish, Wildlife, Geologic, Historic
Dolores River	32.0	18.6	9,600	6,100	Recreational	Scenic, Fish, Recreation, Geologic, Paleontological
East Creek	18.9	9.0	5,800	2,900	Recreational	Geologic
Gunnison River Segment 2	6.0	3.8	1,900	1,000	Recreational	Fish, Historic
North Fork Mesa Creek	2.1	2.1	700	900	Scenic	Vegetation
North Fork West Creek	3.3	3.3	1,100	1,100	Wild	Scenic
Roan Creek	15.8	6.5	4,500	2,000	Scenic	Fish
Rough Canyon Creek	4.2	4.2	1,400	1,200	Scenic	Scenic, Wildlife, Geologic
Ute Creek	4.2	4.2	1,400	1,400	Scenic	Scenic, Vegetation
West Creek	5.8	4.9	1,900	1,700	Recreational	Scenic, Wildlife, Geologic, Vegetation

Source: BLM 2010a

3.4.4 National Trails

National Scenic Trails and National Historic Trails are congressionally designated under the authority of the National Trails System Act of 1968. National Scenic Trails are extended trails that provide maximum outdoor recreation potential and for the conservation and enjoyment of the various qualities – scenic, historical, natural, and cultural – of the areas through which they pass. The BLM currently manages land along 5 National Scenic Trails, none of which are within the GJFO planning area.

National Historic Trails are extended trails that closely follow a historic trail or route of travel of national significance. Designation identifies and protects historic routes, historic remnants, and artifacts for public use and enjoyment. Nationwide, the BLM currently manages 11 National Historic Trails. They must meet the following three criteria listed in Section 5(b)(11) of the National Trails System Act:

- They must follow actual documented route of historic use;
- They must be of national significance; and
- They must possess significant potential for public recreation and/or interpretation.

The Old Spanish National Historic Trail was designated on December 4, 2002, by the Old Spanish Trail Recognition Act of 2002 (Public Law 107-325). The northern branch of the trail passes through a portion of the GJFO (**Figure 2-91**, Alternative A: National Historic Trails and State and BLM Byways). The interim nature and purpose of the trail is to afford the public the opportunity to connect to the trail resources and the trail story.

The Old Spanish National Historic Trail was a 2,700-mile trade route linking Santa Fe, New Mexico, and Los Angeles, California, passing through New Mexico, Colorado, Utah, Arizona, Nevada, and California. The trail had brief but heavy use between 1829 and 1848. During that period, Mexican and American traders took woolen goods west over the trail by mule train and returned eastward with California mules and horses for the eastern US and Mexican markets (Old Spanish Trail Association 2009).

Spanish traffic was fairly constant between 1765 and 1821 to trade with the Ute. Some trail users chose to trade with the Utes as far north as Salt Lake, and followed a path now labeled the "North Branch," which led to Grand Junction, Colorado before heading south to rejoin the other major route from Santa Fe via Green River, Utah. Mexican trader Antonio Armijo made the first commercial, round-trip journey along a southern variant of the route in 1829 to 1830. William Wolfskill and George Yount's commercial pack train of 1830 to 1831 inaugurated consistent use of the entire route from 1830 to 1848. Use lapsed after the end of the Spanish American War in 1848, and by 1853, the Old Spanish National Historic Trail had been abandoned as a principal trade route

(NPS 2001). The various historical routes together make up what is today known as the Old Spanish National Historic Trail.

Current Conditions

BLM and NPS jointly administer the Old Spanish National Historic Trail. The Old Spanish Trail Association serves as the primary non-federal partner. A strategy is being developed by the BLM and NPS which will guide how the agencies achieve trailwide comprehensive plan and agency policy requirements and which will provide strategic direction for administration and management of the Old Spanish NHT. The trail-wide comprehensive plan does not make land use allocations and does not direct the actions of National Trail managers."

Fifty-one miles of the Old Spanish National Historic Trail fall within the GJFO field office boundary, and 40 miles are within the GJFO planning area. However, only 6.9 miles of the congressionally designated route are under BLM jurisdiction, as the remaining portions are on land with other surface ownership (**Figure 2-91**, Alternative A: National Historic Trails and State and BLM Byways). On-the-ground surveys and additional archival work will help the BLM identify the location of the OSNHT more precisely.

Within the planning area, the Old Spanish National Historic Trail was classified as VRI Class IV during a 2009 visual resource inventory except for a short stretch of VRI Class III on private land (Otak 2009). Much of the Old Spanish National Historic Trail corridor within the planning area has been greatly impacted by residential, commercial and transportation developments in the past 10-20 years. This change in character is especially evident near Whitewater, where the expanding urban and suburban footprint has curtailed visitors' ability to experience the historic trail in a relatively unaltered landscape. Between Whitewater and Grand Junction a recreation route (approximately 4.5 miles in length) has been identified as the Old Spanish Trail. However, the historic alignment of the trail is likely further north and east along the Highway 50 corridor. The recreation route provides an opportunity for visitors to experience the general area of the historic trail in a slightly less developed setting.

Trends

The trail-wide comprehensive plan will examine trail resources along the entire route of the Old Spanish National Historic Trail. At the local level, the BLM will continue to work with the local branch of the Old Spanish Trail Association to manage trail use and provide educational opportunities in a manner that safeguards the nature and purposes of the trail.

3.4.5 National, State, and BLM Byways

Background

Byways and backways are routes that range from multilane freeways to narrow, graded roads open part of the year. Designations include All American Roads,

National Scenic Byways, Colorado Scenic Byways, and BLM Back Country byways. Designation as a byway or backway can occur at the national level by the US Secretary of Transportation, at the state level, or at the BLM Field Office level. There are three designated byways or backways in the GJFO planning area.

National Scenic Byways

The National Scenic Byways Program was established under the Intermodal Surface Transportation Efficiency Act of 1991 and was reauthorized in 1998 under the Transportation Equity Act for the 21st Century. Under the program, the US Secretary of Transportation recognizes certain roads as National Scenic Byways or All American Roads based on their archaeological, cultural, historic, natural, recreational, and scenic qualities. For a highway to be considered for inclusion in the National Scenic Byways Program, it must provide safe passage for passenger cars year-round, it must be designated a State Scenic Byway, and it must have a current corridor management plan in place. To receive an All American Road designation, a road must possess multiple intrinsic qualities that are nationally significant and contain one-of-a-kind features that do not exist elsewhere. The road must also be considered a "destination unto itself." That is, the road must provide an exceptional traveling experience so recognized by travelers that the primary reason for their trip would be to drive along the byway (National Scenic Byways Program 2009).

Colorado Scenic Byways

Similar to National Scenic Byways, Colorado Scenic Byways are paved highways that have been designated by official state declaration for their scenic, historic, recreational, cultural, archaeological, or natural qualities. The byways are paved roads that are generally safe, year-round, for passenger cars.

BLM Back Country Byways

The BLM Back Country Byways Program was developed by the BLM to complement the National Scenic Byways Program. Back Country Byways highlight the spectacular nature of the western landscapes. Back Country Byways vary from narrow, graded roads, passable only during a few months of the year, to two-lane paved highways providing year-round access.

Current Conditions

There are two National Scenic Byways that cross through the GJFO planning area: Dinosaur Diamond National Scenic and Historic Byway and the Grand Mesa National Scenic and Historic Byway. In addition, there is one State Scenic byway, the Unaweep-Tabeguache State Scenic and Historic Byway, that crosses through the GJFO planning area. Refer to **Figure 2-91**, Alternative A: National Historic Trails and State and BLM Byways, for the location of the byways. The BLM serves as a project partner for each of these byways and is committed to making decisions that focus on thoughtful marketing and comprehensive resource protection. There are no BLM Back Country Byways in the GJFO planning area.

Dinosaur Diamond Scenic and Historic Byway

The Dinosaur Diamond National Scenic and Historic Byway is a 480-mile, two-state byway that provides opportunities to see dinosaur bones being excavated and prepared by paleontologists for museum display. Visitors can also visit museums along the byway that showcase reconstructed skeletons and fleshed-out re-creations of dinosaurs found in the area. In addition to dinosaur sites, archaeological areas are scattered throughout the region that encompasses Dinosaur Diamond, and visitors can observe prehistoric Native American petroglyphs and pictographs that cover rock cliffs across the northern edge of the Colorado Plateau. It was designated a National Scenic Byway in 2002. The Dinosaur Diamond Partnership is currently preparing an application to be considered by the National Scenic Byways Program for All American Road listing (Dinosaur Diamond Partnership 2009).

There are existing oil and gas leases off of the byway and, under the current plan, the area is open for oil and gas leasing. The proposed Red Cliff Mine and the McClane Canyon coal mine are also adjacent to this byway.

Unaweep-Tabeguache Scenic and Historic Byway

Since its designation, the Unaweep-Tabeguache State Scenic and Historic Byway has experienced a more active motorized tourist industry. The byway travels through Unaweep Canyon from Whitewater to Gateway, then along the Dolores and San Miguel Rivers to Uravan, Naturita and Placerville. The Unaweep section follows the ancient path of the Gunnison River as it carved a deep channel in the earth to expose dramatic walls of pre-Cambrian granite. Unaweep Canyon has a unique geological feature—a divide in the middle that causes water to flow "out of two mouths" (the roughly translated meaning of the word Unaweep). The waters that fall on the east side of Unaweep's divide flow to the Gunnison River via the seasonal East Creek. The western waters flow to the Dolores River via the year-round-flowing West Creek.

Nine-Mile Hill is a legendary wagon route once used for hauling supplies into and radium ore out of Gateway during the radium boom of the early 1900s. During this time, Nine-Mile Hill's grueling 18 percent grade often exhausted the stock teams pulling wagonloads up and was equally treacherous coming down. The infamous hill even proved too steep for early motor-powered vehicles, and passengers frequently had to climb the hill on foot. This route, which is now Colorado Highway 141, was once known as Uranium Road. It served as the only access between the ore-rich mines in Gateway, Uravan, Naturita, and Nucla and the processing mills in Grand Junction. Today, Nine-Mile Hill is only five miles long and less steep than before.

The Tabeguache section runs south from Gateway to the communities of Nucla and Naturita in the Uncompahgre Field Office of the BLM. The Dolores River cuts a dramatic path through the sandstone as the byway winds its way alongside, sometimes hundreds of feet above the river. Here in this section

visitors find a world-famous hanging flume and recently closed Uravan mining site, both evidence of the area's rich history of mining and mineral extraction.

Grand Mesa Scenic and Historic Byway

The 63-mile Grand Mesa National Scenic and Historic Byway was designated a scenic byway in 1996. The byway begins at Interstate 70 and follows Colorado Highway 65 up Plateau Canyon to an elevation of more than 11,000 feet and leads visitors to a variety of year-round outdoor recreation opportunities. Less than four miles of the Grand Mesa Scenic and Historic Byway actually cross GJFO-managed land, but the byway provides several points at which visitors can access BLM lands for recreational purposes.

Trends

Driving for pleasure is expected to increase through the GJFO planning area, particularly along the existing scenic byways. Development pressures are likely to increase both on private and public lands adjacent to the byways. It is likely that increased development proposals on current private ranch lands will increase over time as population increases. As both the Dinosaur Diamond and the Unaweep-Tabeguache byways traverse BLM lands with both existing mineral leases and the opportunity for future mineral exploration and development, development pressure is also expected to increase on public lands. The BLM continues to work with partnership groups such as the Dinosaur Diamond Prehistoric Highway Partnership (Dinosaur Diamond Scenic and Historic Byway) to enhance and promote the scenic byways in the project area.

3.5 SUPPORT

This section is a description of the support conditions in the GJFO planning area and follows the order of topics addressed in Chapter 2:

- Cadastral
- Interpretation and Environmental Education
- Transportation Facilities

3.5.1 Cadastral

Cadastral survey is one of the BLM's basic responsibilities as the keeper of over 200 years of federal survey records and plats. In addition, the cadastral program supports all other functions by conducting land surveys and resurveys to identify public/private land boundaries. These surveys are often needed where there are unauthorized uses, land tenure adjustments, or BLM projects near a public/private land boundary. The costs of cadastral surveys are borne by the federal program or private interest that benefit from the boundary identification.

Current Conditions

Cadastral survey has been used extensively throughout the GJFO over the past 20 years primarily with trespass issues related to lands and realty. Unauthorized

agricultural and mineral development, residential development, fence construction, and road development have been the primary uses for cadastral survey. Cadastral has also been used to survey boundaries related to legislative actions and boundaries associated with land acquisitions, exchanges, and disposals throughout the GJFO.

Trends

As development of urban areas adjacent to BLM lands increases throughout the planning area, so will the need for cadastral efforts. The need for accurate surveys will be critical in areas of mixed federal and private ownership, such as Whitewater, the Grand Mesa Slopes, DeBeque, and Glade Park. The need for boundary surveys related to land tenure adjustments will also continue. The current capacity of the cadastral program is not sufficient to meet the increasing survey needs in the planning area associated with urban interface development.

3.5.2 Interpretation and Environmental Education

Interpretation is the voice for all BLM resource management programs. A well-developed program supports the goals and objectives of all resources and programs by serving customers; promoting land health; and enhancing the public's enjoyment, understanding, and appreciation of the public lands' natural and cultural resources and their management. An interpretive program reaches out to dispersed visitors across varied landscapes and serves visitors who are exploring many facets of public lands.

Management issues are addressed within the interpretive story in a way that relates those issues to the visitors' experiences. Interpretive planning is done collaboratively with internal and external groups, and clear measurable objectives are established to gauge the cost/benefit and the program's effectiveness. The BLM's interpretive program aims to respect and serve people with diverse backgrounds and abilities.

Current Conditions

Interpretation and education opportunities in the decision area have not been extensively developed. Only a handful of small interpretive sites and a variety of single interpretive signs are scattered throughout the decision area. Currently, visitors receive information on opportunities in the decision area, as well as on safety concerns, from both off-site and on-site sources. Off-site sources include assorted resource brochures distributed throughout the area, maps, programs given by resource specialists or local historians, teacher information packets, fact sheets, and various Internet web sites. Many program- or area-related brochures have been automated and are available on the Internet. Informational tours for volunteer groups and the general public are periodically given by BLM specialists.

On-site information is obtained from directional signs, road markers, ranger patrols, and interpretive signs. An integral part of the BLM's recreation outreach is the GJFO visitor center in Grand Junction, with an average of 75 visits per

day. The visitor center provides interpretation, education, and information to visitors interested in route conditions, recreation opportunities available in the region, and current events.

The GJFO visitor center coordinates with other providers locally and regionally to provide the public with current, accurate information. Brochures and other information are sent to the Chamber of Commerce and Visitor Centers in Grand Junction and Fruita, Colorado, and in Moab, Utah. Other BLM partnerships have been developed with the Unaweep-Tabeguache State Scenic and Historic Byway and Dinosaur Diamond National Scenic Byway.

Trends

A developed interpretive program will focus on the GJFO's public lands and the interrelationship between the physical elements, biological systems, and cultural and historical events. Many of these efforts are accomplished in partnership with other land-management agencies and involve local communities. The BLM will continue to partner with other organizations and government agencies, thereby sharing costs and more effectively delivering interpretive products and services to the public. Making interpretive and educational resources available electronically on the Internet also furthers this goal.

3.5.3 Transportation Facilities

The BLM's transportation system represents one of the most critical assets to the accomplishment of the BLM's mission to manage public lands. It affords entry for public access and provides the infrastructure that supports uses ranging from recreation to commercial activity and is the primary means of access to public lands under BLM GJFO jurisdiction.

Current Conditions

Federal, State, and County Roads

A network of federal, state, and county roads provides access throughout the planning area. Interstate 70 bisects the planning area, bringing traffic to the region from throughout the US.

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 (Highway 6/50, 141, and 139) carry the largest traffic volumes, followed by county roads.

BLM Roads

BLM roads provide public and administrative (agency and permittee) access to public lands, through public lands, and to inholdings of private land within the planning area. The 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. Most use of BLM roads would be described as casual.

Related to transportation planning is travel management. Travel management (**Section 3.3.5**, Comprehensive Travel and Transportation Management) 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. Refer to **Section 3.3.5**, Comprehensive Travel and Transportation Management, for more information.

Road System Maintenance

The BLM maintains roads under standards set forth in the BLM 9100 series manuals and the GJFO 1987 RMP (BLM 1987). Maintenance provides for resource protection, accommodation of users, and protection of the BLM's investment. The BLM uses the road maintenance intensities described in **Table 3-45**, Road Maintenance Intensity Levels. Road system maintenance has focused on maintaining major recreational access roads, which generally receive most of the traffic volume. The BLM annually maintains approximately 100 miles of road within the planning area, depending on road conditions and funding availability; approximately 95 miles are planned for maintenance in Fiscal Year 2010. Road maintenance generally consists of blading or grading and is usually performed 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 periods of heavy rainfall. Snow is not removed.

The 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, they were 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 Facility Asset Management System. It includes four primary "Maintenance Intensity" levels that allow for low, medium, and high maintenance intensities, irrespective of the type of route (road, primitive road, or trail) (BLM 2006b).

Maintenance intensities must be consistent with land use planning management objectives (for example, natural, cultural, recreation, and visual settings).

Table 3-45
Road Maintenance Intensity Levels

Maintenance Intensity Level	Maintenance Description, Objectives, and Funds
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 planned annual maintenance • Meet identified environmental needs • No preventive maintenance or planned annual maintenance activities *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 is given to maintaining drainage and runoff patterns as needed to protect adjacent lands. Grading, brushing, or slide removal is not performed unless route bed drainage is being adversely affected, causing erosion. • Meet identified resource management objectives • Perform 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 are 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	The BLM has reserved this level for possible future use; 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 will be maintained as needed. Surface maintenance will be conducted to provide a reasonable level of riding comfort at prudent speeds for the route conditions and intended use. Brushing is conducted as needed to improve sight distance when appropriate for management uses. Landslides adversely affecting drainage receive high priority for removal; otherwise, they will be removed on a scheduled basis.

Table 3-45
Road Maintenance Intensity Levels

Maintenance Intensity Level	Maintenance Description, Objectives, and Funds
	• Meet identified environmental needs • Generally maintained for year-round traffic • Perform annual maintenance necessary to protect adjacent lands and resource values • Perform preventive maintenance as required to generally keep the route in acceptable condition Planned maintenance activities should include environmental and resource protection efforts, annual route surface • Route surface and other physical features are 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	The BLM has reserved this level for possible future use; 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 • The entire route will be maintained at least annually. Problems will be repaired as discovered. These routes may be closed or have limited access due to weather conditions but are generally intended for year-round use. • Meet identified environmental needs • Generally maintained for year-round traffic • Perform annual maintenance necessary to protect adjacent lands and resource values • Perform preventive maintenance as required to generally keep the route in acceptable condition • Planned maintenance activities should include environmental and resource protection efforts, annual route surface • Route surface and other physical features are maintained for regular traffic

Source: BLM 2006b

Functional Road Classification Types for BLM System Roads

Based on BLM Manual Section 9113 (Roads) (BLM 1985), roads on BLM lands are classified into three classes based on the amount of traffic movement: collector, local, and temporary resource roads.

Collector Roads—These BLM roads normally provide primary access to large blocks of land and connect with or are extensions of a public road system. They accommodate mixed traffic and serve many uses. They generally receive the

highest volume of traffic of all roads in the BLM road system. User cost, safety, comfort, and travel time are primary road management considerations. Collector roads usually require application of the highest standards used by the BLM.

Local Roads—These BLM roads normally serve a smaller area than collectors and connect to collectors or public road systems. Local roads receive lower volumes, carry fewer traffic types, and generally serve fewer users. User cost, comfort, and travel time are secondary to construction and maintenance cost considerations. Low volume local roads in mountainous terrain, where operating speed is reduced by terrain, may be single-lane roads with turnouts. Environmental impacts are reduced because steeper grades, sharper curves, and lower design speeds than would be permissible on collector roads are allowable.

Resource Roads—These BLM roads are spur roads that provide point access and connect to local or collector roads. They carry very low volume and accommodate only one or two types of use. Use restrictions are applied to prevent conflicts between users needing the road and users attracted to the road. The location and design of these roads are governed by environmental compatibility and minimizing bureau costs with minimal consideration for user cost, comfort or travel time.

Mineral and Energy Development-related Transportation Issues

Road capacity, maintenance, and safety issues from mineral and energy development-related traffic are an issue in the GJFO planning area in areas where mineral and energy resources are being developed. A short-term increase in the volume of both heavy and light traffic occurs during the construction, well drilling, and completion phases of developing mineral and energy resources. Temporary conflicts (including a potential for delays, dust, road degradation, and increased vehicle safety) occur during the construction/drilling phase and recompletion/workover activities. County roads also are affected by heavy equipment use, fugitive dust, and traffic-related noise. All associated impacts are lower after gas wells are in operation because traffic levels drop.

Many existing unimproved roads have been repaired and improved to accommodate the increase traffic and heavy equipment. Many new roads have also been created to facilitate gas production by providing access to the many gas wells. These new roads across public lands are often only open to gas development personnel for administrative vehicle access.

Airports and Railroads

Grand Junction Regional Airport is the only public airport in the planning area. There are a number of locations throughout the GJFO that are commonly known and consistently used for aircraft landing and departure activities that, through such casual use, have evolved into backcountry airstrips. The major rail line that serves the planning area is the Union Pacific. However, this rail line

operates mostly within the McInnis Canyons and Dominguez-Escalante NCAs, which are outside of the GJFO planning area.

Trends

Road system maintenance in the GJFO has focused on maintaining major recreational access roads, which generally receive most of the traffic volume. For the past 8 to10 years, the GJFO has annually maintained approximately 100 miles of road.

3.6 SOCIAL AND ECONOMIC CONDITIONS

This section is a description of the support conditions in the GJFO planning area and follows the order of topics addressed in Chapter 2:

- Native American Tribal Uses
- Public Health and Safety
- Socioeconomics
- Environmental Justice

3.6.1 Native American Tribal Uses

Current Conditions

Contemporary Native American tribes with interests in the planning area include the Northern Ute, Ute Mountain Ute, and Southern Ute Tribes. The Northern Ute Tribe resides on the Uintah and Ouray Indian Reservation in northeastern Utah. Three bands of Utes comprise the Northern Ute Tribe: the Whiteriver Band, Uncompahgre Band, and Uintah Band. The Ute Mountain Ute Tribe and Southern Ute Tribe have separate reservations in the extreme southwestern corner of Colorado. The Ute's aboriginal homelands encompassed large areas of Utah, New Mexico, Arizona, and Colorado, including the entire GJFO. The ancestors of the Uncompahgre and White River Ute bands are associated with the GJFO planning area in particular and were forcibly removed to the reservation lands in eastern Utah in 1881. How this has affected the Utes own view of themselves, their history and their culture is critical to understanding the concept of Traditional Cultural Properties and establishing continuity in cultural significance. In consultation Ute elders and traditional leaders have identified that this event, when they were disenfranchised from their ancestral homeland, is considered by them to be a recent event and the psychological trauma experienced in those events persists to the present day. There is an effort to move toward reconciliation and participate in projects intended to reconnect the Ute to their homeland. Whether a traditional community has visited an area for traditional culture practices is especially relevant for the planning area because of this recent event. (Ott 2010).

Shoshone and Comanche populations were also present in northwestern Colorado during various historic periods, primarily north of the GJFO. The Hopi and Zuni Tribes, as well as the Navajo Nation, also connected to the planning area through past use or evidence from oral traditions.

Potential Native American interests in planning area lands include a wide range of overlapping economic, social, traditional, and religious practices and uses. Because the BLM manages lands ceded under treaties, or that are within historical and traditional aboriginal use areas, the agency has the responsibility to consult with tribes to consider the conditions necessary to satisfy any economic or resource access rights and to continue traditional uses in interest areas. Currently, tribal members may be using public lands for subsistence and cultural purposes. Tribes having traditional or economic interests in the planning area need to be considered during land use and project planning under treaties (if applicable), the tribal trust relationship, various federal laws, US DOI and BLM regulations and guidance, and executive orders. These requirements are sometimes further interpreted through specific court decisions, agreements, and regulations.

Treaty rights are not rights granted from the US, but rather are rights specifically reserved or retained by tribes under the terms of treaties or agreements. Several treaties and agreements affecting the planning area were initiated by the federal government beginning in 1849. The level of participation and understanding by the Utes in these treaties varied, as did federal ratification, appropriations, protections, and compliance (Burns 2004). The result of these treaties was the loss of Ute lands in the planning area.

Indian Trust Assets are legal interests in property, physical assets, or intangible property rights held in trust by the US for Indian tribes or individual Indians. Common examples of trust assets may include lands, minerals, hunting and fishing rights, water rights, other natural resources, and money. This trust responsibility requires that all federal agencies ensure that their actions protect Indian Trust Assets.

The planning area is not contiguous to any tribal lands. There are no programmatic agreements, MOUs, or plans that are co-signed between the BLM and the Tribes. There are no known off-reservation treaty rights or Indian Trust Assets present in the planning area.

Characterization

There is little information available on specific economic, traditional, and sacred uses or locations within the planning area. Because of the long displacement of the Ute bands to reservations and boarding schools and the subsequent ownership and management by others, it has been difficult to maintain relationships with the sites, natural resources, and landscapes of ancestral lands. Tribal concerns regarding natural resource management and economic uses of resources are only beginning to be documented, but generally these include

expanding the understanding of cultural sites to include the physical setting, vistas, landscapes, and plants. It is anticipated that there are documented and unrecorded cultural use areas, traditional cultural properties, rock art, trails, wickiups, camps, eagle traps, burials, battle locations, and ceremonial sites that are of interest to tribes. These are discussed primarily in **Section 3.2.11**, Cultural Resources.

The 1987 RMP does not contain any specific decision guidance relating to Native American issues or concerns. There was no documented Native American Consultation for the 1987 RMP. Consultation with the tribes between 1987 and 2000 was not documented. Native American consultation on both a programmatic and project-specific basis to identify any traditional cultural properties, sacred/religious sites, and special use areas began through letters, phone calls, presentations to Tribal Councils, and on-site visits with Ute tribal members in a systematic manner in 2001. Field site visits were conducted to share the results of compliance projects where sites that are affiliated to the Ute Tribes are recorded. In 2006 the BLM became a partner in the Ute Ethnobotany Project, bringing Ute elders and students to reconnect with traditional lands, the project resulted in the development of the Ute Learning Garden and this project continues in partnership with the Ute Indian Tribe.

The Ute Ethnohistory Project is a long-term partnership and research project with the Ute Tribes dedicated to identifying areas and sites of cultural and religious importance to the Ute people. The Ute Ethnohistory Project coordination meeting between the BLM managers and the Ute cultural representatives was in November 2007 with follow-up field and office meetings in 2008 and 2009.

On April 8, 2006, the GJFO invited the Southern Ute Indian Tribe, the Northern Ute Indian Tribe, and the Ute Mountain Ute Tribe to become cooperating agencies for the RMP revision process. To date, none of the Tribes have signed an MOU with the BLM to become a cooperating agency.

3.6.2 Public Health and Safety

The BLM's mission to sustain public lands for the use and enjoyment of present and future generations includes efforts to minimize and reduce threats from releases of hazardous substances that could have an impact on the health, diversity, and productivity of the public lands as well as on the health and safety of the individuals who utilize and work on these lands. In addition, the Federal Land Policy and Management Act of 1976 require that BLM actions comply with approved standards for public health and safety. Of particular concern to BLM are the safety impacts related to abandoned mines, debris flows, and hazardous materials.

The goals public safety management are to (1) protect public health and safety and environmental resources by minimizing environmental contamination from past and present land uses (i.e., abandoned mine lands) on public lands and on

BLM owned and operated facilities; (2) comply with Federal, State, and local hazardous materials management laws and regulations; (3) maintain the health of ecosystems through assessment, cleanup, and restoration of contaminated lands; (4) manage the costs, risks, and liabilities associated with hazardous materials so that the responsible parties and not the government bear the brunt of financial liabilities; and (5) integrate environmental protection and compliance with all environmental statutes into BLM activities.

Public health and safety topics include law enforcement, hazardous materials and sites, illegal dump sites, target shooting, abandoned mines, energy development, hydrogen sulfide wells, motor vehicle operations, and remoteness and natural hazards.

Current Conditions

Law Enforcement

The BLM law enforcement officers and rangers enforce federal laws and regulations governing the public lands and resources. They conduct high-priority investigations and enforcement actions that focus on resource protection and public health and safety, ensuring compliance with both federal laws and land use regulations on public lands.

The mission of the Colorado BLM law enforcement program is as follows:

- Enforcing federal laws and regulations related to the use, management, and development of the public lands and their resources, including activities related to the administration of the public lands;
- Public education of laws, policies, regulations and user ethics;
- Protecting critical resources from being removed, damaged, or destroyed; and
- Providing a public service on public lands in a manner that is complementary to the proprietary jurisdictional nature of such lands (BLM 2010h).

Implementation of the law enforcement program ensures that:

- Critical resources are protected from being removed, damaged, or destroyed without authorization or in violation of environmental requirements or restrictions;
- The lands and waters are free from illegal dumping or pollution;
- The users of the public lands will have a safe and enjoyable experience that is not impacted by the illegal acts or inappropriate conduct of others;

- The revenues owed to the government for authorized or unauthorized uses are paid and collected;
- Unauthorized use is prevented and discouraged through termination, investigation, and appropriate resolution;
- Authorized or unauthorized users of the public lands or their resources are held accountable for any required repairs or reclamation;
- Criminal activities are reported, investigated, or referred to appropriate agencies (BLM 2010h).

Hazardous Materials and Sites

Hazardous materials can be defined as any item or chemical that has the potential to cause harm to humans, natural resources, or the environment when spilled, released, or contacted. Hazardous wastes are hazardous substances that have been discarded (e.g., spilled, released, dumped, etc.). The US Environmental Protection Agency (EPA) classifies hazardous materials as toxic, corrosive, ignitable, or reactive, and some materials may exhibit multiple characteristics.

The primary regulators of hazardous wastes and hazardous waste sites in Colorado are, the EPA and the Colorado Department of Public Health and Environment (CDPHE). Other state agencies regulate specific types of hazardous waste sites, such as the Colorado Oil and Gas Conservation Commission (oil and gas development waste materials) and the Colorado Department of Labor and Employment, Division of Oil and Public Safety (leaking petroleum storage tanks).

Illegal Dump Sites

Illegal dumping is defined as the disposal of waste in an unpermitted area (US 21 EPA 1998). Illegally dumped wastes are primarily nonhazardous materials that are dumped to avoid disposal fees or to avoid the time and effort required for proper disposal. Illegal waste dump sites commonly contain the following materials:

- Construction and demolition waste such as drywall, roofing shingles, lumber, bricks, concrete, and siding;
- Abandoned automobiles, auto parts, and scrap tires;
- Appliances, containing harmful refrigerants;
- Furniture;
- Yard waste;
- Household trash; and
- Medical waste.

If not addressed, illegal dumps often attract more waste, potentially including hazardous wastes, such as asbestos containing materials, household chemicals and paints, automotive fluids, and commercial or industrial wastes (US EPA 1998). Sites used for illegal dumping vary but may include abandoned industrial, residential, or commercial buildings, vacant lots on public or private property, and infrequently used roadways (US EPA 1998). Because of their accessibility and poor lighting, areas along rural roads and railways are particularly vulnerable.

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. Environmental and property damage (release of refrigerants the atmosphere, the shooting of trees and signs) is also a significant problem.

Outdoor shooting ranges provide recreational facilities for shooting sports enthusiasts. Recently, there has been a growing public concern about the potential negative environmental and health effects of range operations. In particular, the public is concerned about potential risks associated with past and continued use of lead shot and bullets at outdoor ranges. Historically, the three major sources for human exposure to lead are lead-based paint, lead in dust and soil and lead in drinking water. The main human exposure to lead associated with shooting ranges is through lead contaminated soil. However, other pathways are discussed below, along with lead's detrimental effects on humans and animals. Lead can be introduced into the environment at shooting ranges in one or more of the following ways. Each of these pathways is site-specific and may or may not occur at each individual range:

- Lead oxidizes when exposed to air and dissolves when exposed to acidic water or soil.
- Lead bullets, bullet particles, or dissolved lead can be moved by storm water runoff.
- Dissolved lead can migrate through soils to groundwater.

The GJFO manages two developed target shooting ranges and one undeveloped shooting area, and many other sites are historically known for dispersed target shooting. The GJFO has made attempts in certain areas to make target shooting safer for the public and environment, often by encouraging target shooting in places where other recreational use is low. The GJFO relies on the public to encourage safe shooting practices.

Open OHV Areas (i.e., Grand Valley, 18 Road, and 34 and C) have experienced safety issues and user conflicts associated with dispersed target shooting due to high use by OHV users seeking cross-country travel experiences. The 1987

RMP closed the Grand Valley Open OHV area to target shooting but did not close the 34 and C area.

BLM-administered lands near 34 and C Roads outside of the open OHV area are within close proximity to residential areas, industrial areas, and Federal Aviation Administration infrastructure. As a result, recreational shooting in those areas directly conflicts with state and federal use and conduct laws. BLM law enforcement personnel as well as the Mesa County Sheriff's Office receive multiple complaints each week regarding unsafe shooting behaviors within the 34 & C Roads area. Federal Aviation Administration infrastructure has been subject to shooting vandalism raising concerns about Federal Aviation Administration communications outages. This area of public land is utilized by OHV users, off-road enthusiasts, target shooters, and hikers. There is a lack of adequate backstops and screening within these areas.

Portions of the Bang's Canyon and North Fruita Desert SRMAs, the Gunnison River Bluffs area, and developed recreation sites (e.g., Mud Springs Campground, trailheads, wildlife viewing areas, picnic areas, day use areas, etc.) have high, concentrated use. Much of these areas also lack adequate topographic screening that has resulted in user conflict and safety concerns. Portions of the Bang's Canyon SRMA (i.e., the Little Park road corridor) and North Fruita Desert SRMA (i.e., the open OHV area) are closed to recreational shooting. Bang's Canyon is within close proximity to residential and industrial areas, causing recreational shooting in this area to be in direct conflict with state and federal use and conduct laws, which could result in serious safety issues due to the lack of backstops and screening within the areas identified. The current shooting closure areas have been very effective in providing a safe environment for public land users.

The GJFO agreed to close the Gunnison River Bluffs area to target shooting through a cooperative agreement with the City of Grand Junction and Mesa County. This area has a patchwork of public, private, and county lands, and the parties agreed that closure was necessary for public safety and to protect important county infrastructure (e.g., the landfill and county buildings). While the county lands (including trailheads to BLM-administered lands) have been closed, the GJFO has not formalized closure of the BLM-administered lands with an RMP amendment or Federal Register Notice. Shooting is not a popular activity in this area.

Coal and Main Canyons provide the primary public access to the Little Book Cliffs Wild Horse Range from the Grand Valley. Visitation is very high. The local tourism industry directs tourists to visit this area to see wild horses and has advocated for a shooting ban due to conflicts with tourism. Many of the visitors access the horse area on horseback. The close proximity to Grand Junction also makes this location very popular for recreational shooting, and unauthorized recreational shooting occurs on private lands adjacent to the trailhead as well. It

is anticipated that when this trespass situation is stopped by the private landowner, shooting activity will increase on public lands in the trailhead area. Several incidents have occurred in the past ten years where riders and/or horses were injured due to the sound of gunfire. Riders have been thrown from their horses and in one incident the horse ran into a wire fence with rider aboard. Two wild horses were killed from gunshots in 1982 and 1998.

Abandoned Mine Lands (AML)

Increased population growth is reflected in higher demand for outdoor recreation on public lands. Recreation areas and campground facilities on public lands can be located in proximity to AML sites. Use of Off-Highway Vehicles can lead to AML sites and increases the exposure risks to dangerous mine shafts or old dilapidated buildings. Fishing can place anglers in proximity of AML sites, and is impacted by decreased fish population among polluted waters stemming from AML sites, and available fish may pose a significant source of contaminants when consumed.

Abandoned mine sites may pose hazards to the environment, employee and/or visitors health and safety. Changes in the chemical composition or soil loss near abandoned mines can result in alterations or loss of natural habitat for native wildlife. Environmental problems stemming from AML sites include: contaminated/acidic surface and ground water; and stockpiled waste rock and mill tailing piles. Many affected watersheds are in arid climates in the West, where water is scarce, and the need to improve water quality for human and aquatic resources use is critical. Some watersheds may be significantly impacted by widespread mercury contamination. In addition to abandoned mine sites, there are abandoned smelter sites where remaining tailings piles from past milling operations continue to impact the environment through air pollution caused by dust. Exposure to radiation, particularly radon gas, can be a hazard, especially in abandoned uranium mines.

Open mines are unstable; openings or tunnels may collapse, internal supports may fail, and mine shafts (vertical openings) may be obstructed or unseen. Oxygen levels can be at lethally low levels, or toxic gases could be present at high concentrations. Hazardous wastes, such as containers of explosives, and chemicals used in milling or drilling operations could be present. Illegal dumping of hazardous wastes within abandoned mines is also a possibility.

Energy Development

Energy development can include oil, gas, geothermal, wind, and solar energy sites. Oil and gas development is often associated with concerns over public health and safety. The BLM requires all oil and gas operators to comply with applicable regulations designed to protect the environment and the public (e.g., COGCC rules for waste and BLMs Onshore Orders 1, 2, and 7), and with additional requirements imposed by the BLM as part of the drilling permit or lease or ROW grant.

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 contaminate surface water, groundwater and soil. Active wells can produce hazardous chemical emissions through well control valves (e.g., venting of pressurized well gas), leaking equipment (e.g., well heads), water or condensate tanks (e.g., entrained gas can flash or evaporate), and gas compressors. Well work over operations can also result in the release of hazardous chemicals.

Certain waste materials from oil and gas exploration and production activities 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, the Superfund Act, and the Emergency Planning and Community Right to Know Act (the Toxics Release Inventory) (Witter et al. 2008). These exemptions, however, do not preclude these wastes from control under state regulations, under the less stringent Resource Conservation and Recovery Act Subtitle D solid waste regulations, or under other federal regulations. In addition, although they are relieved from regulation as hazardous wastes, the exemption does not mean these wastes could not present a hazard to human health and the environment if improperly managed. In general exempted waste is that which comes from down-hole or was brought to the surface from the well, and waste that has otherwise been generated by contact with the oil and gas production stream during the removal of produced water or other contaminants from the product

Local government efforts to chart and guide energy development within the GJFO planning area are underway. Mesa County has developed an Energy Master Plan that identifies the following:

1. The known energy resources and opportunities within Mesa County;
2. The potential impacts on the community associated with the development of those resources;
3. An analysis of current energy-related policies in Mesa County; and
4. A set of recommended clear and understandable policies that will guide reasonable regulation and development of energy resources and mitigation of the impacts (Mesa County 2011).

The Energy Master Plan is a policy document implemented in coordination with the community and with energy industries through the planning and development review processes.

Topics of recent and growing public concern, both nationally and within the GJFO, include hydraulic fracturing to enhance recovery of natural gas and

associated liquid hydrocarbons and emissions to the atmosphere of natural gas (methane) and other gaseous constituents.

Potential Risks from Spills and Releases during Transport of Natural Gas, Condensate, and Produced Water

Companies are responsible for understanding and abiding by all applicable hazardous materials transportation laws and regulations. The potential exists for a pipeline carrying natural gas, liquid condensate, or produced water to develop leaks or ruptures during natural gas extraction, transport, and processing. Data from the US Department of Transportation indicate that an average of one rupture annually should be expected for every 5,000 miles of pipeline (Office of Pipeline Safety, as cited in BLM 2014). More than 50 percent of pipeline ruptures occur as a result of heavy equipment striking the pipeline. Such ruptures would potentially cause a fire or explosion if a spark or open flame ignited the natural gas escaping from the pipeline. Pipeline design, materials, maintenance, and abandonment procedures are required to meet the standards set forth in US Department of Transportation regulations (49 CFR Part 192, Transportation of Natural Gas by Pipelines). In the GJFO, oil owners and operators are required to maintain and implement Spill Prevention, Control, and Countermeasure plans, including such cleanup and mitigation measures as required by BLM or the state.

Potential Risks from Hydraulic Fracturing

Hydraulic fracturing has been used for more than 50 years to enhance the recovery of oil and gas hydrocarbons from bedrock by creating small fractures that function as preferential flowpaths of fluids toward the borehole. The fractures are generally more permeable to fluid flow than the interstices (pore spaces) within sedimentary rocks containing the hydrocarbons, because the pore spaces are filled with a natural cementing agent (typically calcite or silica). Recent advances in hydraulic fracture technology have opened to development large reserves of domestic natural gas reserves that previously could not be extracted from the rock. This advance has been realized primarily in "tight" formations, particularly deep marine shales and marlstones that have very low permeability due to very small grain size in addition to the pressure from thousands of feet of overlying strata.

Public concern about the use of hydraulic fracturing has been focused on the potential for contamination of freshwater aquifers and impacts to domestic and municipal water wells. An associated concern has involved the potential for "mini-earthquakes" caused by the creation of enough pressure within the formation to cause fractures. For decades, oil and gas companies and independent geophysicists have used state-of-the-art equipment to monitor microseismic activity—defined as a "faint" or "very slight" tremor—during hydraulic fracturing to optimize well completions and gather information about fracture dimensions and propagation (Warpinski 2009, as cited in BLM 2014). These data give an indication about the magnitude of seismic activity associated

with hydraulic fracturing, dimensions of resultant fractures in geologic formations, and probability for induced fractures to extend into nearby aquifers, if present. Research indicates that microseismic activity created by hydraulic fracturing occurs at Richter magnitude 1 or less (Warpinski and Zimmer 2012, as cited in BLM 2014). In comparison, a magnitude 3 earthquake is the threshold that can be felt at the ground surface. The Richter magnitude scale is base-10 logarithmic, meaning that a magnitude 1 tremor is 1/100th the amplitude of a magnitude 3 tremor. The National Academy of Sciences reviewed more than 100,000 oil and gas wells and waste water disposal wells around the world and concluded that "incidences of felt induced seismicity appear to be very rare," with only one such documented occurrence (National Academy of Sciences 2012, as cited in BLM 2014).

The magnitude of induced fractures has been measured with field monitoring equipment (including microseismic "listeners") and in laboratory tests and compared with three-dimensional hydraulic fracture models. Researchers have successfully validated these models for fracturing in "tight gas" reservoirs including those in the Piceance Basin. Results of the analyses show that fractures resulting from completions of oil and gas wells can be predicted (Zhai and Sharma 2005, Green et al. 2009, and Palisch et al. 2012, as cited in BLM 2014) and that the lengths of induced fractures can be estimated.

Based on a review of available information on microseismic monitoring and fracture dimensions, Fisher and Warpinski (2011) (as cited in BLM 2014) concluded that fractures from deep horizontal wells are not a threat to propagate across the long distances (thousands of feet) needed to reach freshwater aquifers much closer to the surface. This conclusion applies to the GJFO area, and is also applicable to much shallower potable groundwater sources consisting of unconsolidated alluvium (streambed deposits) associated with the Colorado River and major tributaries. In general, alluvial water wells in the GJFO extend to depths of less than 200 feet, with few in the range of 400 feet. Impacts to water quality of these shallow freshwater wells are highly improbable as a result of hydraulic fracturing, which occurs at depths of 5,000 to 11,000 feet below ground surface.

In addition to vertical separation of several thousand feet between the upper extent of fractures and freshwater aquifers, the BLM and COGCC impose requirements for proper casing and cementing of wellbores to isolate the aquifers penetrated by a wellbore. The BLM requires that surface casing be set from 800 to 1,500 feet deep, based on a geological review of the formations, aquifers, and groundwater. Cement is then pumped into the space between the casing and surrounding rock to prevent fluids from moving up the wellbore and casing annulus and coming in contact with shallow rock layers, including freshwater aquifers. BLM petroleum engineers review well and cement design and final drilling and cementing logs to ensure that the cement has been properly placed. When penetration of groundwater and freshwater aquifers is

anticipated, BLM inspectors may witness the cementing of surface casing and subsequent pressure testing to ensure that the annular space between the casing and borehole wall is properly sealed.

No single list of chemicals currently used in hydraulic fracturing exists for western Colorado, and the exact combinations and ratios used by operators are considered proprietary. However, the general types of compounds and relative amounts used are well known and relatively consistent (**Table 3-46**, Typical Hydrofracturing Chemical Additives). Since fracture jobs are tailored to the downhole environment and companies are aware of the concerns involving hydraulic fracturing, the chemicals listed in **Table 3-46**, Typical Hydrofracturing Chemical Additives, may or may not be used, and the information is provided solely as general information. Although a variety of chemicals additives is used in hydraulic fracturing (the examples in the table being drawn from a total of 59 listed on the FracFocus website), the vast bulk of fluid injected into the formation during the process is water mixed with sand, representing 99.51 percent of the total by volume in the typical mixture shown in **Table 3-46**, Typical Hydrofracturing Chemical Additives. The sand is used as a proppant, or propping agent, to help keep the newly formed fractures from closing.

Table 3-46
Typical Hydrofracturing Chemical Additives

Additive Type[1]	Typical Example[1]	Percent by Volume[2]	Function[1]	Common Use of Example Compound
Acid	Hydrochloric acid	0.123	Dissolves minerals and initiate cracks in the rock	Swimming pool chemical and cleaner
Biocide	Glutaraldehyde	0.001	Eliminates bacteria in the water that produces corrosive by-products	Disinfectant; sterilizer for medical and dental equipment
Breaker	Ammonium persulfate	0.010	Allows delayed breakdown of the gel	Used in hair coloring, as a disinfectant, and in manufacture of household plastics
Clay stabilizer	Potassium chloride	0.060	Creates a brine carrier fluid that prohibits fluid interaction with formation clays	Used in low-sodium table salt substitutes, medicines, and intraveneous fluids
Corrosion inhibitor	Formic acid	0.002	Prevents corrosion of the pipe	Used as preservative in livestock feed; used as lime remover in toilet bowl cleaners
Crosslinker	Borate salts	0.007	Maintains fluid viscosity as temperature increases	Used in laundry detergents, hand soaps, and cosmetics

Table 3-46
Typical Hydrofracturing Chemical Additives

Additive Type[1]	Typical Example[1]	Percent by Volume[2]	Function[1]	Common Use of Example Compound
Friction reducer	Polyacrylamide	0.088	"Slicks" the water to minimize friction	Used as a flocculant in water treatment and manufacture of paper
Gelling agent	Guar gum	0.056	Thickens the water to help suspend the sand	Used as a thickener, binder, or stabilizer in foods
Iron control	Citric acid	0.004	Prevents precipitation of metal oxides	Used as flavoring agent or preservative in foods
Surfactant	Lauryl sulfate	0.085	Increases the viscosity of the fracture fluid	Used in soaps, shampoos, detergents, and as foaming agents
pH adjusting agent	Sodium hydroxide, acetic acid	0.011	Adjusts pH of fluid to maintain the effectiveness of other components, such as crosslinkers	Sodium hydroxide used in soaps, drain cleaners; acetic acid used as chemical reagent, main ingredient of vinegar
Scale inhibitor	Sodium polycarboxylate	0.043	Prevents scale deposits in the pipe	Used in dishwashing liquids and other cleaners
Winterizing agent	Ethanol, isopropyl alcohol, methanol	--	Added as necessary as stabilizer, drier, and anti-freezing agent	Various cosmetic, medicinal, and industrial uses
Total Additives		**0.49**		
Total Water and Sand		**99.51**		

[1]FracFocus Chemical Disclosure Registry, fracfocus.org/chemical-use/what-chemicals-are-used, as cited in BLM 2014
[2]US Department of Energy 2009, as cited in BLM 2014

Following completion of fracturing activities, the pressure differential between the formation and the borehole (a result of the weight of thousands of feet rock above the formation) causes most of the injected fluids to flow toward the borehole and then upward to the surface along with the hydrocarbon fluids released from the formation. The composition of this mixture, called flowback water, gradually shifts over a period of several days to a few months as injected fluids that have not yet migrated back to the wellbore or reacted with the native rock are carried out of the formation.

In 2011, the COGCC published an analysis of hydraulic fracturing technology use in Colorado and potential risks to human health and the environment. The introduction to that report states this:

> "Hydraulic fracturing has occurred in Colorado since 1947. Nearly all active wells in Colorado have been hydraulically fractured. The COGCC serves as first responder to incidents and complaints concerning oil and gas wells, including those related to hydraulic fracturing. To date, the COGCC has not verified any instances of groundwater contaminated by hydraulic fracturing."

Although public awareness of hydraulic fracturing has heightened public concern about contamination of freshwater aquifers and water wells, similar concerns have been expressed more generally in relation to oil and gas developments. A non-peer-reviewed "white paper" by Witter et al. (2008) (as cited in BLM 2014) addressed the chemicals used or produced during oil and gas development but made little reference to health or environmental statistics. However, the authors did note two situations relative to environmental exposures. One was the reported occurrence of detectable levels of methane in 135 of 184 water wells, springs, seeps, ponds, and rivers sampled during a hydrogeologic (groundwater) investigation conducted for Garfield County in 2006 (Papadopoulos 2007, as cited in BLM 2014). That study noted that methane may have been 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) (as cited in BLM 2014) were unable to conclude whether any of the methane in wells and natural waterbodies sampled by Papadopoulos (2007) (as cited in BLM 2014) resulted from oil and gas related activities or from secondary generation of methane by natural bacterial processes unrelated to oil and gas.

Measures currently required by the BLM and COGCC for protecting groundwater aquifers, water wells, and surface waters are described in **Section 3.2.5**, Water Resources. These measures include isolating deeper, hydrocarbon-producing horizons from shallower bedrock and alluvial layers that communicate with surface waters and within which freshwater wells are completed. Examples include requiring setting casing to a depth below the deepest freshwater aquifer encountered and water wells in the vicinity, and cementing the casing to prevent flow of saline waters, natural gas, and associated fluids moving up the borehole from contacting the freshwater zones. In general, the GJFO requires surface casing deeper than the deepest water wells in the area.

<u>Hydrogen Sulfide Wells</u>

Hydrogen sulfide is a poisonous gas that can occur in association with oil and gas operations. Hydrogen sulfide (H2S, CAS#7783-06-4) is an extremely hazardous, toxic compound. It is a colorless, flammable gas that can be identified in relatively low concentrations, by a characteristic rotten egg odor. The gas occurs naturally in coal beds, sulfur springs, gas wells, and as a product of

decaying sulfur-containing organic matter, particularly under low oxygen conditions. Industrial sources of hydrogen sulfide include petroleum and natural gas extraction and refining, hydrogen sulfide can be present at AML sites. Hydrogen sulfide has a very low odor threshold, with its smell being easily perceptible at concentrations well below 1 part per million (ppm) in air. The odor increases as the gas becomes more concentrated, with the strong rotten egg smell recognizable up to 30 ppm. Above this level, the gas is reported to have a sickeningly sweet odor up to around 100 ppm. However, at concentrations above 100 ppm, a person's ability to detect the gas is affected by rapid temporary paralysis of the olfactory nerves in the nose, leading to a loss of the sense of smell. This means that the gas can be present at dangerously high concentrations, with no perceivable odor.

Hydrogen sulfide is classified as a chemical asphyxiant, similar to carbon monoxide and cyanide gases. It inhibits cellular respiration and uptake of oxygen, causing biochemical suffocation. Typical exposure symptoms include:

- LOW 0 - 10 ppm: Irritation of the eyes, nose and throat.
- MODERATE 10 - 50 ppm: Headache, dizziness, nausea and vomiting, coughing and breathing difficulty.
- HIGH 50 - 200 ppm: Severe respiratory tract irritation, eye irritation, acute shock, convulsions, coma, death in severe cases.

Motor Vehicle Operations

Except for approximately 35,300 closed acres, Off Highway Vehicle (OHV) travel is allowed on an open or limited basis in the entire GJFO planning area (BLM 1987).

Motorized vehicle operations consist of two and four-wheel-drive vehicles, large and small commercial vehicles used in mineral resource extraction and development of natural resources (e.g., oil shale and natural gas) as well as an assortment of OHV's used for recreation, hunting activities, sightseeing, and firewood gathering. Motorized and, non-motorized vehicles, horses and pedestrians all share and concurrently utilize a large portion of the Field Offices resource areas.

All users have the ability to impact natural habitats, land features, travel routes, and outdoor structures located near travel corridors in a variety of ways:

- Travel conditions change due to elevation, terrain, and weather. All users much adapt to changing travel route conditions, resource damage along a travel route corridor is expensive to repair, damages habitat, and is unsightly.
- Wet conditions make roads and trails muddy and often impassable. Continued use of these travel routes will cause destruction.

- Gouging of dirt roads, ATV/motorcycle and bicycle routes occurs when wheels spin while traveling uphill, and hard braking when descending steep grades or turning sharply.
- Noxious weed spread; seeds are caught in the mud caked to tires, wheel wells and fenders. Caution needs to be practiced especially when coming from another geographical area.
- Encounters between motorized and non-motorized or equestrian users in the field; slow down or stop, signal or announce your intentions before passing. In general, downhill traffic yields to uphill traffic, and motorized traffic yields to non-motorized traffic.

Remoteness and Natural Hazards

Exposure to natural hazards such as inclement weather, rough terrain, and dangerous animals is an inherent risk in any activity conducted within the GJFO planning area. Proper equipment and adequate planning should be taken prior to conducting activities in order to prepare for the remoteness and natural hazards present in much of the planning area.

Trends

Law Enforcement

As the local population increases, the need for BLM law enforcement is expected to increase. It is believed that an increased presence of BLM staff on the ground would help alleviate problems like the creation of social trails by recreationists, trespass on private land, and unauthorized use of seasonally closed trails.

Hazardous Materials and Sites

The frequency of hazardous materials incidents in the past has mirrored the rate of economic activity and population growth, with economic boom and population growth usually resulting in more illegal dumping and more materials transportation accidents and accidental spills.

Illegal Dump Sites

Illegal dumping is increasing as the local population grows and as dump fees at permitted sites increase.

Target Shooting

Requests for shooting closures are expected to increase in high use areas with increasing conflicts between users and concerns over safety.

Abandoned Mines

If abandoned mines are discovered, they will be addressed in accordance with the Abandoned Mine Lands program.

Energy Development

Trends in well activity on BLM-administered lands within the GJFO planning area have mirrored economic conditions. Across all surface and mineral ownerships, 964 oil and gas wells have been spud within the GJFO planning area since 1998 (IHS Energy Group 2008). This represents nearly twice the total number of active wells in the GJFO planning area as of December 2011. Approximately 15 percent of the conventional wells and 70 percent of the coalbed natural gas wells drilled since 1998 were drilled on federal mineral interests (BLM 2012a).

In addition, new issues such as enhanced protection of sage-grouse habitat need to be addressed. The BLM has also seen technological advancements like directional drilling and modern drilling rigs used to improve access to energy resources.

Hydrogen Sulfide Wells

The release of hydrogen sulfide at well sites on BLM lands in the GJFO planning area is not expected.

Motor Vehicle Operations

Increased energy development and other factors could cause expansion of the existing road network to allow for construction and maintenance of projected wells and to handle the demands of an increasing population. As a result, traffic and the potential for accidents would likely increase.

Remoteness and Natural Hazards

The GJFO planning area has become generally less remote due to many factors, including energy development, urban growth, and increased recreational use on public lands. Improvements in equipment will likely mitigate the effects of some natural hazards, but users will continue to accept risk when the chance of encountering a natural hazard is present. Wilderness areas and other places far removed from infrastructure and services will continue to pose risks to unprepared visitors.

3.6.3 Socioeconomics

This section was prepared for and in cooperation with the GJFO by researchers at Colorado Mesa University. BLM has reviewed and accepted the information contained in the following section.

In many ways, the communities that adjoin the 1.2 million acres of public lands managed by the GJFO are archetypical of the twenty-first century American west. These lands include the planning area for the GJFO, the McInnis Canyon National Conservation Area and the Dominguez-Escalante National Conservation Area. Their populations include some residents committed to traditional agricultural pursuits, such as ranching and orchard culture, and some who seek to expand into niche markets, such as vineyards and organic farming. These communities seek to balance the benefits of extractive industries against their long experience of boom and bust cycles. They also evince increasing

concern over the potential environmental damage, particularly to water, resulting from extraction. In diversifying their economies away from dependence on extraction, these communities use the recreational opportunities offered by available public lands to entice businesses by highlighting the quality-of-life advantages of the valley's moderate climate and fantastic scenery: scenery which includes the tallest flat-topped mountain in the world (The Grand Mesa), the Colorado National Monument, the Colorado River, the Dominguez-Escalante NCA, Mt. Garfield and the McInnis Canyons National Conservation Area. The diversity of the communities themselves represent contending voices in the discussion of the management of public lands—some raised to preserve traditional agriculture, some raised to encourage tourism, some favoring expansion as medium-sized urban areas, some in favor of the preservation of their small-town character the protection of public lands promises. As a public lands agency supporting multiple-use, the BLM must find an appropriate balance between these contending voices. Many factors—fluctuations in populations, attempts to attract a young professional class, attempts to attract retirees, and increasing infrastructure demands on local governments from residents employed on public lands beyond the GJFO—combine to impact the way in which the communities relate to the management of our public lands.

Social Context

The largest portion of lands managed by the GJFO, some 938,000 acres or 73 percent of the total, lie within Mesa County, and the remainder of lands are spread between three other counties: Garfield with 322,000 acres (25.2 percent), Montrose with 17,000 acres (1.3 percent), and Delta with 2,000 acres (0.1 percent). Because it contains the largest portion of the GJFO land, and nearly 100 percent of the population, Mesa County is the focus of this description.

Government

While the planning area overlaps four counties, as mentioned above, the vast majority of the lands managed by the GJFO lie inside Mesa County. Mesa County was incorporated on February 11, 1883, and is governed by a three-member Board of County Commissioners.

Social Context

Communities in the GJFO resemble a hub and spoke system with Grand Junction acting as the hub and several smaller communities acting as the spokes. Despite their inter-connectedness, each community has its own social context, sense of tradition, and connection to public lands. Some like Glade Park and Palisade are small, tight-knit communities that are intimately tied to public lands through ranching and agriculture; others, like Grand Junction and Fruita are much larger and are marketing their public lands to tourists and potential businesses. Because of their unique attributes, each of these communities is discussed separately. This discussion is taken, in part, from research conducted by the Natural Resource and Land Policy Institute at Colorado Mesa University

in 2009 and summarized in the "GJFO Community Assessment Report." That report presents the results of 11 focus groups held with citizens and leaders in the seven communities located in the GJFO planning area.

While each has a distinct personality, all the communities share a similar history. Most began as agricultural settlements where ranching and orchards—most famously peach and cherry orchards—dominated. Each community was impacted at the beginning of the twentieth century by the discoveries of first oil and then radium, with each producing its own economic boom. Communities then experienced a subsequent bust, decline in population, and realignment. Cold War demand for uranium and America's increasing need for energy benefitted each community to varying degrees, and, subsequently, each was subject to extensive environmental remediation (Gulliford 2003).

Grand Junction

As the largest city between Denver and Salt Lake City, Grand Junction is the center for regional activity in Mesa County. Ample shops, restaurants, and medical services contribute greatly to the city's economic role as a regional hub. The city has gone to great lengths to diversify its economy while maintaining a robust extraction industry. To do this, the city seeks to attract a talented pool of professionals eager to expand the area's economic base. Outdoor recreation is important to the professionals the city seeks to attract. Access to public lands and the variety of recreational opportunities that can be provided on BLM lands play a significant role in the Grand Junction Economic Partnership's efforts to expand the community's economic base.

Fruita

Like Grand Junction, Fruita has experienced a dramatic population increase over the last 20 years. The community prides itself on its small town atmosphere and its role as "Gateway to our Federal Lands." Like other Grand Valley locales, citizens of Fruita referenced in the GJFO Community Assessment Report see public lands as a buffer against sprawl. While the community would like to promote its economy, the focus is much more on developing its potential tourism industry. Consequently, residents are somewhat suspicious of growth and support good planning to maintain a small-town atmosphere while promoting economic vitality. The benefit of access to public lands is at the heart of the Fruita community.

Palisade

Like Fruita, Palisade is small and very community oriented. It is surrounded by high-end agriculture consisting of orchards and many wineries that cultivate their own grapes. The area is also well known for its stunning scenery and viewscapes. The town's vision includes further development of its downtown core to promote entertainment and economic activity. Each year the town sponsors a number of festivals—like the Wine and Peach festivals—and events that highlight its heritage and agricultural background.

De Beque

Located in the far eastern part of Mesa County along the I-70 corridor, De Beque is a town with a little over 500 residents. Traditional agriculture, such as ranching, and the natural gas industry provide much of the economic base for residents. The town expects rapid growth due to the boom in the natural gas industry. Many think the development of natural gas reserves can be done with minimal environmental consequences, but some fear the community could experience adverse effects.

Community members live in De Beque because the surrounding public lands provide opportunities to observe wildlife, hunt, fish, and enjoy "God's Country." They would like to see the BLM continue to promote the family values and the agricultural heritage of the area by providing greater access to public lands, continuing grazing opportunities on public lands, and providing better signs on trails to protect sensitive areas. The town would not mind having more recreational visitors in the area, as this promotes more economic activity for local businesses. However, increased tourism would probably create a need for another road through town to access BLM lands.

Glade Park

A part of unincorporated Mesa County, Glade Park is a small community located behind the Colorado National Monument southeast of Grand Junction bordering McInnis Canyon National Conservation Area. Consequently, the area is fairly well isolated from the Grand Valley, a fact that appeals to its residents. Families in the community have strong historical ties to the area. Ranching and traditional agriculture represent the community's heritage and have always been a major part of the economy. Area residents wish to preserve this lifestyle for the future.

Loma/Mack

Like Glade Park, the residents of Loma and Mack have a strong connection to ranching and farming. Located west of Fruita, the traditional agricultural community is in transition to a bedroom community for Grand Junction as more and more residents commute there to work. The rural lifestyle, the quiet, and the lack of local government and its ability to tax were reasons cited for living in the Loma/Mack area. Residents want their community to stay the way it is – based in agriculture and affordable.

Gateway

Located in the southern part of Mesa County, Gateway is a small unincorporated community with a strong heritage connected to traditional agriculture and resource extraction, particularly uranium. Since 2005, the community has been changed by the development of Gateway Canyons Resort. Residents are concerned that the resort's new emphasis on recreation will interfere with future resource-extraction activity, as well as grazing and other

economic activity that have provided a living for generations of family members. The area is almost entirely surrounded by BLM-managed lands.

Collbran: A small town of 708 residents located in the Plateau Valley in northeastern Mesa County. Surrounded by public lands managed by varying agencies, this community is impacted by the planning decisions of public lands agencies.

Demography and Social Indicators

In many ways the social character of Mesa County resembles that of many western locations whose economic fortunes are tied to the boom and bust cycles so prevalent in communities reliant on extraction industries as their primary economic driver. From the first oil and radium booms a century ago, to uranium mining in the 1950s, to the oil shale boom of the late 1970s and early 1980s, to the most recent natural gas boom of the 2000s the area has dealt with the social challenges presented by an overheated economy as well as the difficulties posed by surviving each subsequent recession. Since 1980, Mesa County has experienced consistent population growth due primarily to in-migration. While the boom times created difficulties for local government to keep pace with infrastructure demands, the down cycles encouraged Mesa County communities to diversify their economies. The results have helped stabilize the economy but also create conflict between long-time residents with ties to traditional agriculture and mining and new residents attracted to the area for its natural beauty and recreational opportunities.

Population

According to the US Census Bureau, Mesa County's population in July 2008 was estimated to be 143,171 (US Census Bureau 2009). A majority of Mesa County's citizens live on the valley floor in the cities of Fruita and Grand Junction, the town of Palisade, and the unincorporated lands in and around these municipalities.

Like the rest of the state of Colorado, Mesa County has experienced dramatic population growth since 1987. In the decade between 1990 and 2000, the county's population grew from 93,145 to 116,255 and was estimated to stand at 143,000 residents in 2008 (US Census Bureau 2010a). This represents a 25 percent increase between 1990 and 2000 with an additional 20 percent growth between 2001 and 2008. Between the years 1980 and 2008, the population of Mesa County has grown approximately 75.6 percent.

As illustrated in **Table 3-47**, Population Totals (1980-2008), dramatic population increases have been widely distributed across population centers. These population centers have exhibited anywhere from 70 to 164 percent growth rate. The three largest incorporated population centers include Grand Junction, Fruita and Palisade. The largest unincorporated area in Mesa County is Clifton, which is located on the eastern periphery of Grand Junction between

Table 3-47
Population Totals (1980-2008)

Location	1980	1990	1980-1990 % Change	2000	1990-2000 % Change	2008	2000-2008 % Change	1980-2008 % Change
State of Colorado	2,889,735	3,294,394	14.0	4,301,261	30.6	4,939,456	14.8	70.9
Mesa County	81,530	93,145	14.2	116,255	24.8	143,171	23.2	75.6
Grand Junction	27,956	29,034	3.8	41,986	44.6	49,688	18.3	77.7
Clifton	not available	12,671	not available	17,345	36.8	not available	not available	not available
Fruita	2,810	4,045	43.9	6,478	60.1	7,418	14.5	164.0
Palisade	1,551	1,871	20.6	2,579	37.8	2,840	10.1	83.1

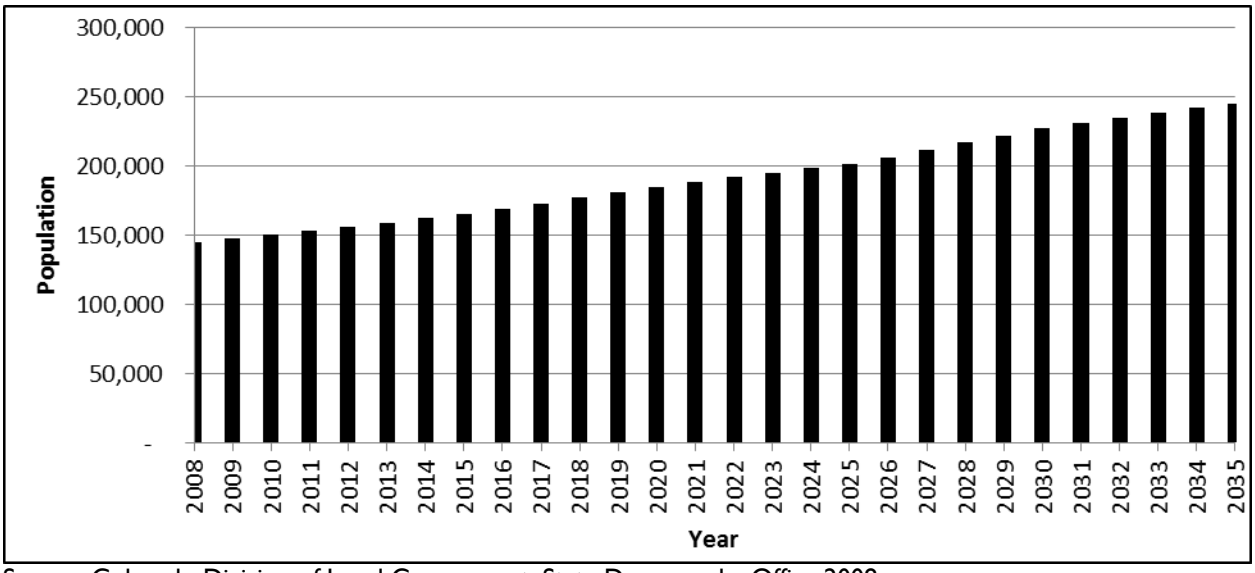
Sources: 1980-2000 Data: Colorado Division of Local Government, State Demography Office 2009a; Clifton Data: US Census Bureau 2010b; 2008 Municipalities and County Data: US Census Bureau 2010a; 2008 State of Colorado Data: US Census Bureau 2009

Grand Junction and Palisade. Growth in these areas has been spurred by increased employment opportunities in Mesa County, especially in the energy and healthcare sectors. A more detailed discussion of the economy can be found in section five in this report.

Growth can also be partly attributed to a growing retirement population. This increase may partly be due to natural aging of the existing population. But efforts to diversify the Mesa County economy after the oil shale bust have had a major impact as well. A significantly deflated housing market during the late 1980s and early 1990s provided a great opportunity for local realtors to attract retirees primarily from California and the Denver metro area. These retirees were referred to as "active seniors" drawn to the area by low housing values, great climate, and plenty of recreational opportunities, much of which occurs on GJ BLM land (Redifer 2010). The recession of 2008 has temporarily halted growth in Mesa County but the upward trend is expected to continue as natural gas prices begin to increase.

As illustrated in **Diagram 3-12**, Mesa County Population Forecast (2008-2035), the population of Mesa County is estimated to steadily increase for the foreseeable future. According to population projections (which account for the 2008-2010 economic recession), the county will grow at an average rate of 2.0 percent per year between 2010 and 2015. The population of Mesa County is projected to reach 200,000 residents by 2025 and 245,000 residents by 2035. Much of the residential growth in the area is continuing to occur in unincorporated areas and puts further stress on county government for services.

Diagram 3-12
Mesa County Population Forecast (2008-2035)



Source: Colorado Division of Local Government, State Demography Office 2008

Much of the past and anticipated future growth is due to migration. Net migration added an average of 1,972 persons to Mesa County per year between 1990 and 1999. This number is projected to increase to 2,987 persons per year between 2000 and 2009 and 2,387 between 2010 and 2020. This trend is important because migration is estimated to have contributed an average of 641 more persons per year than births between 1990 and 1999 and is estimated to grow to 1,249 persons between 2000 and 2009 (Colorado Division of Local Government, State Demography Office 2009b). It may also explain some of the tension that has emerged between new (and often transient) arrivals and more established residents.

The median age of Mesa County in 2007 was estimated at 36.9 years of age, which is slightly older than the state median age (35.6) (US Census Bureau 2008a). The largest population gains have historically occurred in the 25 to 44 and 45 to 64 age groups. Gains in these groups are expected to continue between the years 2010 and 2020. The age groups with the smallest population in Mesa County are 15-24 year olds closely followed by citizens 65 years of age and older. However, as more economic opportunities emerge from the rapid economic growth in the region, and the retiree population grows, these numbers are apt to change.

Social Difference

The racial composition of Mesa County is more homogeneous than the rest of the state. In 1990, white non-Hispanic residents comprised approximately 90 percent of Mesa County's population (US Census Bureau 1990) and decreased to 84 percent of the population by the end of 2008 (US Census Bureau 2008a). Comparatively, white non-Hispanic residents made up 71.2 percent of

Colorado's population in 2008 (US Census Bureau 2008a). In both 1990 and 2008, Hispanics comprised Mesa County's largest racial minority group making up approximately 8 percent (US Census Bureau 1990) and 11.8 percent (US Census Bureau 2008a) of the region's population, respectively. Comparatively, Mesa County's Hispanic population trails the state's where Hispanics accounted for 19.9 percent of the population in 2008 (US Census Bureau 2008a).

Crime Indicators

Growth has the potential of altering the quality of life in any community. Transient workers and newcomers may be less invested and have little attachment to traditions and history. Changes in economic emphases can displace workers. With population growth in the region, there is concern that there will be a corresponding increase in crime, especially violent crime. The rural nature of Mesa County and surrounding environs raises concerns about the production of methamphetamine. Between 1997 and 2004, violent crime in the county fluctuated between a high of 2,280 reported felonies and a low of 1,307 felonies. From 2005 through 2008, the number of reported felonies trended between 1,900 and 2,100 felonies per year (Colorado Bureau of Investigation 2009).

The number of reported incidents on GJFO land has ranged between 70 and 360 incidents per year. Data illustrated in **Diagram 3-13**, Reported Incidents on BLM-managed Lands (1998-2010), provides two important insights into law enforcement challenges faced by the field office. First, as illustrated in the general upward trend of reported incidents between 1998 and 2010, population growth in the Grand Valley has placed added pressure on public lands. Second, as illustrated in the various spikes of reported incidents in 2004 and 2010, the GJFO has been more effective in managing for this increased pressure when given adequate resources to do so. For a majority of time from 1998 through 2010, the GJFO has had one full-time ranger, except in the years 2004 and 2010 when there were three rangers.

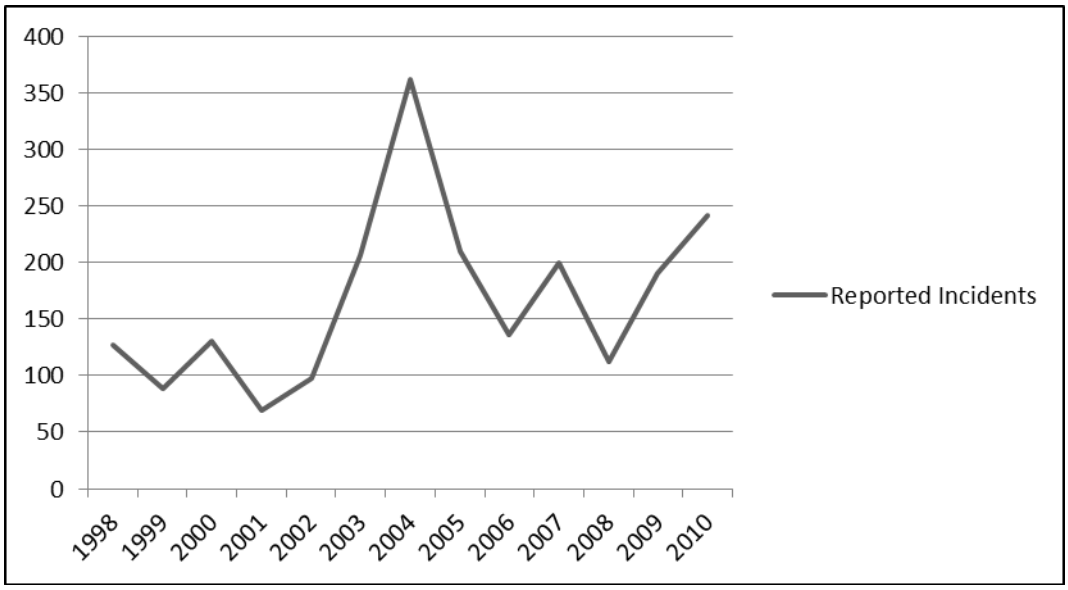
An area of concern for the Sheriff's Department that relates to population growth and increased recreation in Mesa County's backcountry relates to Search and Rescue calls. Since 2000 the Sheriff's Office reports that the Search and Rescue Team has seen calls increase from 10 to 15 per year to 55 calls last year. This is attributed to more visitors with less experience and to the increased capacity of the rescue unit.

Transportation

Development brings a constellation of problems; this is particularly clear in transportation. Population and economic growth are changing traffic patterns in the Grand Valley.

Transportation growth has also been hampered by previous planning decisions and inadequate funding for transportation. For example, land use decisions that

Diagram 3-13
Reported Incidents on BLM-managed Lands (1998-2010)



Source: Boik 2009

place the vast majority of the county's retail industry on the western edge of Grand Junction place a great deal of stress on the county's four east-west routes, particularly Patterson Road and the I-70 Business Loop. As in many Colorado cities and towns, transportation funding is inadequate to meet the needs of future growth in Mesa County. Currently, most of the available federal funding is being spent on the I-70 Business Loop, but projections indicate that more will be needed. A 2008 ballot initiative proposed by the state legislature to secure long-term funding for transportation projects in Colorado was defeated by the voters, leaving the future of transportation funding in limbo (Colorado Mesa University Natural Resource and Land Policy Institute 2009).

Economic Indicators

The GJFO is located right in the middle of what the local newspaper calls "Energy Alley." This refers to the 150 mile stretch of I-70 between Rifle, Colorado, and Green River, Utah, where a variety of abundant energy resources can be found. Everything from uranium and coal to oil, oil shale and natural gas has been discovered in this area. More recently methane gas as well as alternative energy sources such as wind, solar and geothermal have generated interest from developers as well (Grand Junction Daily Sentinel 2010). Historically, resource extraction has been a primary economic driver in the communities surrounding the GJFO (Gulliford 2003; Hessler 2010).

The national demand for energy has had dramatic impacts on the economy of Mesa County. Four significant boom and bust cycles associated with energy development include radium and oil at the turn of the last century (Gulliford 2003), uranium mining in the 1950s, oil shale development in the 1970s, and

more recently the explosion in natural gas development, which started in the early 2000s and busted with the national recession in 2008. As a result of these severe economic cycles, communities in Mesa County have put a great deal of effort into diversifying their economy.

Interrelationships among Producing Sectors

Between the late 1980s and the 2008 recession, Mesa County had been experiencing steady economic growth. This had been a welcome development given the region's economic troubles following the oil shale bust (Gulliford 2003). During the late 1980s, the recovery was aided by the effort to clean up uranium mill tailings left over from the days when uranium mining had provided its own economic boom. In the early 1990s, expansion continued as the availability of affordable land and a favorable climate assisted the promotion of Mesa County as a retirement community. Low property values, the natural beauty and recreational opportunities found in the area's public lands greatly enhanced efforts to attract retirees. Later in the decade the Mesa County Economic Development Council, the forerunner of the Grand Junction Economic Partnership (GJEP), was successful in helping to diversify the Mesa County economy by encouraging a number of firms to relocate to the area. Access to public lands has been a critical contributor to this recruiting effort by increasing the quality-of-life appeal to potential businesses and their employees (BLM 2009l). Specifically, easy access to recreation and open space has increased the county's ability to recruit qualified professionals in higher education, medicine and business.

Throughout the 1990s and into 2000s, tourism played an important role in the area's economic expansion and diversification. Increased recreational activities, new golf courses, the natural beauty of the surrounding area as well as a growing wine industry encouraged many to visit Grand Junction. The designation of the McInnis Canyons and Dominguez-Escalante NCAs have the potential for increasing tourism to the area. The county's growing role as a regional hub for retail trade, healthcare, and other services also provide incentives for increased visitation. In 2000, Grand Junction was designated as a metropolitan statistical area. This designation has also encouraged many national retail and restaurant chains to locate within the county.

With a diverse economy come some unique challenges for Mesa County that will be affected by land use decisions made by the BLM's GJFO. The economy certainly thrives during periods where there is a high level of resource extraction activity, but most of this has little to do with the Grand Junction BLM lands. For instance, the majority of current natural gas development occurs to the east and northeast in Garfield and Rio Blanco counties outside the GJFO boundaries, but many workers prefer to live in Grand Junction and recreate on public lands managed by the GJFO. As a result, Mesa County has become an important part of northwest Colorado's oil and gas industry. The County provides a central location for industry infrastructure and material stockpiling,

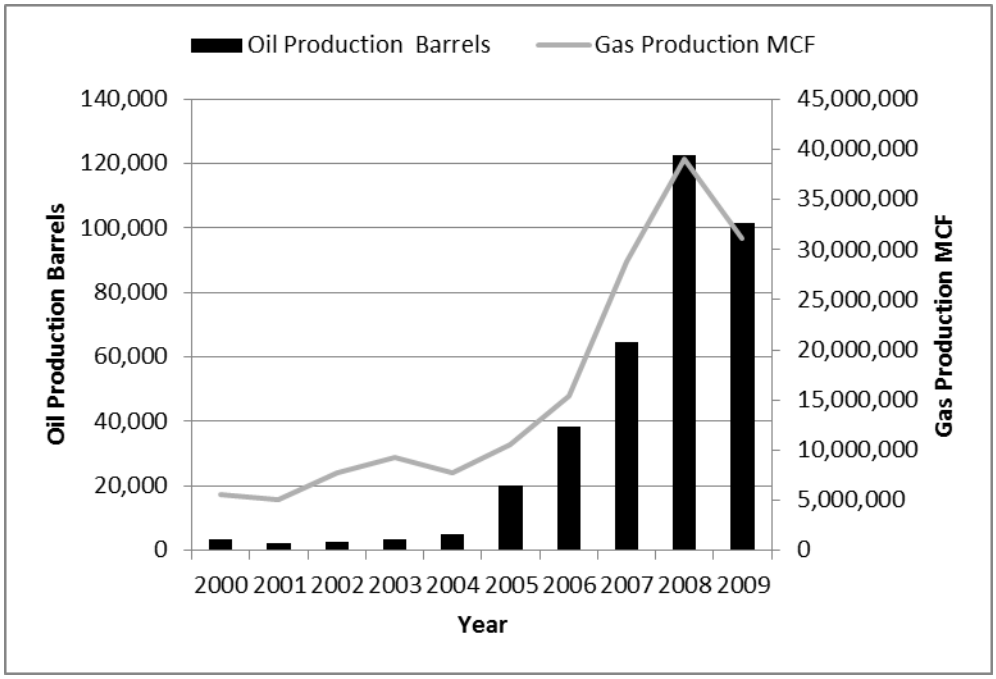
as well as an amenable place for their skilled workers to live. The BLM's recreational management decisions, on the other hand, have contributed significantly to GJEP's efforts to attract new industries. These companies see promotion of an active lifestyle as an advantage when competing in the labor market for employees.

Dependence on BLM Lands and Resources (value of visitor-day expenditures, grazing and mining to the local economy)

Energy

Energy development is a mandated use for public lands managed by the BLM. Despite efforts to diversify the economy, the energy industry is still seen by many as the primary economic driver in the county (Hessler 2010). Over the past decade Mesa County has consistently been one of the top ten counties in Colorado for active oil and gas wells. In **Diagram 3-14**, Mesa County Annual Oil and Gas Production (2000-2009), the results of the impact of the national recession on oil and gas production can be seen in the drop off in oil production levels in 2009 of approximately 17 percent over 2008 production levels while natural gas production decreased twenty percent.

Diagram 3-14
Mesa County Annual Oil and Gas Production 2000-2009



Source: Colorado Oil and Gas Conservation Commission 2010

Despite the significance of oil and gas activity it pales in comparison to other counties in "Energy Alley." A good indicator of oil and gas activity in a county is the ad valorem tax collected on oil and gas production. The ad valorem tax raised from oil and natural gas production in Mesa County peaked in 2009 with an assessed taxable value of roughly $2.8 million. By comparison, in the same year, Garfield County's taxable assessed value $3.9 billion.

Mesa County's economic dependence on the energy industry is not driven by energy development within the BLM's GJFO but by the number of energy industry employees who live in Mesa County but commute to work on drill rigs located outside the county. In the 2008 report, BBC Research Consulting noted the following:

- Fifty percent of energy workers who worked in Garfield County live in Mesa County
- Thirty percent of energy workers who worked in Moffat County lived in Mesa County
- Twenty percent of energy workers who worked in Rio Blanco County lived in Mesa County
- One hundred percent of energy workers who worked in Mesa County lived in Mesa County

Two more recent developments in energy-related activity on BLM lands in the GJFO may also have significant economic impacts on Mesa County. The Red Cliff coal mine north of Loma, Colorado, would increase Colorado's overall coal production by 6 to 8 million tons a year or 25 percent (Grand Junction Daily Sentinel 2010). Meanwhile efforts by Energy Fuels to build a uranium mill near Naturita may encourage renewed interest in uranium mining in the southern most region of the BLM's GJFO. If this occurs it could conflict with private efforts to develop tourism in the Gateway area (Grand Junction Daily Sentinel 2010).

Tourism and Recreation

Tourism and recreation are becoming increasingly important to the Mesa County economy. The Mesa County Commissioners see opportunities to increase tourism dollars from out of county visitors by increasing recreational attractions on BLM's GJFO lands. To this end they have appropriated money for a volunteer coordinator to work with BLM and other federal land managers to organize volunteer activity to build or improve trails in the area (Mesa County 2009c).

Recreation and tourism is another economic area that has experienced considerable growth since 2000. The area's many natural attractions have also been supplemented by efforts to encourage visitors to come to Mesa County. Special events like the Fruita Fat Tire Festival, as well as new and existing mountain bike trails, hiking, and whitewater activities have increased tourism in

the county. Spending by overnight visitors to Mesa County, which can partly be attributed to the prevalence of its public lands, jumped from $132 million in 2000 to $259 million in 2007. Increased tourism to Mesa County has increased local tax revenue from $4 million in 2000 to a projected $7.2 million in 2007. Moreover, the number of tourism related jobs increased from 2,370 in 2000 to 3,240 in 2007 (Colorado Tourism Office 2008). The BLM's marketing and maintenance of the region's open lands has helped identify the region as a destination hotspot. Additionally, the large expanse of public lands has helped attract the young professionals needed to fill critical regional industries such as education, law, and medicine.

Agriculture

Traditional agriculture, while declining, remains an important part of the Mesa County economy.

Residents in the rural parts of the county still rely heavily on BLM grazing permits for their cattle operations (BLM 2009l). Many of the residents in communities like Gateway, Glade Park, and Loma are concerned about protecting the agricultural heritage of their area from the pressures of increased recreation and tourism development. This is contrary to the new and growing wine industry in the valley that would like to see increased recreational opportunities as a way to attract more wine enthusiasts.

A traditional and mandated use for BLM land is livestock grazing. Fees are paid by livestock producers that allow them to graze their animals in designated areas on land managed by BLM. Livestock production has an impact on the regional economy but also on the region's social fabric, as it preserves a valued western lifestyle.

Livestock use of public lands is measure in AUMs. One AUM is roughly equivalent to the amount of forage necessary to graze one cow or cow/calf for one month. On GJFO land as well as other BLM managed lands, there is a difference between available AUMs and those actually used over the course of a year. Available AUM's are defined as active AUM's on a permittees grazing permit. Economic impact analysis requires a distinction between these two categories because only those AUMs utilized will have an impact on the regional economy. Actual AUM use has been substantially less than allowed AUM's for the past ten years. There are several factors that contribute to this difference. The primary reason is drought. From 2000 to 2006 the area was experiencing an extended drought that began back in 1998. The drought has been at various levels of severity annually with the greatest impact coming from 1998 to 2004. During these drought years grazing use was reduced, substantially in 2000 through 2004. It took several years for ranchers to restock to pre-drought numbers if they did at all. Other factors that have contributed to using fewer AUMs than allowed are fluctuations in livestock markets and changes in the demographics of permittees.

Employment, Income, and Subsistence

Labor Force, Employment, and Unemployment

Trends in the labor force, employment, and unemployment help describe the overall health of a region's economy. **Table 3-48**, Labor Force Trends, Mesa County and Colorado (1990-2008), illustrates labor force trends for Mesa County and Colorado. The labor force is defined as the civilian noninstitutional population 16 years old and over who are employed or actively seeking employment. Over the long term, labor force size reflects broader demographic trends. A growing population, for example, will be mirrored by an expanding labor force. Over shorter intervals, labor force participation responds cyclically to economic conditions. By definition the labor force shrinks when discouraged workers abandon their job searches; conversely, the labor force expands when more promising economic conditions draw hopeful job-seekers back into the labor market.

Table 3-48
Labor Force Trends, Mesa County and Colorado (1990-2008)

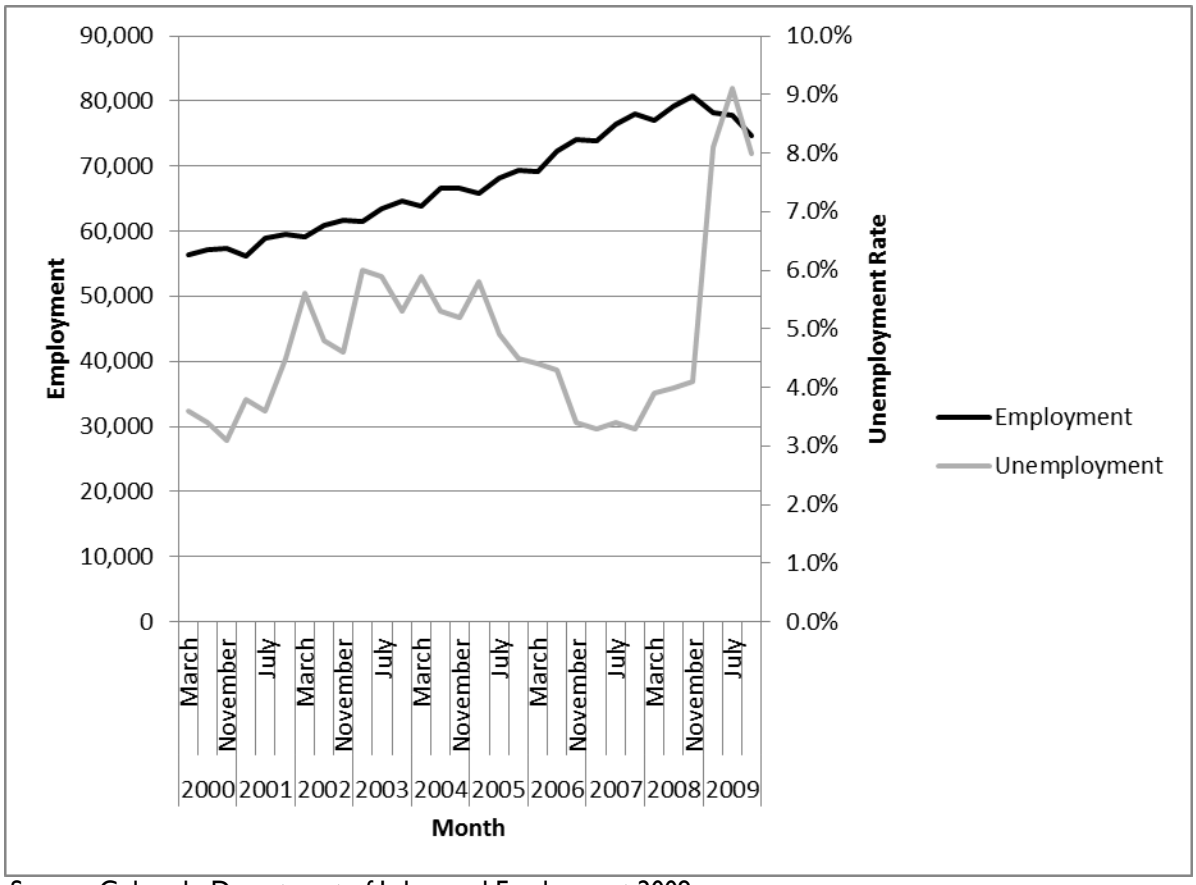
Area	1990	1996	2002	2009	% Change 1990-2009	% Change 1990-1996	% Change 1996-2002	% Change 2002-2009
Mesa	44,840	56,282	63,781	81,627	82	25.5	13.3	28
Colorado	1,770,678	2,175,564	2,455,708	2,701,106	52.5	22.9	12.9	10.0

Source: US Department of Labor, Bureau of Labor Statistics (Bureau of Labor Statistics) 2009a

As can be seen in **Table 3-48**, Labor Force Trends, Mesa County and Colorado (1990-2008), Mesa County's labor force growth rate exceeded that for the state as a whole over the years 1990-2009. The table further shows that Mesa County's accelerated growth relative to Colorado's occurred primarily during the period 2002-2009. A drop in the labor force from 2008 to 2009 didn't negate the overall trend, but it likely reflects the effect of the recession on Mesa County. Those recent years, when Mesa County's labor force growth significantly outstripped Colorado's, correspond to a boom in natural gas production that will be further documented in this section. Most of the increased gas production will be seen to take place outside of Mesa County and outside of the BLM lands overseen by the Grand Junction Field Office.

Diagram 3-15, Mesa County Employment and Unemployment Rate (2000-2009), illustrates both the unemployment rate and the level of employment in Mesa County from 2000 to mid-2009. Together these two groups, the employed and the unemployed, are the labor force referred to above. The unemployment rate is likely the most familiar of all economic statistics. It reports the percent of the labor force that is without work and is actively seeking employment. Perhaps counter intuitively, being without work alone does not designate a person as unemployed. A discouraged worker, having given up looking for work, is not counted as unemployed no matter how readily she would take a job were

Diagram 3-15
Mesa County Employment and Unemployment Rate (2000-2009)



Source: Colorado Department of Labor and Employment 2009

one available. Looking at **Diagram 3-15**, Mesa County Employment and Unemployment Rate (2000-2009), it is clear that employment in Mesa County steadily increased between 2000 and mid-2008. Beginning late in 2008, employment in Mesa County dipped dramatically, with the loss of approximately 6,000 jobs from November 2008 through November 2009. Beginning in mid-2008, the unemployment rate increased dramatically from a low of 3.2 percent in 2007 to a high of 9.3 percent in July 2009. Trends for total jobs in Mesa County and Colorado for 1990 through 2008 are reported below in **Table 3-49**, Total Employment Trends in Mesa County and Colorado (1990-2008).

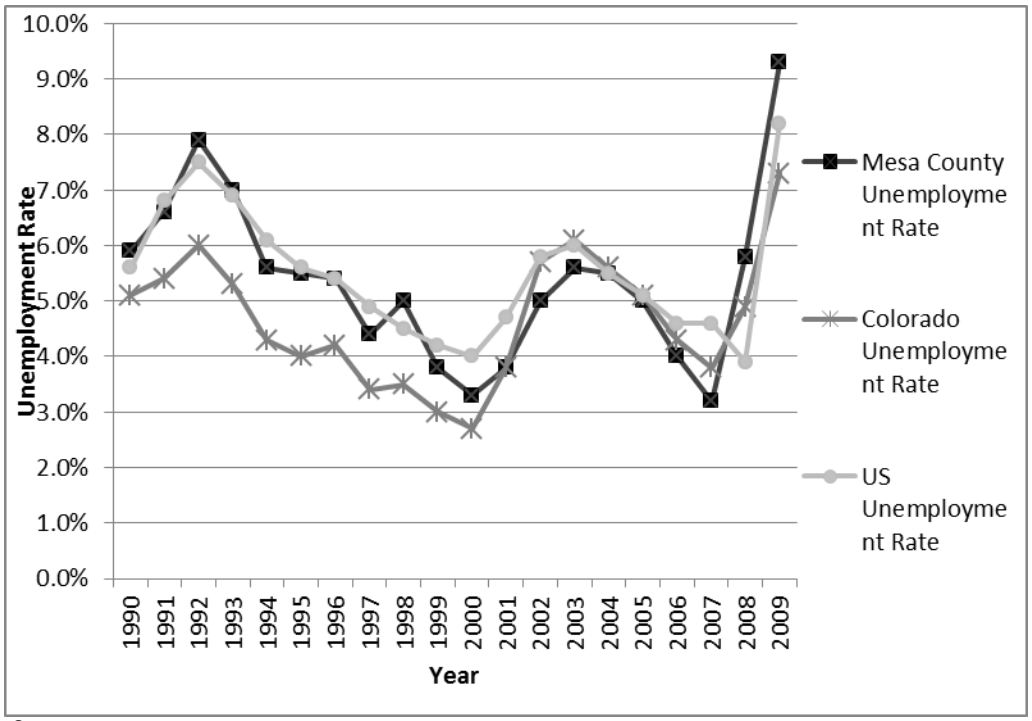
Table 3-49
Total Employment Trends in Mesa County and Colorado (1990-2008)

Location	1990	2000	2001	2008	% Change 1990-2000	% Change 2001-2008
Colorado	2,039,626	2,926,410	2,941,343	3,285,413	43.5	11.7
Mesa County	49,479	70,123	70,820	91,728	41.7	29.5

Sources: US Department of Commerce, Bureau of Economic Analysis (BEA) 2010a, 2010b

Comparing the county's unemployment rate with the state and national unemployment rate, it is clear that the County had outperformed the state and nation between 2002 and 2007. However, as illustrated in **Diagram 3-16**, Annual (Not Seasonally Adjusted) Unemployment Rate, since 2008, Mesa County has experienced higher rates of unemployment than the state of Colorado and the United States. Much of the low unemployment rate between 2002 and 2007 can be explained by a boom in the energy sector. With the crash of oil and gas prices in 2008 and 2009, as well as a significant downturn in the national economy, Mesa County employment increased nearly threefold from its low of 3.2 percent in 2007 to 9.3 percent in January, 2009. This far outpaced both the State of Colorado and the United States.

Diagram 3-16
Annual (Not Seasonally Adjusted) Unemployment Rate



Sources:
Mesa County and Colorado data: Colorado Department of Labor and Employment 2009
United States Data: Bureau of Labor Statistics 2009a

Employment by Industry

The US Department of Commerce, Bureau of Economic Analysis (BEA), through its Regional Economic Information System, reports data on total employment and earnings as well as on employment and earnings by industry sector. The data is available for the national, state, and county level. Data from 1990-2008 will be used to describe employment and earnings trends in Mesa County and compare them to state and national trends.

Prior to 2001, BEA reported this data using the Standard Industrial Classification (SIC), which categorizes industries into sectors and then into smaller subgroups. In 2001, the North American Industrial Classification System (NAICS) was introduced to better identify new industries in the changing economy. One outcome is that data often cannot be compared between those different time periods. In this report some data will be reported side by side from the two systems; in most cases data will be reported only for 2001 through 2008.

Trends in total employment for Mesa County and Colorado are reported in **Table 3-49**, Total Employment Trends in Mesa County and Colorado (1990-2008). Total employment includes all jobs, full and part time. A person working two jobs is counted twice. The estimate is intended to count private and public employment as well as self-employment. Over the entire period 1990 through 2008, total employment in Mesa County grew by 85.4 percent compared to 61 percent for Colorado. In **Table 3-49**, Total Employment Trends in Mesa County and Colorado (1990-2008), data is reported for 1990 through 2000 and 2001 through 2008 to avoid mixing data from SIC and NAICS calculations. It shows that from 1990 through 2000 total employment increased at roughly comparable rates in Mesa County and the state as a whole. During the 2001 through 2008 period, which includes the expansion of natural gas production in the region, Mesa's level of employment increased more than two-and-a-half times as fast as did Colorado's.

The largest sector by number of jobs for 2008 was retail trade, followed by health care and social assistance, government (all levels), construction, and accommodation and food services round out the top five sectors by total jobs. **Table 3-50**, Employment by Industry, Colorado and Mesa County (2001-2008), below presents all sectors by percent of jobs from highest to lowest. Mining, identified as the fastest growing sector, ranked tenth by number of jobs in the sector. In the BEA classification system, natural gas drilling and production is included in the mining sector. Two factors not accounted for by this measure of the economy are the incomes generated by the various sectors and the relative number of part-time vs. full-time jobs in each sector. Earnings generated by the various sectors are examined below following the discussion of jobs by industry.

Table 3-50, Employment by Industry, Colorado and Mesa County (2001-2008), and **Table 3-51**, Industrial Sectors Ranked by Number of Jobs in Mesa County and Colorado (2008), use data on employment by industry sector to compare Mesa County and Colorado over the years 2001 through 2008. The first, **Table 3-50**, Employment by Industry, Colorado and Mesa County (2001-2008), compares Mesa County with Colorado by sector and shows the percent change in jobs for each sector over the eight year period. The rank of each sector from greatest to least percent change is also shown. This allows easy comparison between Colorado and Mesa County for the different sectors.

Table 3-50
Employment by Industry, Colorado and Mesa County (2001-2008)

Industry Employment	Mesa 2001	Mesa 2008	% Change 2001-2008 (rank in % change)	Colorado 2001	Colorado 2008	% Change 2001-08 (rank in % change)
Accommodation & Food Service	5,297	6,913	30.5 (8)	218,280	242,972	11.3 (13)
Administrative & Waste Serv.	4,155	5,122	23.3 (13)	176,777	201,660	14.1 (10)
Arts, Entertain. & Recreation	1,261	1,897	50.4 (3)	71,439	87,434	22.4 (8)
Construction	6,738	9,377	39.2 (4)	237,667	248,081	4.4 (17)
Educational Services	503	637	26.6 (11)	39,125	55,723	42.4 (3)
Farm Emp.	2,016	2,092	3.8 (17)	46,541	45,201	-2.9 (19)
Finance & Insurance	3,061	4,054	32.4 (7)	154,122	185,102	20.1 (9)
Forestry & Ag. Services	282	365	29.4 (9)	8,521	11,033	29.5 (5)
Government	8,460	9,681	14.4 (16)	390,700	435,542	11.5 (12)
Health Care & Social Assist.	8,043	10,177	26.5 (12)	219,627	271,847	23.8 (6)
Information	1,185	1,198	1.1 (19)	118,445	90,030	-24.0 (21)
Management of Companies	155	120	-22.6 (21)	19,750	30,758	55.7 (2)
Manufacturing	4,144	3,719	-10.3 (20)	192,291	158,598	-17.5 (20)
Mining	652	4,532	595.1 (1)	23,210	46,393	99.9 (1)
Other Services	3,904	4,699	20.4 (14)	145,587	163,065	12.0 (11)
Professional & Tech. Services	3,349	4,621	38.0 (5)	232,228	286,147	23.2 (7)
Real Estate & Rental/Leasing	3,025	5,006	65.5 (2)	137,404	190,681	38.8 (4)
Retail Trade	9,499	10,973	15.5 (15)	307,334	324,742	5.7 (15)
Transportation & Warehousing	2,592	3,433	32.4 (6)	84,998	89,503	5.3 (16)
Utilities	234	238	1.7 (18)	8,347	8,828	5.8 (14)
Wholesale Trade	2,265	2,874	26.9 (10)	108,950	112,073	2.9 (18)

Note: Number in ( ) indicates rank from greatest to least change
Sources: BEA 2010b

For Colorado the five fastest growing sectors were mining (which includes natural gas), management, educational services, real estate, and forestry and agricultural services. Only one of these fast growing sectors ranked in the top ten sectors by number of jobs in 2008, but these numbers indicate important trends in Colorado's economy over the period. In Mesa County, mining led growth with an increase of 595 percent. Mining was followed by real estate; arts, entertainment, and recreation; construction; and professional and technical

services. These increases are consistent not only with an increase in resource extraction but with residential development and commercial development overall. For Mesa County, one of its five fastest growing sectors (construction) also shows up in the five largest sectors by jobs. Three more of the five fastest growing sectors (real estate, professional and technical services, and mining) are ranked in the top ten sectors by number of jobs.

Looking at job losses, both Colorado and Mesa County lost significant numbers of manufacturing jobs over the period surveyed, with Colorado suffering a greater rate of loss than Mesa County. Colorado suffered its greatest rate of job loss in the information sector while Mesa County held a little better than even with 1.1 percent growth. Colorado's other job loss area was farm employment (-2.9 percent). Mesa County showed modest growth in farm jobs, but the trend is not clear. From 2001 through 2006 farm employment in Mesa County dropped by 6.4 percent; then in 2007 and 2008 jobs bounced back to show a 3.8 percent increase over the eight year period. Mesa County's greatest rate of job loss (-22.6 percent) occurred in management. By contrast this sector had Colorado's second highest rate of job growth.

Table 3-51, Industrial Sectors Ranked by Number of Jobs in Mesa County and Colorado (2008), ranks industrial sectors by total jobs from largest to smallest sector for 2008. This provides one snapshot of the structure of Mesa County's economy and allows comparisons to the economy of the state as a whole for the same year. A few observations follow. For Colorado and Mesa County the top five sectors by number of jobs comprise four of the same sectors (government, retail trade, construction, and health care and social assistance) although the sectors rank in different order for each entity. The top five sectors in Mesa County accounted for about 51.4 percent of the jobs in 2008 while the top five sectors for the state accounted for about 47.8 percent of total jobs. When we compare Mesa County to Colorado, we can see that construction, mining, and farm employment provided higher shares of jobs in Mesa than in Colorado overall. The mining sector includes natural gas drilling and production.

Earnings by Industry

In addition to data for total employment, BEA reports total earnings and earnings by industry. **Table 3-52**, Total Earnings Trends in Mesa County and Colorado (1990-2008) (Thousands of Real 2008 Dollars), records the trend in total earnings over the years 1990 through 2008 for both Mesa County and Colorado. Earnings are reported in real 2008 dollars to adjust for inflation's effect on purchasing power. Over the full period Mesa County earnings grew by about 121 percent, compared to an increase for Colorado of 91.9 percent. As with total employment, the data in **Table 3-52**, Total Earnings Trends in Mesa County and Colorado (1990-2008) (Thousands of Real 2008 Dollars), are reported in two segments: 1990-2000 and 2001-2008. This avoids mixing data from SIC and NAICS, the two different systems for classifying industries.

Table 3-51
Industrial Sectors Ranked by Number of Jobs in Mesa County and Colorado (2008)

MESA COUNTY 2008			COLORADO 2008		
Industry	**Jobs**	**Percent of All Jobs**	**Industry**	**Jobs**	**Percent of All Jobs**
Retail Trade	10,973	12.0	Government	435,542	13.3
Health Care & Social Assist.	10,177	11.1	Retail Trade	324,742	9.9
Government	9,681	10.6	Professional & Tech. Services	286,147	8.7
Construction	9,377	10.2	Health Care & Social Assist.	271,847	8.3
Accommodation & Food Service	6,913	7.5	Construction	248,081	7.6
Administrative & Waste Serv.	5,122	5.6	Accommodation & Food Service	242,972	7.4
Real Estate & Rental/Leasing	5,006	5.5	Administrative & Waste Serv.	201,660	6.1
Other Services	4,699	5.1	Real Estate & Rental/Leasing	190,681	5.8
Professional & Tech. Services	4,621	5.0	Finance & Insurance	185,102	5.6
Mining	4,532	4.9	Other Services	163,065	5.0
Finance & Insurance	4,054	4.4	Manufacturing	158,598	4.8
Manufacturing	3,719	4.1	Wholesale Trade	112,073	3.4
Transportation & Warehousing	3,433	3.7	Information	90,030	2.7
Wholesale Trade	2,874	3.1	Transportation & Warehousing	89,503	2.7
Farm Emp.	2,092	2.3	Arts, Entertain. & Recreation	87,434	2.7
Arts, Entertain. & Recreation	1,897	2.1	Educational Services	55,723	1.7
Information	1,198	1.3	Mining	46,393	1.4
Educational Services	637	0.7	*Farm Emp.*	45,201	1.4
AG. Services	365	0.4	Management of Companies	30,758	0.9
Utilities	238	0.3	AG. Services	11,033	0.3
Management of Companies	120	0.1	Utilities	8,828	0.3

Source: BEA 2010b

Table 3-52
Total Earnings Trends in Mesa County and Colorado (1990-2008)
(Thousands of Real 2008 Dollars)

Location	1990	2000	2001	2008	% Change 1990-2000	% Change 2001-2008
Colorado	87,031,272	144,701,087	147,385,632	167,020,895	66.3	13.3
Mesa County	1,655,873	2,471,245	2,482,252	3,662,956	49.2	47.6

Note: Earnings inflated to 2008 dollars using Consumer Price Index for all urban customers for Denver, Boulder, Greeley
Source: BEA 2010c

The data shows that the growth in earnings for Colorado slowed dramatically in 2001 through 2008 compared to 1990 through 2000. Mesa County, on the other hand, grew at a steadier rate over both periods and grew far faster than Colorado in total earnings for 2001 through 2008. This period of earnings growth greater than the state as a whole includes a boom in earnings driven by natural gas production in the region.

Earnings trends in Mesa County and Colorado for the various industry sectors are compared in **Table 3-53**, Earnings by Industry, Colorado and Mesa County (2001-2008) (Thousands of Real 2008 Dollars). In Mesa County earnings from mining grew by more than 1,000 percent for the fastest rate of growth from 2001 through 2008. No other sectors exceeded double digit increases in earnings, but several grew by more than 50 percent.

After mining, the fastest growing earnings in Mesa County came from arts, entertainment, and recreation; wholesale trade; administrative and waste services; professional and technical services; transportation and warehousing; and accommodation and food service. Each of these saw earnings increase by over 50 percent. For Colorado earnings grew fastest in the management sector at 83 percent. Earnings for mining grew next fastest at 74 percent. Mining is the only sector whose earnings growth ranked in the top five for both Mesa County and Colorado. It is important to remember that greater growth in earnings does not imply that an industry sector contributes large earnings overall. A small sector can have a high rate of growth and still remain a small sector.

In **Table 3-53**, Earnings by Industry, Colorado and Mesa County (2001-2008) (Thousands of Real 2008 Dollars), industrial sectors are ranked by earnings for Mesa County and Colorado in 2008. The earnings are expressed in real 2008 dollars. With this data the contribution of various sectors to Mesa County's economy can easily be observed. Retail trade, which ranked highest in number of jobs, ranks only fifth in terms of earnings. Mining, which includes natural gas, ranked only number ten in job numbers but ranks fourth in earnings for the county. Only three of the nine industrial sectors that ranked above mining in jobs exceed it in earnings. The obvious factors at play are wage levels and the

Table 3-53
Earnings by Industry, Colorado and Mesa County (2001-2008)
(Thousands of Real 2008 Dollars)

	Mesa County			Colorado		
Industry Earnings	**2008**	**% Change 2001-08**	**2008 % of All Earnings**	**2008**	**% Change 2001-08**	**2008 % of All Earnings**
Total	3,662,956	47.6		167,020,895	13.3	
Government	566,179	36.8	15.5	26,728,385	29.3	16
Health Care & Social Assist.	475,672	35.2	13	13,319,631	33.8	8
Construction	438,915	33.7	12	12,709,238	-7	7.6
Mining	358,445	1173.9	9.8	4,702,866	74	2.8
Retail Trade	307,712	22.4	8.4	9,631,858	1.2	5.8
Transportation & Warehousing	192,697	56	5.3	4,686,388	0.6	2.8
Other Services	177,642	42.2	4.8	6,308,054	22.6	3.8
Professional & Tech. Services	173,303	58.1	4.7	19,949,601	25.8	11.9
Manufacturing	170,275	0.1	4.6	11,312,645	-10.4	6.8
Wholesale Trade	163,920	65	4.5	8,699,206	14.5	5.2
Finance & Insurance	150,327	34	4.1	10,992,623	14.7	6.6
Administrative & Waste Serv.	147,384	60.5	4	6,966,206	16.5	4.2
Accommodation & Food Service	141,789	55.6	3.9	5,631,141	18.4	3.4
Real Estate & Rental/Leasing	65,033	10.8	1.8	4,040,987	-20.8	2.4
Information	56,908	17.1	1.6	11,454,142	-5.1	6.9
Arts, Entertain. & Recreation	21,891	93.8	0.6	2,296,626	15.1	1.4
Utilities	20,311	12.6	0.6	987,841	11.3	0.6
Educational Services	10,268	-22.6	0.3	1,622,323	45.7	1
Farming	7,343	-54.9	0.2	1,004,537	-19	0.6
Forestry and Ag. Services	8,712	-4.5	0.2	243,647	14.4	0.1
Management of Companies	8,230	-24.3	0.2	3,732,950	82.3	2.2

Note: : 2001 values inflated using Consumer Price Index for all urban customers for Denver, Boulder, Greeley
Source: BEA 2010b

relative number of part-time vs. full-time jobs in different sectors. Mining creates a greater proportion of higher paying, full-time jobs than retail trade, for example. One last finding from this data will be mentioned. Recall that earnings in the arts, entertainment, and recreation sector increased at the second fastest rate (93.8 percent) of any industry from 2001 through 2008, yet at the end of that rapid growth, earnings in the sector ranked only eighteenth out of twenty-one industries in contribution to total earnings for the county. Fast growth in

earnings can identify important trends in a local economy, but the fast growth alone does not indicate a significant impact on total earnings. Again, a small sector can experience a high growth rate and not be a significant contributor to overall earnings.

Comparing Colorado and Mesa County, government is the largest sector as measured by earnings. In addition three of the top five sectors and six of the top ten sectors are common to both entities although not ranked at identical levels. Perhaps the most striking difference between the two economies is that mining ranks fourth in earnings for Mesa County but only thirteenth for Colorado.

Earnings losses were found in four Mesa County sectors (farming, management, educational services, and forestry and agricultural services) from 2001-2008. Colorado saw earnings losses in real estate, farming, manufacturing, construction, and information. Mesa matches a little better with Colorado in earnings losses when it is recalled that, while manufacturing along with real estate showed positive earnings growth over the eight year period in Mesa, they had shown three and four years respectively of earnings losses at the end of the reporting period. They were following the same trend earnings wise as was the state overall.

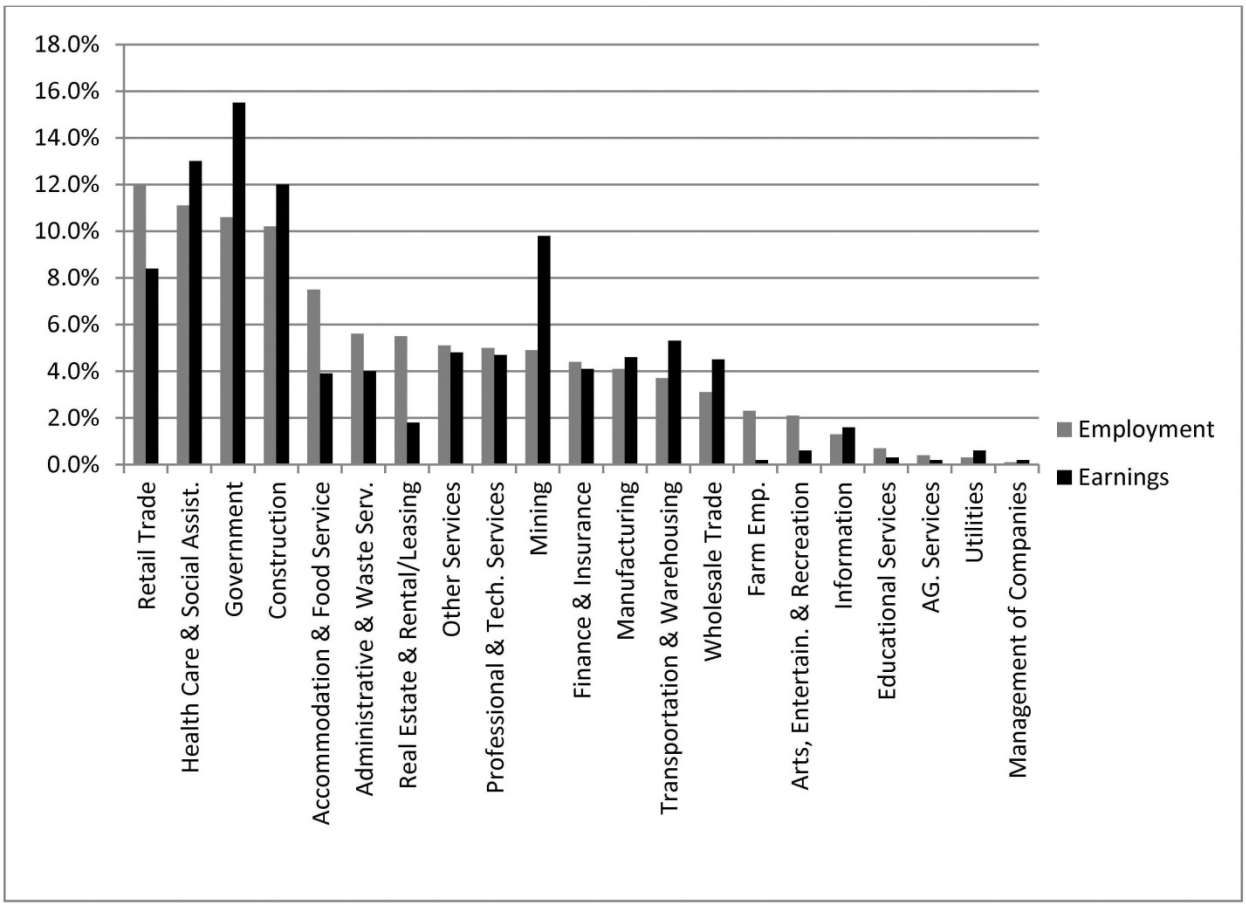
Diagram 3-17, Contributions to Jobs and Earnings by Industry Sector, Mesa County (2008), shows the share of jobs and earnings generated by each industrial sector in Mesa County for 2008. One obvious feature of the data is that the four highest contributors to earnings produce a larger share of earnings than of jobs. Meanwhile, retail trade, the largest sector by jobs, ranks only fifth in terms of earnings generated. The mining sector includes natural gas drilling and production.

Cross County Income Flows

To adjust for cross-county flows of income, The Bureau of Economic Analysis (BEA) reports residence adjustments. Some Mesa county residents commute to other counties to work. These workers earn their incomes in other counties and bring them into Mesa County. Some residents of other counties commute to Mesa County. They earn their incomes in Mesa County but take them to their home county. The residence adjustment accounts for this cross-county flow of income by subtracting the outflow of income from the inflow of income for Mesa County. A positive number indicates that residents of the county earn more income from other counties than non-residents transfer out of the county. **Table 3-54**, Residence Adjustment, Mesa County (1990-2008) (Thousands of Real 2008 Dollars), reports the residence adjustment for Mesa County for 1990 and for 2001 through 2008 in both nominal and real dollars.

The residence adjustment is positive for all those years and increases dramatically after 2004. Over that time natural gas and oil production were increasing significantly in Garfield County and the number of Mesa County employees in oil and natural gas production was increasing as well.

Diagram 3-17
Contributions to Jobs and Earnings by Industrial Sector, Mesa County (2008)



Source: BEA 2010b

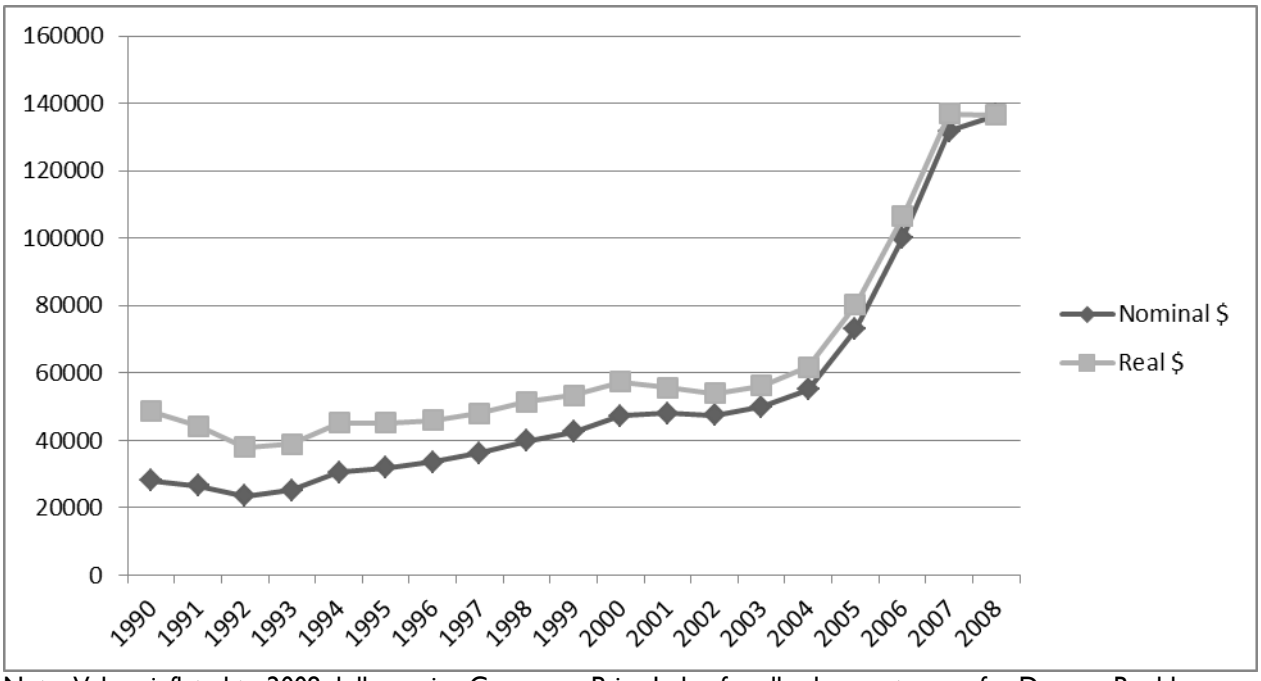
Table 3-54
Residence Adjustment, Mesa County (1990-2008) (Thousands of Real 2008 Dollars)

	1990	2001	2002	2003	2004	2005	2006	2007	2008
Nominal $	27,970	48,035	47,400	50,005	55,033	72,950	100,189	131,734	136,449
Real $	48,560	55,613	53,838	56,189	61,772	80,211	106,372	136,866	136,449

Note: Values inflated to 2008 dollars using Consumer Price Index for all urban customers for Denver, Boulder, Greeley
Source: BEA 2010d

Diagram 3-18, Residence Adjustment, Mesa County (1990-2008) (Thousands of Real 2008 Dollars), graphs the dramatic increase in Mesa County's residence adjustment recorded in **Table 3-54**, Residence Adjustment, Mesa County (1990-2008) (Thousands of Real 2008 Dollars).

Diagram 3-18
Residence Adjustment, Mesa County, 1990-2008 (Thousands of Real 2008 Dollars)

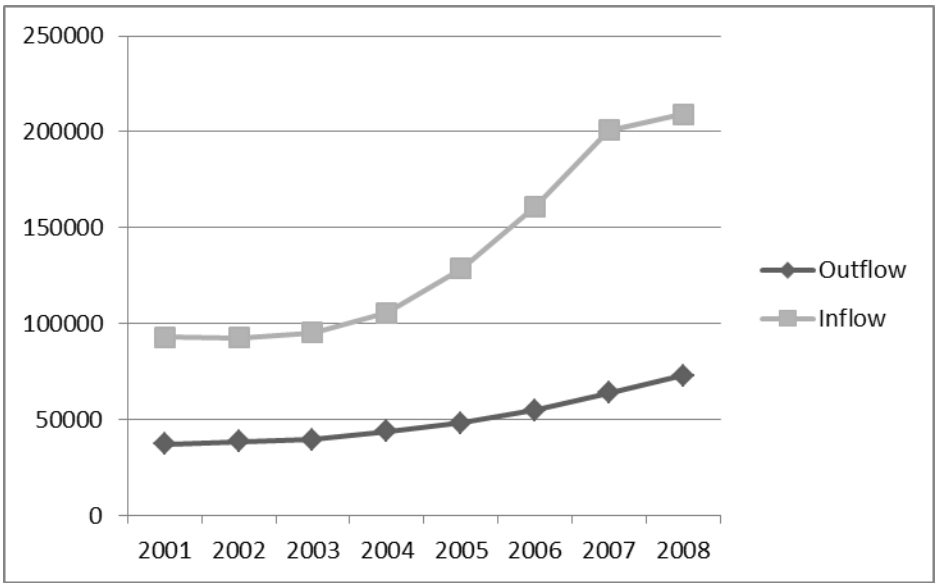


Note: Values inflated to 2008 dollars using Consumer Price Index for all urban customers for Denver, Boulder, Greeley
Source: BEA 2010d

Diagram 3-19, Earnings Inflow vs. Outflow, Mesa County (2001-2008) (Thousands of 2008 Dollars), and **Diagram 3-20**, Earnings Inflow vs. Outflow, Garfield County (2001-2008) (Thousands of Real, 2008 dollars), represent the earnings inflows and outflows used to calculate the residence adjustment for Mesa County (**Table 3-54**, Residence Adjustment, Mesa County (1990-2008) (Thousands of Real 2008 Dollars)) and for neighboring Garfield County. The difference between the inflow and outflow is the residence adjustment. It can be seen that the increased inflow of incomes for Mesa County coincides with an increase in outflow of incomes for Garfield County. This represents, in part, incomes to Mesa County oil and natural gas workers from oil and natural gas production in Garfield County, which showed substantial increases beginning in 2004.

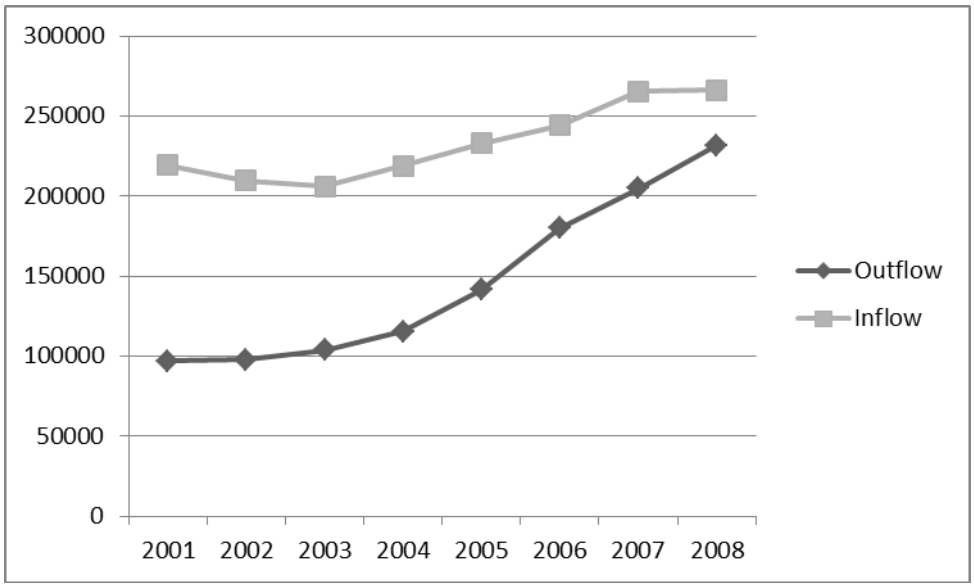
Commuting patterns can help substantiate the connection between Mesa County workers and oil and natural gas production in Garfield County. The US Census Bureau reports data on commuting patterns between counties as part of its Local Employment Dynamics (LED) program. LED uses existing administrative reports from states combined with census, survey, and other administrative records. As such the LED statistics involve some synthetic data.

Diagram 3-19
Earnings Inflow vs. Outflow, Mesa County, 2001-2008 (Thousands of 2008 Dollars)



Note: Values inflated to 2008 dollars using Consumer Price Index for all urban customers for Denver, Boulder, Greeley
Source: BEA 2010d

Diagram 3-20
Earnings Inflow vs. Outflow, Garfield County (2001-2008) (Thousands of Real 2008 Dollars)



Note: Values inflated to 2008 dollars using Consumer Price Index for all urban customers for Denver, Boulder, Greeley.
Source: BEA 2010d

Table 3-55, Commuting Patterns Mesa County to Garfield County (2002-2008), reports commuting patterns for Mesa County residents working in Garfield County. Data are reported for those who commute for either full or part time jobs as well as those who commute only for their primary job. The number of commuters for each year is reported as well as the share that represents of all jobs held by Mesa County residents. There is a steady increase in both the number of commuters and their share of overall jobs from 2004 through 2007. There is a drop off in both commuters and their share of jobs in 2008, but both numbers are still higher than any other year except 2007.

Table 3-55
Commuting Patterns Mesa County to Garfield County (2002-2008)

	2002	2003	2004	2005	2006	2007	2008
Total Full & Part Time Jobs, All Mesa County Residents	49,434	49,144	52,066	53,023	55,716	61,839	64,806
Commuters to Garfield County	903	844	1,050	1,215	1,954	2,644	2,529
Share of All Jobs	1.8%	1.7%	2.0%	2.3%	3.5%	4.3%	3.9%
Total Primary Jobs, All Mesa County Residents	46,450	46,317	48,860	49,505	52,125	57,755	60,709
Commuters to Garfield County	853	793	976	1,133	1,844	2,506	2,389
Share of Primary Jobs	1.8%	1.7%	2.0%	2.3%	3.5%	4.3%	3.9%

Source: U.S. Census Bureau 2008a

Personal Income

The recent surge in economic activity since 2004, including the increased activity in the energy industry on public and private lands, has helped increase wages in Mesa County (see **Table 3-56**, Annual Average Wage Colorado and Mesa County (2001-2008)). Wages increased 43 percent between 2001 and 2008 which approximates an $11,800 wage increase during that time. It remains to be determined what impact the economic downturn of 2008 and 2009 will have on annual wages in Mesa County and the state of Colorado.

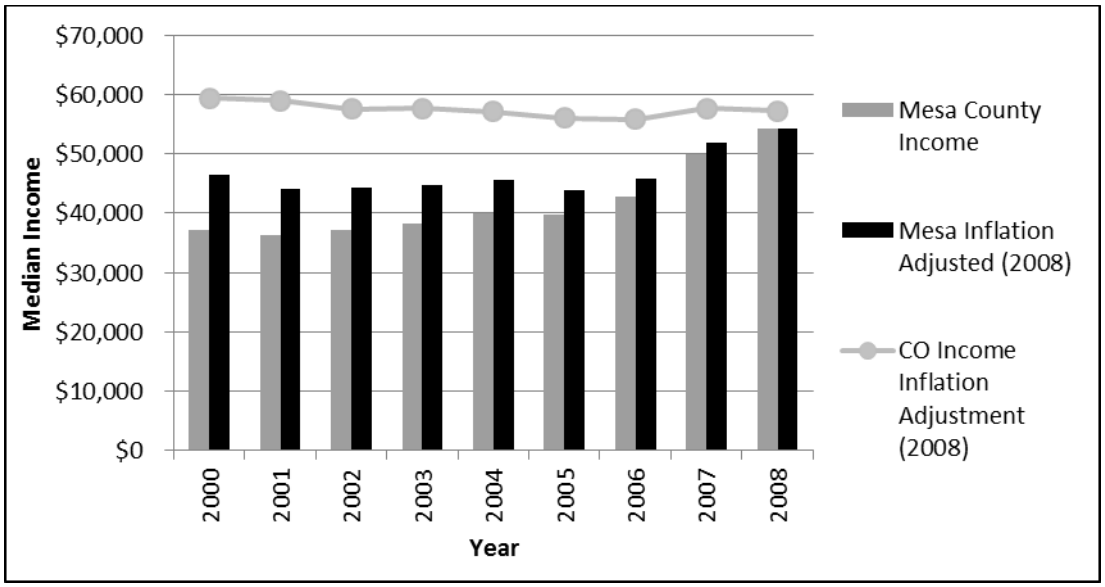
Low unemployment and subsequent increases in wages has had a positive impact on family income in Mesa County. As illustrated in **Diagram 3-21**, Mesa County Annual Median Household Income (2000-2008), the median household income has increased by nearly 35 percent between 2000 and 2008. Adjusting for inflation, the County has seen approximately a $7,000 rise in median income between 2001 and 2008. With unemployment over nine percent in 2009 it is expected that median family income has dropped as well.

Table 3-56
Annual Average Wage Colorado and Mesa County (2001-2008)

Year	Colorado	State % Change	Mesa County	Mesa County % Change	Ratio to State Average
2001	$37,952	n/a	$27,426	n/a	0.72
2002	$38,005	0.1%	$28,331	3.3%	0.75
2003	$38,942	2.5%	$29,053	2.5%	0.75
2004	$40,276	3.4%	$29,965	3.1%	0.74
2005	$41,601	3.3%	$31,611	5.5%	0.76
2006	$43,506	4.6%	$33,729	6.7%	0.78
2007	$45,396	4.3%	$36,221	7.4%	0.80
2008	$46,614	2.7%	$39,246	8.4%	0.84

Note: The data has not been adjusted for inflation.
Source: Bureau of Labor Statistics 2009b

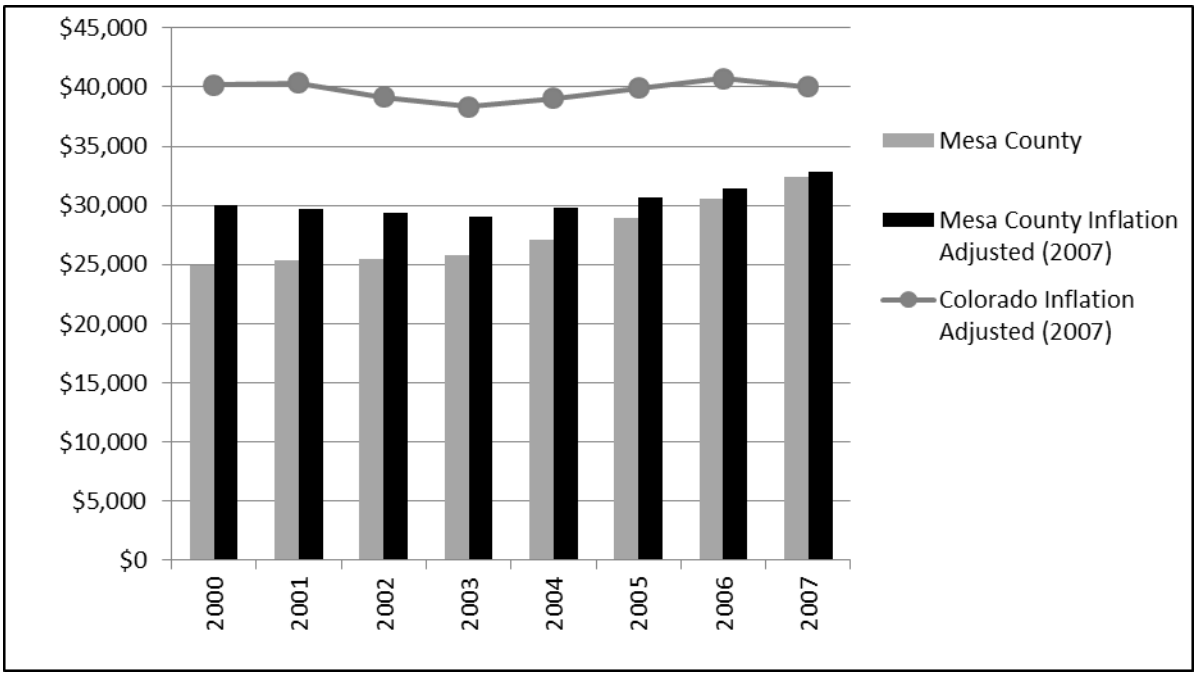
Diagram 3-21
Mesa County Annual Median Household Income (2000-2008)



Source: US Census Bureau 2008b

As illustrated in **Diagram 3-22**, Mesa County and Colorado per Capita Personal Income (2000-2007), per capita income in Mesa County has increased approximately 31 percent between 2000 and 20007. Adjusting for inflation, per capita personal income in Mesa County grew approximately 10 percent between 2000 and 2007. Traditionally there has been a relatively large gap between Mesa County and Colorado in per capita income. The data shows that Mesa County residents still earn less than their Colorado counterparts, but this gap has closed almost $3,000 since 2000. Again it is unclear how the recession of 2008 will impact per capita income, but the expectation is that it will decrease.

Diagram 3-22
Mesa County and Colorado per Capita Personal Income (2000-2007)

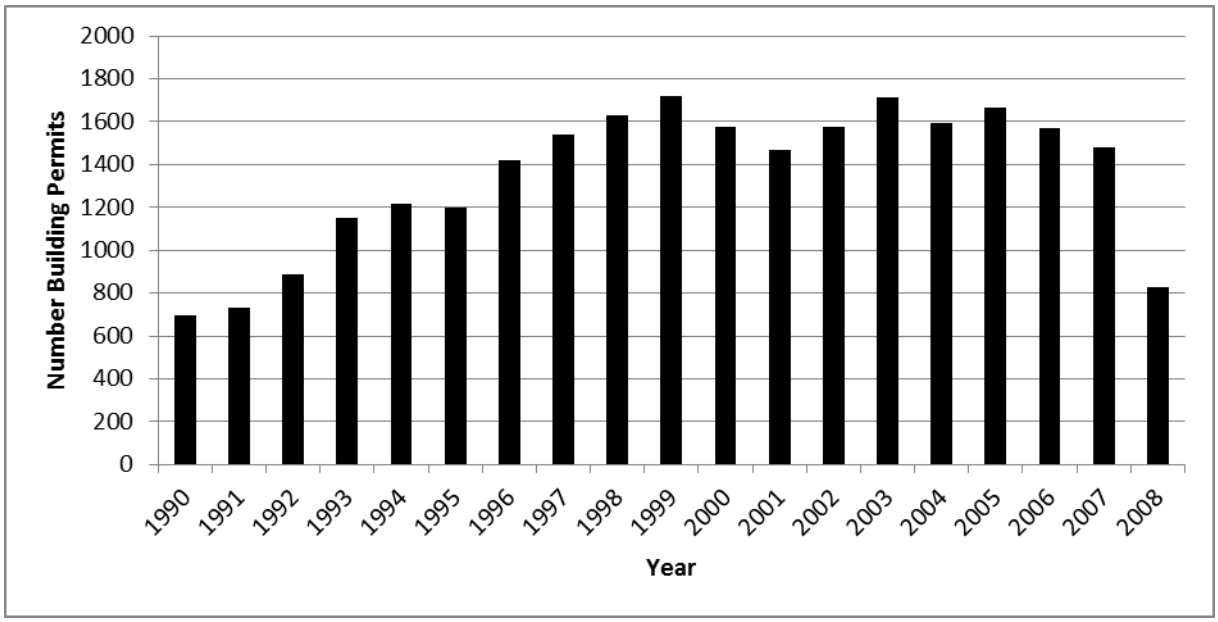


Source for Colorado: BEA 2007

Housing

As evidenced in **Diagram 3-23**, Residential Building Permits Issued in Mesa County (1990-2008), building in Mesa County has been strong since 1990, evidenced by the doubling of residential permits issued between 1990 and 1995. The increased number of permits can be explained by the County's growing population and healthy economy. In 2008 building permits decreased to 1991 levels thereby illustrating the impact the 2008 and 2009 economic downturn has had on Mesa County.

Diagram 3-23
Residential Building Permits Issued in Mesa County (1990-2008)



Note: Data does not include commercial building permits
Source: Mesa County Building Department. 2008.

The expansion of the economy helped maintain a robust real estate market in Mesa County. While higher interest rates and rising defaults on mortgages were driving down housing prices nationally, the median price of a home in the Grand Junction metropolitan area continued to increase. Between 2000 and 2008, the median home sales price in Grand Junction was estimated to nearly double from $118,900 to $233,000. In fact, according to a March 2008 report issued by the Office of Federal Housing Enterprise Oversight, Grand Junction ranked number two in the top 20 metropolitan statistical areas with the highest rate of house price appreciation (Housing Colorado 2009). The 2008 and 2009 economic downturn had a significant impact on home sales and prices in Mesa County. According to zillow.com the average home value in Grand Junction plummeted to $190,000 in January, 2010 (Zillow.com 2010). Foreclosure rates have also risen dramatically in Mesa County increasing 143 percent in the second quarter of 2009 over the previous year while real estate sales dropped from 5568 in 2006 to just 1998 in 2009 (Inside Real Estate News 2009).

The rental market does not provide much of an alternative for those who cannot afford to buy a home. While the housing market was very affordable until 2004, there was very little incentive to build additional rental units. As the housing market became less affordable, the vacancy rate for apartments has dropped dramatically. Grand Junction vacancy rates for multi-family units ranged between 4.1 percent and 1.6 percent between 2007 and the second quarter of 2009 (Colorado Department of Local Affairs 2009a). Since then vacancy rates

have skyrocketed to 7.5 percent for multi-family units (Grand Junction Free Press 2009).

Non-economic Social and Cultural Benefits of Public Lands

In addition to the economic benefits accrued from tourism and natural resource development on adjacent public lands, gateway communities such as Grand Junction, Fruita, Mack, Loma, Palisade, DeBeque, Colbran, Mesa, Glade Park and Gateway accrue a wide variety of intangible benefits from their proximity to BLM public lands in the Grand Junction Field Office. People move to, or remain in these gateway communities for the quality of life that is impacted and enhanced by the condition of adjacent public lands.

These values of public lands were measured by a series of focus groups conducted by the Redifer Research Institute of Colorado Mesa University for the RMP process of data collection. Between February 23, 2009 and April 22, 2009, eleven focus groups were conducted with community leaders and residents living in the Grand Junction BLM Field Office's (GJFO) area. The communities include: Grand Junction, Fruita, Mesa County, Glade Park, Palisade, De Beque, Gateway, and Loma-Mack. The purpose of the focus groups was to ascertain what participants value about the community they live in and the accompanying public lands (values); their concerns in achieving their community and public lands vision (concerns); the beneficial outcomes their vision would produce (outcomes); and the appropriate role of collaborating partners in planning and managing public lands (collaboration). The results of these focus groups were recorded in a report submitted to the BLM GJFO for inclusion in the RMP process in January of 2010. Included here are the key findings from that report.

The Value of Public Land

Regardless of the community, public lands are a vital component of what citizens enjoy about living in their community. The most frequently discussed values: wildlife, access, small-town atmosphere, quiet/isolation, open space and recreation, are all related to public lands. The same is true for concerns: health of public lands, social spaces, water, trash, oil and gas development, jobs and economic growth and user conflict on public lands. While some connections to public lands may not be as readily apparent as others, they are nonetheless visible. For example, the small town atmosphere of many communities is protected by surrounding public lands as it prevents significant population increases. It is clear that public lands both attracts and maintains residents and increases the quality of life in the Grand Junction Field Office.

A Tailored Approach to Managing Public Lands

In most cases the character of a community is shaped by its surrounding public lands. From Fruita's recreation destinations in the Grand Valley Area to Glade Park's ranching community, in the Glade Park Area public lands shape the communities they surround. Because citizens are attracted to the character of

their communities, they have a strong desire to maintain it. The result is a lack of consensus among the communities, which complicates the management of public lands. The different interests and intensity preferences among the communities suggests that a tailored management approach for each community is preferable to a one-size-fits-all management approach. For example, there is more support for oil and gas development in the northern part of the Roan Creek Area then if that development took place in the Grand Valley Area. Agriculture is an emphasis in both the Glade Park and Grand Mesa Slopes Areas, but the type of agriculture differs, with communities favoring ranching in the Glade Park Area, and higher end fruit growing in the Grand Mesa Slopes area. Without a carefully tailored approach, the communities may feel as though the BLM is threatening their quality of life and the character of their community

Differing Viewpoints

Within several communities there appear to be conflicts over what they desire. However, because the participants believe that public lands should provide opportunities for multiple users, they expressed a desire for multiple-use management. Specifically, participants expressed a desire for a tailored multiple-use approach that reflects community values, addresses the concerns of community members, and helps the community achieve its desired outcomes. Feedback from group participants and CMU suggest that management should focus on maximizing desired outcomes, while also considering adverse outcomes in order to minimize adverse impacts.

Economic Opportunities

Given the diversity of communities and public lands in the BLM GJFO, there are a diverse range of economic opportunities directly tied to public lands. These include agri-tourism, (in the Grand Valley and Grand Mesa Slopes Areas) ranching, (in the Glade Park Area) extractive resources development, (in the northern portion of the Roan Creek Area) tourism, (in the Gateway Area) attracting business, (in the Grand Valley Area) recreation services (in the Bangs Canyon Area), and hunting (in the Bookcliffs and Glade Park Areas) (just to name a few). Not all of these economic opportunities appear in each community. In fact, the uniqueness of the local economic opportunities on public land contributes to the unique characteristics of the distinctive communities.

Regional Hub

Grand Junction is a regional hub and there is recognition that the management of public lands can impact the city and surrounding communities. This impact can be felt in numerous ways, from acting as a natural barrier to growth, to encouraging high-density development, attracting young talent to the region, and attracting businesses. In turn, because Grand Junction is the regional hub, what happens in Grand Junction has an impact on surrounding communities.

Educational Outreach
There was a desire by participants to see a conscientious effort by the BLM to engage in educational outreach. Educating citizens about public lands, the challenges of managing these lands, and stewardship were important to many communities. Beginning this process with children (in tandem with public schools) will help correct many of the problems witnessed on public lands such as trash and ad-hoc trail building. In turn, this will lessen the burden on the BLM, which is perceived to be stretched as a result of inadequate funding.

Collaboration
Beyond outreach, there is a clear desire for collaboration between the BLM and various partners. The two groups that received the most support as collaborators are community residents and local governments. There was greater support for collaboration in the planning process than there was in the management of public lands. The BLM has found, in practice that community partners are indeed eager to participate in management as well.

Identifying Areas of Action
Emphasis should be on collaborating with other jurisdictions and partners to ensure that management actions can have the greatest impact in helping communities achieve their vision

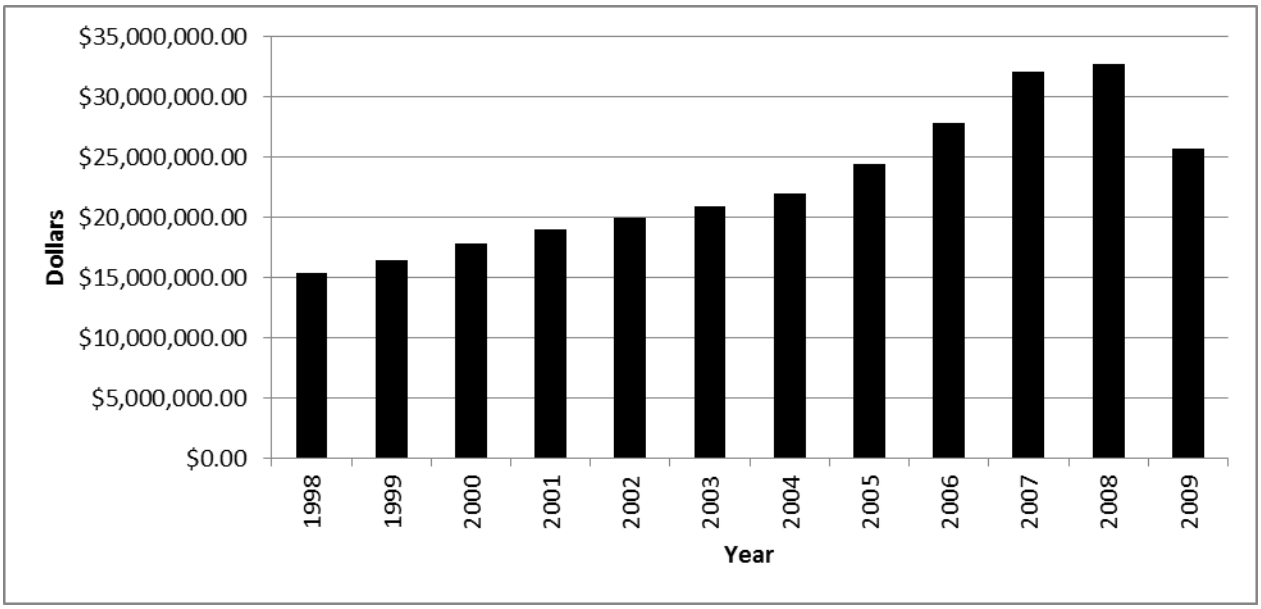
Public Finance and Government Services

Government Revenues
As the population and economy of Mesa County has grown over the last twenty years, the county's revenues and expenditures have also grown. The county has experienced increased revenue in three different areas: sales tax revenues, severance taxes, and payment in lieu of taxes (PILT) payments.

First, as illustrated in **Diagram 3-24**, Mesa County Sales Tax Revenues (1998-2009), Mesa County has experienced an increase in its sales tax revenues every year since 1998. While the percent change has ebbed and flowed over this period (with a low of 4 percent increase in sales tax collection to a high of 16 percent increase), the strength of this revenue reflects a healthy Mesa County economy. Sales tax revenues leveled off between 2007 and 2008 with a .01 percent growth rate. By January, 2010 the county's sales tax revenue had dropped 24 percent when compared to the same month in 2009 (Grand Junction Daily Sentinel 2010). This slowing illustrates the significant impact the 2008 and 2009 economic downturn has had on the county.

The second area of revenue growth relates to the energy industry. From 2003 to 2008 applications for permits to drill in Mesa County grew from 27 to approximately 501 (Colorado Oil and Gas Conservation Commission 2009). This represents approximately 6 percent of the total permits issued statewide.

Diagram 3-24
Mesa County Sales Tax Revenues (1998-2009)



Note: 2009 data is projected revenue
Source: Mesa County Finance Department 2008

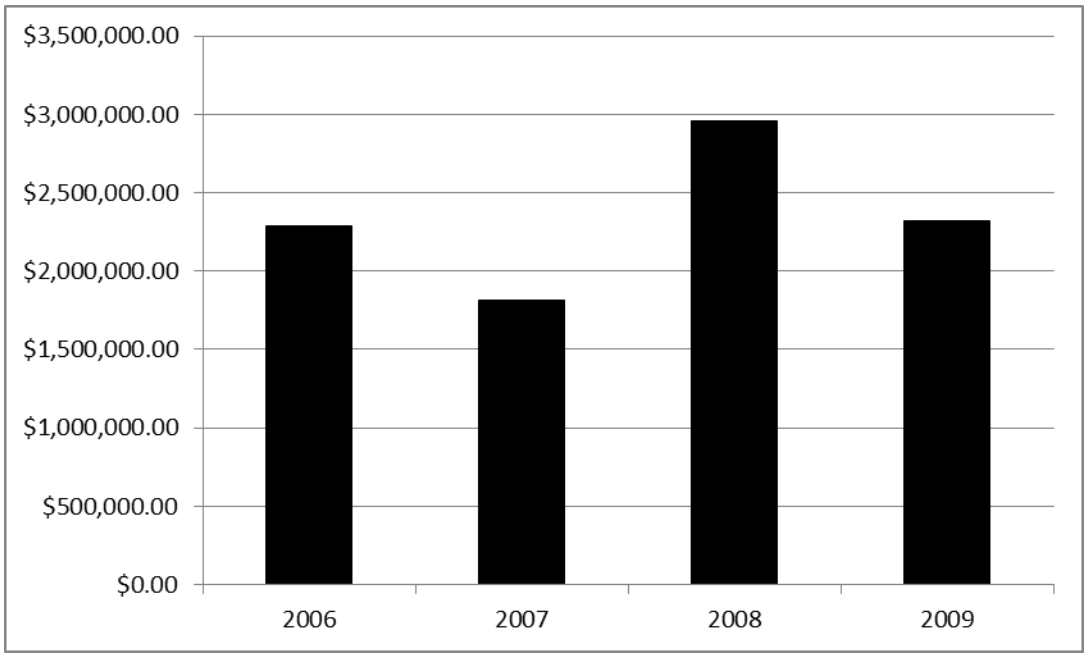
With 805 active wells[2] in 2008, Mesa County ranked eighth in the state for active oil and gas wells (Colorado Oil and Gas Conservation Commission 2009). In 2006 a total of 1,611 oil and gas employees lived in Mesa County (Mesa County 2007).

Growth of the oil and gas industry in Mesa County is best exhibited in **Diagram 3-25**, Federal Mineral Lease Direct Distribution to Mesa County (2006-2009). Between 2000 and 2008, oil production has increased from approximately 3,500 barrels to over 122,000 barrels. Likewise natural gas production has increased six fold between 2000 and 2008. Federal mineral lease payments to Mesa County have contributed significantly to Mesa County's tax base. As illustrated in **Diagram 3-26**, from 2006 through 2009, Mesa County received a low of $1.8 million to a high of $2.9 million.

Mesa County severance tax revenues were close to $3 million in 2006 and were projected to grow to as much $5 million by 2010 (Mesa County 2007). The decrease in national oil and gas prices in late 2008 had a significant impact on production levels. This decrease has significantly impacted Mesa County's severance tax projections. Revised 2010 severance tax projections after the crash in oil and gas prices anticipated County revenue to drop from $5 million to a little less than $1 million (Mesa County 2009c).

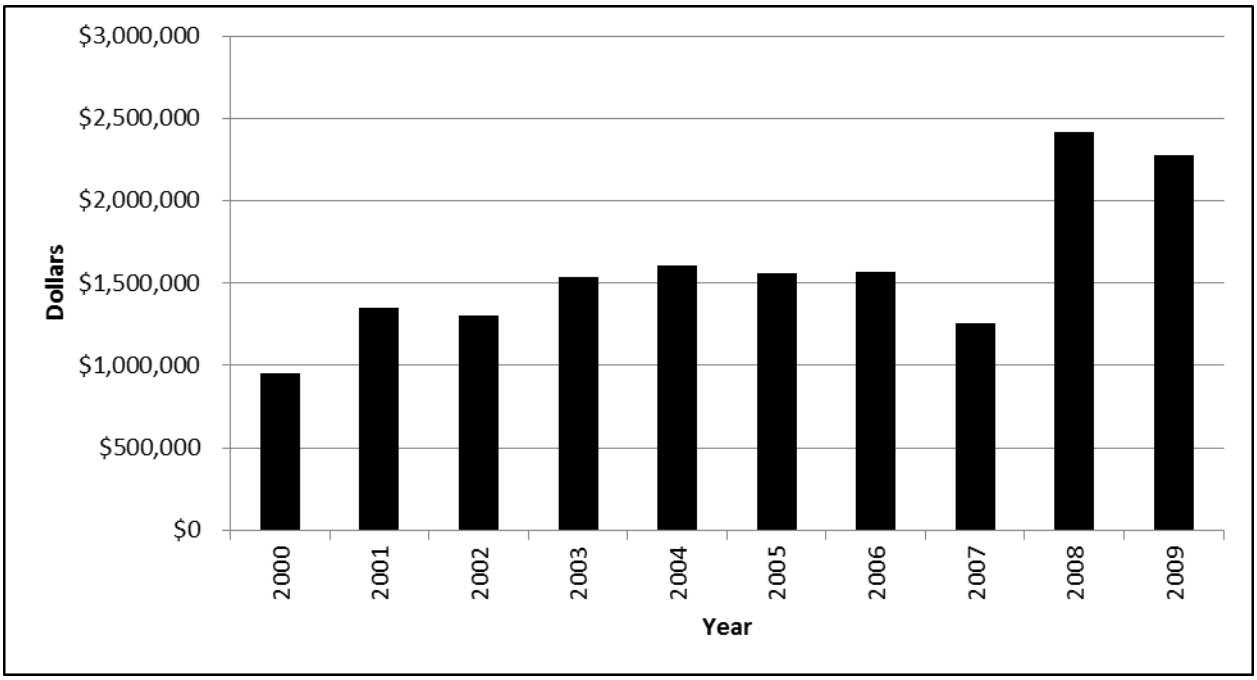
[2] Includes all wells regardless of mineral ownership.

Diagram 3-25
Federal Mineral Lease Direct Distribution to Mesa County (2006-2009)



Source: Colorado Department of Local Affairs 2009b

Diagram 3-26
Payments in Lieu of Taxes, Mesa County (2000-2008)



Source: US Department of the Interior

Mesa County oil and gas taxable assessed value grew from $.94 million in 2000 to $2.8 million in 2009. This money helps Mesa County offset the costs of meeting the infrastructure needs of the oil and gas industry. This amount fluctuates based off the price and production of oil and gas.

In total, PILT payments received by Mesa County from the United States have contributed from $1 million to $2.5 million annually since the beginning of the program. **Diagram 3-26** shows the payments received from 2000. Annual variations occur, depending on the amount of money the Congress appropriates. If it is less than the full entitlements of the counties nationally the funds are prorated among all of the counties in the United States. PILT funds to counties also vary, depending on how much money a County receives from the United States from other sources such oil and gas, or coal leasing.

3.6.4 Environmental Justice

This section was prepared for and in cooperation with the GJFO by researchers at Colorado Mesa University. BLM has reviewed and accepted the information contained in the following section.

Executive Order 12898 instructs federal agencies to identify "disproportionately high and adverse human health or environmental effects on minority populations and low-income populations." To comply with Executive Order 12898 on Environmental Justice, this section examines the racial and economic conditions of the planning area.

Assess Potential for Disproportionate Impacts to Environmental Justice Populations

Exhibited in **Table 3-57**, Mesa County and Colorado Racial Composition (2006-2008 Estimates), below, the racial diversity of Mesa County is homogeneous when compared to the state of Colorado. The County is predominantly white with a relatively small minority population. The largest racial minority is Hispanic, comprising 11.8 percent of the population, compared to 19.9 percent of Colorado's population.

Table 3-57
Mesa County and Colorado Racial Composition (2006-2008 Estimates)

Race	Mesa County		Colorado	
	Total Population	Percentage	Total Population	Percentage
	138,641	**100**	**4,844,568**	**100**
Hispanic or Latino (of any race)	16,342	11.8	963,831	19.9
Mexican	11,346	8.2	712,498	14.7
Puerto Rican	296	0.2	18,236	0.4
Cuban	26	0.0	5,553	0.1
Dominican	0	0.0	1,714	0.0
Central American	132	0.1	26.228	0.0
South American	348	0.3	14,113	0.3
Other Hispanic or Latino	4,194	3.0	185,489	3.8

Table 3-57
Mesa County and Colorado Racial Composition (2006-2008 Estimates)

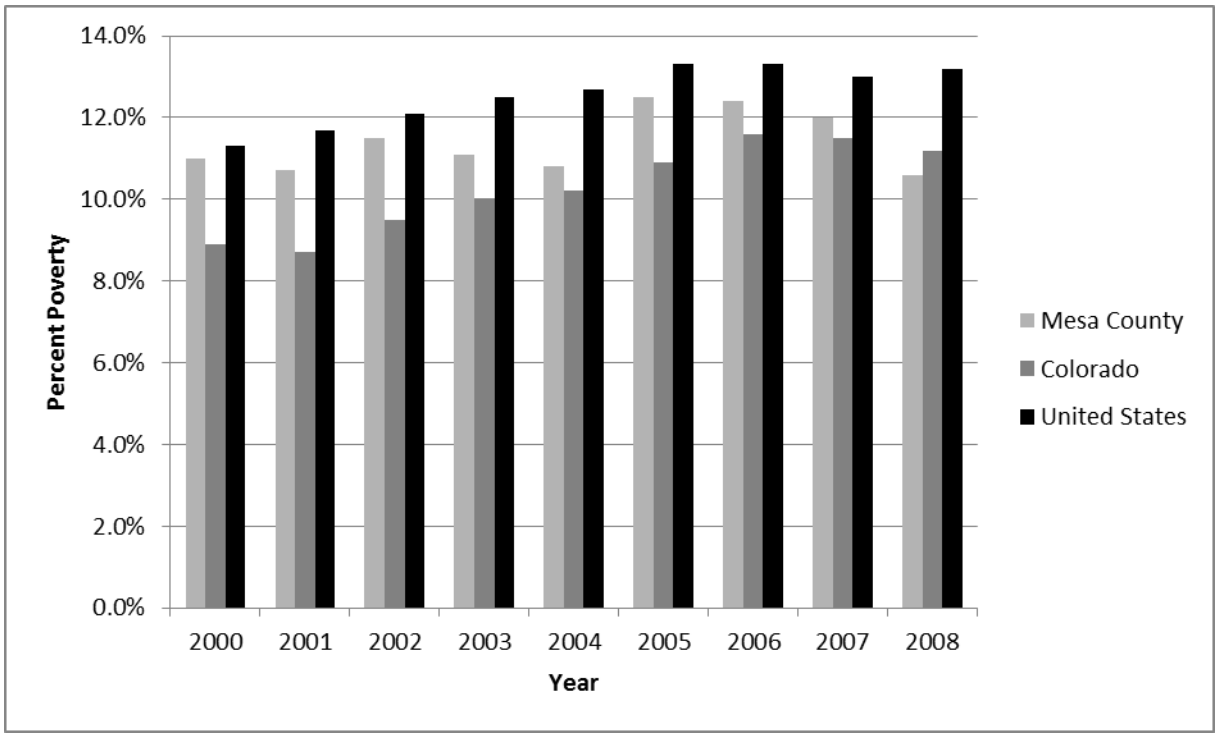
Race	Mesa County		Colorado	
	Total Population	Percentage	Total Population	Percentage
Not Hispanic or Latino	122,299	88.2	3,880,737	80.1
White alone	117,334	84.6	3,448,171	71.2
Black or African American alone	754	0.5	177,105	3.7
American Indian and Alaska Native alone	775	0.6	30,772	0.6
Asian alone	767	0.6	124,787	2.6
Native Hawaiian and Other Pacific Islander alone	137	0.1	4,305	0.1
Some other race alone	52	0.0	10,101	0.2
Two or more races	2,480	1.8	85,496	1.8
Two races including Some other race	120	0.1	3,294	0.1
Two races excluding Some other race, and Three or more races	2,360	1.7	82,202	1.7

Source: US Census Bureau 2008a

Looking at **Diagram 3-27**, Percent of Mesa County Residents in Poverty (2000-2007), Mesa County's poverty rate has ebbed and flowed between a low of 10.6 percent and a high of 12.5 percent between 2000 and 2008. Since 2000, Mesa County has fared much better than the US as a whole, but not as well as the state of Colorado. Until 2009 the county's economic health was largely insulated from changes in the national market. Since then the global recession has hit Mesa County full force. According to the Mesa County Workforce Center employment peaked in April 2009. At that time the labor force in Mesa County stood at 86,122, but the number of individuals unemployed was almost 7,000, an unemployment rate of 8 percent. This is a notable change from one year earlier when the labor force was 80,268 with 2,600 individuals unemployed for an unemployment rate of just 3.2 percent (Mesa County Workforce Center 2010).

Communities within Mesa County, which include Grand Junction, Palisade, Fruita, Debeque, Glade Park, Loma/Mack, Gateway, and Collbran, are roughly similar to Mesa County in minority population and poverty rates. Like the county, the minority populations located within these communities are not dissimilarly affected by BLM management decisions.

Diagram 3-27
Percent of Mesa County Residents in Poverty (2000-2007)



Source: US Census Bureau 2008a

Conclusion

The descriptions in this report represent a snapshot of current demographic and economic trends in the area adjoining the GJFO. As in the past, new demand for oil, the predicted shift towards nuclear power as a means to reducing carbon output, increasing tourism, and/or the designation of new NCAs might produce changes in what actually occurs. A return, for example, to uranium mining could bring conflicts between residents who remember the economic boon it provided and residents who express concerns about environmental damage. Improvement of the technology for the extraction of oil from oil shale might raise hopes of a new, pre-1980s boom or concerns about the water demands such technology might represent. A growing professional class, with their recreational preferences, and the quality-of-life benefits provided by the area, a continuing increase in an aging population of retirees, the opportunities to remain in the area for natives forced to seek their economic fortunes elsewhere, any one of these factors might alter the character of the region.

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Chapter 4

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CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter presents the likely direct, indirect, and cumulative impacts on the human and natural environment that could occur from implementing the alternatives presented in **Chapter 2**, Alternatives. This chapter is organized by topic, similar to **Chapter 3**, Affected Environment. Each topic area includes a method of analysis section that identifies indicators, methods, and assumptions; a summary of effects common to all alternatives; and an analysis of impacts for each of the four alternatives. Separate sections describing cumulative impacts and irretrievable or irreversible commitment of resources are presented at the end of the chapter.

Many management actions proposed in **Chapter 2** are planning-level decisions and do not result in direct, on-the-ground changes. However, by planning for uses on BLM-administered surface estate and federal mineral estate during the 20-year planning horizon, the analysis focuses on impacts that could eventually result in on-the-ground changes. Federal mineral estate includes BLM-administered federal minerals that occur beneath surface estate managed by the BLM, as well as beneath surface estate within state or private jurisdiction (known as split-estate lands). Impacts for some resources or resource uses, such as recreation and motorized use, could be confined to the BLM-administered surface estate. Other impacts, such as energy and minerals and requirements to protect special status species and cultural resources from such activity, could apply to all BLM-administered federal mineral estate. Some BLM management actions may affect only certain resources and alternatives. This impact analysis identifies impacts that may enhance or improve a resource as a result of management actions, as well as those impacts that have the potential to deteriorate a resource. However, the evaluations are confined to the actions that have direct, immediate, and more prominent effects. If an activity or action is not addressed in a given section, no impacts are expected, or the impact is expected to be negligible based on professional judgment.

The BLM manages public lands for multiple uses in accordance with the FLPMA. Land use decisions are made to protect the resources while allowing for different uses of those resources, such as energy and mineral development, recreation, and livestock grazing. When there are conflicts among resource uses or when a land use activity could result in unacceptable or irreversible impacts on the environment, the BLM may restrict or prohibit some land uses in specific areas. To ensure that the BLM meets its mandate of multiple use in land management actions, the impacts of the alternatives on resource users are identified and assessed as part of the planning process. The projected impacts on land use activities and the associated environmental impacts of land uses are characterized and evaluated for each of the alternatives.

Impact analysis is a cause-and-effect process. The detailed impact analyses and conclusions are based on the BLM planning team's knowledge of resources and the project area; reviews of existing literature; and information provided by experts in the BLM, other agencies, interest groups, and concerned citizens. The baseline used for the impact analysis is the current condition or situation, as described in **Chapter 3**, Affected Environment. Impacts on resources and resource uses are analyzed and discussed in detail commensurate with resources issues and concerns identified throughout the process. At times, impacts are described using ranges of potential impacts or in qualitative terms.

4.1.1 Analytical Assumptions

Several assumptions were made to facilitate the analysis of the projected impacts. These assumptions set guidelines and provide reasonably foreseeable projected levels of development that would occur within the GJFO during the planning period. These assumptions should not be interpreted as constraining or redefining the management objectives and actions proposed for each alternative, as described in **Chapter 2**. The following general assumptions apply to all resource categories. Any specific resource assumptions are provided in the methods of analysis section for that resource.

- Sufficient funding and personnel will be available for implementing the final decision.
- Implementing actions from any of the RMP alternatives will be in compliance with all valid existing rights, federal regulations, BLM policies, and other requirements.
- Implementation-level actions necessary to execute the land use plan-level decisions in this RMP will be subject to further environmental review, including NEPA, as appropriate. The RMP/EIS may support future implementation decisions such as the issuance of leases for fluid minerals such as oil, gas, and geothermal resources. The RMP/EIS does support implementation-level route designations in the GJFO decision area.

- The GJFO Reasonably Foreseeable Development Scenario (BLM 2012a), based on federal minerals and without any development restrictions, estimated that up to 2,108 horizontal shale wells and up to 1,831 combined conventional/directional wells could be drilled on BLM-administered mineral estate within the decision area during the planning period. The anticipated short-term disturbance for the drilling, road construction, and pipeline installation is approximately 2,700 acres for shale development and 6,700 acres for conventional development. The long-term disturbance associated with operation of the new producing exploratory and development wells will be approximately 1,046 acres for shale development and 2,092 acres for conventional development. Actual acres of disturbance could differ from these estimates as a result of advances in technology, changing industry needs, and site-specific measures employed to protect resources.
- A total of approximately 700 wells have been drilled on federal mineral estate in the planning area. The maximum number of federal wells drilled in a year in the planning area is 39 and the average number of federal wells drilled annually over the past 20 years is 11. The BLM expects development will continue over the life of this plan at a level somewhere between these historical development levels and the RFD projection scenario. A scenario was developed using these historical numbers and the RFD development rates to determine a range of alternatives. For Alternatives A and C, the 20-year historical average rate of 11 wells per year was extrapolated to 220 for the planning period. For Alternative B, the historical maximum rate of 39 wells per year was extrapolated to 780 wells for the planning period. For Alternative D, the RFD well count of approximately 4,000 wells for the planning period is used.
- Direct and indirect impacts of implementing the RMP will primarily occur on the public lands administered by the GJFO.
- Local climate patterns of historic record and related conditions for plant growth will continue.
- In the future, as tools for predicting climate changes in a management area improve and changes in climate affect resources and necessitate changes in how resources are managed, the BLM may reevaluate decisions made as part of this planning process and adjust management accordingly.
- Appropriate maintenance will be carried out to maintain the functional capability of all developments.
- The discussion of impacts is based on the best available data. Knowledge of the planning area and professional judgment, based on observation and analysis of conditions and responses in similar

areas, are used to infer environmental impacts where data are limited.

- Stipulations will apply, where appropriate, to all surface-disturbing activities (and occupancy) associated with land use authorizations, permits, and leases issued on BLM-administered lands. The BLM administers 1,061,400 surface acres within the decision area. Stipulations also apply to fluid mineral leasing on lands overlying federal mineral estate, which includes federal mineral estate underlying BLM-administered lands, privately owned lands, and state-owned lands. There are 1,231,200 acres of federal mineral estate within the decision area. Since the Draft RMP/EIS was published, the BLM Colorado has developed statewide stipulations for fluid mineral leasing in accordance with BLM IM 2010-117, Oil and Gas Leasing Reform – Land Use Planning and Lease Parcel Reviews. Statewide stipulations with corresponding stipulations specific to the GJFO that were analyzed in the Draft RMP/EIS have been incorporated into the Proposed RMP (Alternative B) of the Final EIS. Statewide stipulations (denoted with all capital letters; see Appendix B) will be applied to all surface-disturbing activities (and occupancy) associated with land use authorizations, permits, and leases issued on BLM-administered lands, just as GJFO stipulations. Because the statewide stipulations cover the same resources as the stipulations presented and analyzed in the Draft RMP/EIS, there would be no additional or different impact. Buffers for the statewide stipulation HYDROLOGY RIVER NSO CO is slightly different from its counterpart that was analyzed in the Draft RMP/EIS (NSO-1: Major River Corridors). The different buffer distance was considered within the range of alternatives. A 1,312-foot buffer for HYDROLOGY RIVER NSO CO is less than the buffer for NSO-1: Major River Corridors that was considered in Alternative B.
- Data from geographic information systems (GIS) have been used in developing acreage calculations and for generating many of the figures in Appendix A. Calculations are dependent upon the quality and availability of data and most calculations in this RMP are rounded to the nearest 100 acres. Given the scale of the analysis, the compatibility constraints between datasets, and lack of data for some resources, all calculations are approximate and serve for comparison and analytic purposes only. Likewise, the figures in Appendix A are provided for illustrative purposes and subject to the limitations discussed above. The BLM may receive additional GIS data; therefore, acreages may be recalculated and revised at a later date.

4.1.2 General Methodology for Analyzing Impacts

Potential impacts or effects are described in terms of type, context, duration, and intensity, which are generally defined as follows:

- *Type of Impact* – Because types of impacts can be interpreted differently by different people, this chapter does not differentiate between beneficial and adverse impacts (except in cases where such characterization is required by law, regulation, or policy). The presentation of impacts for key planning issues is intended to provide the BLM decision maker and reader with an understanding of the multiple use tradeoffs associated with each alternative.
- *Context* – Context describes the area or location (site-specific, local, planning area-wide, or regional) in which the impact would occur. Site-specific impacts would occur at the location of the action, local impacts would occur within the general vicinity of the action area, planning area-wide impacts would affect a greater portion of the field office, and regional impacts would extend beyond the planning area boundaries.
- *Duration* – Duration describes the length of time an effect would occur, either short term or long term. Short term is defined as anticipated to begin and end within the first five years after the action is implemented. Long term is defined as lasting beyond five years to the end of or beyond the 20-year planning time frame addressed in the RMP.
- *Intensity* – Rather than categorize impacts by intensity (e.g., major, moderate, and minor) this analysis discusses impacts using quantitative data wherever possible.
- *Direct and Indirect Impacts* - Direct impacts are caused by an action or implementation of an alternative and occur at the same time and place. Indirect impacts result from implementing an action or alternative but usually occur later in time or are removed in distance and are reasonably certain to occur.
- *Cumulative Impacts* – Cumulative impacts are described in the Cumulative Impacts section of this chapter. Cumulative impacts are the direct and indirect effects of a proposed project alternative's incremental impacts when they are added to other past, present, and reasonably foreseeable actions, regardless of who carries out the action (40 CFR Part 1508.7). The list of actions used for cumulative impact analysis is provided in **Section 4.2.2**, Past, Present, and Reasonably Foreseeable Future Actions.

For ease of reading, impacts presented are direct, long term, and occur within the larger planning area unless they are noted as indirect, short-term/temporary, or localized. Analysis shown under Alternative A may be

referenced in the other alternatives with such statements as "impacts would be the same as, or similar to, Alternative A" or "impacts would be the same as Alternative A, except for . . ." as applicable.

Irreversible and irretrievable commitment of resources is discussed in **Section 4.8**, Irreversible and Irretrievable Commitment of Resources. Irreversible commitments of resources result from actions in which resources are considered permanently changed. Irretrievable commitments of resources result from actions in which resources are considered permanently lost.

4.1.3 Incomplete or Unavailable Information

The Council on Environmental Quality (CEQ) established implementing regulations for NEPA, requiring that a federal agency identify relevant information that may be incomplete or unavailable for an evaluation of reasonably foreseeable significant adverse effects in an EIS (40 CFR 1502.22). If the information is essential to a reasoned choice among alternatives, it must be included or addressed in an EIS. Knowledge and information is, and would always be, incomplete, particularly with infinitely complex ecosystems considered at various scales.

The best available information pertinent to the decisions to be made was used in developing the RMP. Considerable effort has been taken to acquire and convert resource data into digital format for use in the RMP-both from BLM and outside sources.

Certain information was incomplete for use in developing this plan because inventories are not complete. Some of the major types of data that are incomplete include the following:

- Field inventory of soils and water conditions
- Field inventory of vegetation composition
- Field inventory of wildlife and special status species occurrence and condition
- Field inventories for cultural and paleontological resources

For these resources, estimates were made concerning the number, type, and significance of these resources based on previous surveys and existing knowledge. In addition, some impacts cannot be quantified given the proposed management actions. Where this gap occurs, impacts are projected in qualitative terms or, in some instances, are described as unknown. Subsequent project-level analysis will provide the opportunity to collect and examine site-specific inventory data required to determine appropriate application of RMP-level guidance. In addition, ongoing inventory efforts by BLM and other agencies in the planning area continue to update and refine information used to implement this plan.

4.2 CUMULATIVE IMPACTS

Cumulative impacts are effects on the environment that result from the impact of implementing any one of the RMP alternatives in combination with other reasonably foreseeable actions outside the scope of this plan, either within the planning area or adjacent to it. Cumulative impact analysis is required by CEQ regulations because environmental conditions result from many different factors that act together. The total effect of any single action cannot be determined by considering it in isolation, but must be determined by considering the likely result of that action in conjunction with many others. Evaluation of potential impacts considers incremental impacts that could occur from the proposed project, as well as impacts from past, present, and reasonably foreseeable future actions. Management actions could be influenced by activities and conditions on adjacent public and non-public lands beyond the planning area boundary; therefore, assessment data and information could span multiple scales, land ownerships, and jurisdictions. These assessments involve determinations that often are complex and, to some degree, subjective.

4.2.1 Cumulative Analysis Methodology

The cumulative impacts discussion that follows considers the alternatives in the context of the broader human environment—specifically, actions that occur outside the scope and geographic area covered by the RMP. Cumulative impact analysis is limited to important issues of national, regional, or local significance; therefore, not all resources identified for the direct and indirect impact analysis in this EIS are analyzed for cumulative impacts.

Because of the programmatic nature of an RMP and cumulative assessment, the analysis tends to be broad and generalized to address potential effects that could occur from a reasonably foreseeable management scenario combined with other reasonably foreseeable activities or projects. Consequently, this assessment is primarily qualitative for most resources because of lack of detailed information that would result from project-level decisions and other activities or projects. Quantitative information is used whenever available and as appropriate to portray the magnitude of an impact. The analysis assesses the magnitude of cumulative impacts by comparing the environment in its baseline condition with the expected impacts of the alternatives and other actions in the same geographic area. The magnitude of an impact is determined through a comparison of anticipated conditions against the naturally occurring baseline as depicted in the affected environment (see **Chapter 3**) or the long-term sustainability of a resource or social system.

The following factors were considered in this cumulative impact assessment:

- Federal, nonfederal, and private actions
- Potential for synergistic effects or synergistic interaction among or between effects
- Potential for effects to cross political and administrative boundaries

- Other spatial and temporal characteristics of each affected resource
- Comparative scale of cumulative impacts across alternatives

Temporal and spatial boundaries used in the cumulative analysis are developed on the basis of resources of concern and actions that might contribute to an impact. The baseline date for the cumulative impacts analysis is 2010. The temporal scope of this analysis is the life of the RMP, which encompasses a 20-year planning period.

Spatial boundaries vary and are larger for resources that are mobile or migrate (e.g., elk populations) compared with stationary resources. Occasionally, spatial boundaries could be contained within the planning area boundaries or an area within the planning area. Spatial boundaries were developed to facilitate the analysis and are included under the appropriate resource section heading.

4.2.2 Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and reasonably foreseeable future actions are considered in the analysis to identify whether and to what extent the environment has been degraded or enhanced, whether ongoing activities are causing impacts, and trends for activities in and impacts on the area. Projects and activities are evaluated on the basis of proximity, connection to the same environmental systems, potential for subsequent impacts or activity, similar impacts, the likelihood a project will occur, and whether the project is reasonably foreseeable.

Projects and activities considered in the cumulative analysis were identified through meetings held with cooperators and BLM employees with local knowledge of the area. Each was asked to provide information on the most influential past, present, or reasonably foreseeable future actions. Additional information was obtained through discussions with agency officials and review of publicly available materials and Web sites.

Effects of past actions and activities are manifested in the current condition of the resources, as described in the affected environment (see **Chapter 3**). Reasonably foreseeable future actions are actions that have been committed to or known proposals that could take place within the 20-year planning period.

Reasonably foreseeable future action scenarios are projections made to predict future impacts—they are not actual planning decisions or resource commitments. Projections, which have been developed for analytical purposes only, are based on current conditions and trends and represent a best professional estimate. Unforeseen changes in factors such as economics, demand, and federal, state, and local laws and policies could result in different outcomes than those projected in this analysis.

Other potential future actions have been considered and eliminated from further analysis because there is a small likelihood these actions would be pursued and implemented within the life of the plan or because so little is known about the potential action that formulating an analysis of impacts is premature. In addition, potential future actions protective of the environment (such as new potential threatened or endangered species listings or regulations related to fugitive dust emissions) have less likelihood of creating major environmental consequences alone, or in combination with this planning effort. Federal actions such as species listing would require BLM to reconsider decisions created from this plan because the consultations and relative impacts might no longer be appropriate. These potential future actions may have greater capacity to affect resource uses within the planning area; however, until more information is developed, no reasonable estimation of impacts could be developed.

Data on the precise locations and overall extent of resources within the planning area are considerable, although the information varies according to resource type and locale. Furthermore, understanding of the impacts on and the interplay among these resources is evolving. As knowledge improves, management measures (adaptive or otherwise) would be considered to reduce potential cumulative impacts in accordance with law, regulations, and the final RMP.

Projects and activities identified as having the greatest likelihood to generate potential cumulative impacts when added to the RMP alternatives are displayed in **Table 4-1**, Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario

Human Actions	
Energy and minerals development	Summary. Most oil and gas development on BLM-administered lands within the planning area has in the DeBeque/Collbran area and near the Utah border. Numerous mining claims exist, but the only significant mining activity is associated with past and current uranium/vanadium mining claims and coal mining. Several small individual placer mining claims exist along the Dolores River, and a large group of recently staked uranium mining claims exist on BLM-administered lands in the GJFO, Uncompahgre Field Office, and Moab Field Office. As such, additional mining and oil and gas development is expected.
	Alabaster/Gypsum. Historically there has been one small-scale surface mining operation south of Gateway along Highway 141. There are no active operations underway (BLM 2010d).
	Copper. As of January 2011, there is one Notice of Intent on file for collection of hand specimen quality copper minerals (azurite and malachite) from an existing underground mine. Copper was also produced from some of the historic uranium/vanadium mines in the Uravan mineral belt within the GJFO (BLM 2010d).

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario

Human Actions
Coal. Until recently, there was one active underground coal mine operating within the GJFO along Highway 139 in the Book Cliffs. They have stopped operations until a Lease Modification is processed. Leasing for another larger underground coal mine is going through the NEPA/permitting process with an estimated Record of Decision sometime in the next few years
Potash. There is a potential undefined potash resource underneath Sinbad Valley, and, in 2008, a company expressed interest in exploring the area for potential development via solution mining. Prior to 2008 there had been no exploration activity for potash within the planning area (BLM 2010d).
Mineral material sales. There are two active commercial sand and gravel operations and three common use areas identified for disposal of bentonite clay, adobe fill, and red gravel via over-the-counter permit sales. Three common areas were closed due to potential impacts on cultural resources and a new NCA designation (BLM 2010d). Gravel mining on private lands in and surrounding the planning area is very common. As these resources are depleted on private lands, it is expected that demand for mining public lands will increase. There is an existing clay mine (Little Park Road community pit) that has a high occurrence potential, while there is moderate potential for clay development in other parts of the planning area.
Oil shale development. There are no active or proposed oil shale projects as of March 2011. A Final EIS was completed and a ROD was issued in November 2008, amending the 1987 RMP to make lands available for oil shale leasing. Leases have not yet been issued. A NEPA analysis would be conducted prior to lease issuance (BLM 2010d). These decisions are currently being revisited by the BLM in a programmatic planning process and any additional decisions will be adopted by this RMP, as applicable.
Renewable energy development. The BLM has authorized meteorological towers to test wind energy potential in the field office near Palisade. Potential exists for future geothermal, solar, and wind energy development on or off of BLM-administered lands in or surrounding the planning area.
Uncompahgre Basin (1989) and San Juan/San Miguel (1985) RMPs and Oil and Gas Leasing Amendment (1991). These documents provide for mineral development on the Uncompahgre BLM Field Office and are currently being revised in a new RMP planning effort.
Moab Field Office RMP (2008). This RMP provides for mineral development on the BLM Moab Field Office
White River Field Office RMP (1996) and Oil and Gas amendment. The amendment addresses potential oil and gas exploration and development activities within the 1.5 million acres managed by the White River Field Office.
Glenwood Springs RMP Oil and Gas Leasing Amendment (1999) (Now Colorado River Valley Field Office). The amendment evaluates the impacts of oil and gas leasing and development on BLM-administered lands and federally owned mineral estate under private lands in the Glenwood Springs Planning Area.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario

Human Actions
Grand Junction Field Office Reasonably Foreseeable Development Scenario (2012). This document summarizes existing fluid minerals development activities on the field office and gives a future development scenario based on unconstrained development.
Grand Junction Field Office Mineral Potential Report (2010). Looks at all minerals (non-oil and gas) in the field office and gives a 20-year prediction of development potential.
Grand Mesa, Uncompahgre, and Gunnison National Forests (1993). Final Oil and Gas Leasing EIS and Record of Decision evaluate the potential effects of alternative programs for oil and gas leasing on the Grand Mesa, Uncompahgre, and Gunnison National Forests.
White River National Forest Oil and Gas Amendment. The White River National Forest issued its current oil and gas leasing availability decision in 1993 (Oil and Gas Leasing Final Environmental Impact Statement and Record of Decision). Since 1993, information and circumstances considered for that decision have changed, including the White River National Forest issuance of a revised Land and Resource Management Plan, technological advances in oil and gas exploration and development that expand development potential of previously noneconomic resources, and increased level of projected oil and gas development potential activities on the Forest. The White River National Forest plans to prepare an EIS to disclose the environmental effects from oil and gas leasing.
Orchard II Master Development Plan (2007). EnCana Oil and Gas (USA), Inc. is proposing a multi-year program of oil and gas development on approximately 12,067 acres of public, split estate, and private lands located southeast of the town of DeBeque.
EnCana Oil and Gas (USA), Rulison Area Oil and Gas Development (2007). EnCana proposes to develop oil and gas resources in an area of approximately 1,885 acres of federal, private, and split-estate lands located southwest of Rifle in Garfield County.
Black Hills Western Properties Exploratory Proposal (2012). This project is in the planning phase, and a decision is expected in the near future. It could authorize drilling of 24 wells on 12 pads over a three-year period.
Whitewater Master Development Plan. This project is in the planning phase, and a decision is expected in the near future. It would authorize development of oil/gas on multiple well pads.
The Breaks Exploratory Proposal. This proposal is in the early planning stages for leases east and west of Highway 65, south of Mesa.
Cedar Bench Master Development Plan. This project is in pre-planning (exploration) stages of existing unit re-vitalization using new technology.
Mesa County Mineral and Energy Resources Master Plan (2011). This plan identifies known energy resources and opportunities in Mesa County and recommends policies to guide regulation and development.
TransWest Express Transmission Project Proposal EIS (in progress). This proposed project is a high-voltage, direct current regional electric transmission system proposed by TransWest Express LLC. The project would deliver renewable energy produced in Wyoming to the Desert Southwest region (California, Nevada, Arizona). The Preferred Alternative does not enter the GJFO Planning Area, but other alternatives do.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario

Human Actions	
Vegetation Management	Forestry. Past, current, and foreseeable forestry uses in the project area include personal and commercial harvest of pinyon and juniper fuel wood, poles and posts for fence building, wildings (live trees), and Christmas trees.
	Vegetation treatments. Mechanical treatments of vegetation (e.g., chaining, rollerchops, Dixie-harrow, drill seeding, hydro-axing, brush mowing) were very common in the past on public and private rangelands in the planning area. These treatments and maintenance of these vegetation treatments are still fairly common and will likely continue. In addition, manual, biological, and mechanical treatments of large woody invasive species such as tamarisk (*Tamarix sp*.) and Russian-Olive (*Elaeagnus angustifolia*) have occurred in the riparian areas of rivers and streams and this type of restoration work is likely to continue in the foreseeable future.
	Sage-Grouse habitat. Implementation of conservation and recovery plans for Sage-Grouse within the planning area includes active management techniques to improve habitat quality for Sage-Grouse, maintain or increase management unit populations, and maintain or increase Sage-Grouse numbers.
	Hazardous fuels reduction. Fuels treatments, including prescribed fires, chemical, biological, and mechanical treatment, and seeding, would likely continue and potentially increase in the future.
	Biomass. Future forestry use of woody biomass for energy production could occur.
Livestock grazing	Livestock grazing has a long history in the region. Generally, livestock use has decreased over the past 100 years. Grazing in portions of the Cumulative Impacts Analysis Area has either remained stable or declined in the recent past, and demand on BLM-administered lands has remained stable in the last 10 years. Approximately 978,600 acres of BLM-administered lands are open to grazing within grazing allotment boundaries and are managed by the GJFO in accordance with the 1987 RMP. Some allotments within the planning area are managed by other field offices, while the GJFO manages portions of allotments that are within other field offices. Total active preference (permitted use) is 63,859 AUMs, with an additional 24,344 AUMs in suspension. The majority of the allotments are used for grazing cattle (99 percent), primarily cow/calf operations. The authorization of both sheep and cattle use occurs on only two allotments (1 percent). Two allotments also include a small amount of horse use. Grazing on private lands within the Cumulative Impact Analysis Area (CIAA) is expected to remain stable or slightly decrease as residential development increases.
Recreation and visitor use	Colorado's population has grown significantly in the past 10 years, and an increasing number of people are living near or seeking local public lands for a diversity of recreational opportunities characterized by the "mountain resort or outdoor lifestyle." The primary recreational activities in the GJFO are motorized vehicle touring, big and small game hunting, backpacking, horseback riding, mountain biking, sight-seeing, all-terrain vehicle use, rock climbing, hiking, and river boating. Recreation-based visitor use in the GJFO has increased in most areas in recent years and is expected to continue to increase on BLM-administered and non-BLM-administered lands.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario

	Human Actions
Lands and realty	Since approval of the 1987 RMP, the GJFO has exchanged 2,271 acres, acquired 2,253 acres through exchange, issued patents for 440 acres through the Recreation and Public Purposes Act, purchased 2,296 acres, and acquired 375 acres through donation. The BLM is moving toward the consolidation of BLM-administered lands to benefit the public. To achieve this goal, candidates for land tenure adjustment through disposal, sale, exchange, or acquisition include parcels that are difficult to manage or that do not have public access, relatively small parcels adjacent to other federal- or state-managed lands, parcels that would increase conservation of natural resources, and parcels that increase access and use of BLM-administered lands. Residential development in the areas surrounding GJFO has been increasing.
	Existing and Valid Rights. Currently the GJFO administers 610 cases (8,330 acres) of FLPMA and pre-FPLMA rights-of-way and 262 cases (2,934 acres) of Mineral Leasing Act rights-of-way. These existing authorizations are usually limited to a 30 year term, which is typically renewed, and should be considered a long-term use of the land. Most of these authorizations are for roads, power lines, natural gas pipelines/facilities, water lines, phone lines, injection wells, communication sites, and compressor stations, in addition to other types of facilities. At any one time there are on average 35 pending (i.e., not authorized) rights-of-way requests in the GJFO.
	Bangs Canyon Land Acquisition. The Bangs Canyon acquisition project, consisting of 4 parcels containing 200 acres adjacent to the current Bangs Canyon SRMA boundary along the Gunnison River, was completed in 2011.
	Colorado Mesa University Recreation and Public Purposes Act Land Sale. In January 2012 BLM approved an application from Colorado Mesa University to acquire approximately 80 acres of public land in the Whitewater area for a regional public safety training facility.
	Grand Junction Regional Airport Land Transfer. The BLM is considering a request from the Grand Junction Regional Airport Authority to acquire 720 acres of public land in the North Desert, located north and adjacent to airport property. Decision expected 2014.
	Colorado National Monument General Management Plan Final EIS (2005). This plan sets management, protection, and use goals and guidelines for the Colorado National Monument.
	Colorado Canyons National Conservation Area and Black Ridge Canyons Wilderness (2004). This plan sets management, protection, and use goals and guidelines for the McInnis Canyons National Conservation Area.
	Interim Management Policy for Dominguez-Escalante National Conservation Area and Dominguez Canyon Wilderness (2010). This plan sets management, protection, and use goals and guidelines for the Dominguez-Escalante National Conservation Area. A new RMP is being prepared and is expected to be implemented in 2012.
	Final EIS for White River National Forest (2002). This plan sets management, protection, and use goals and guidelines for the White River National Forest.
	Amended Land and RMP for Grand Mesa, Uncompahgre, and Gunnison National Forests (1991). This plan sets management, protection, and use goals and guidelines for the Grand Mesa, Uncompahgre, and Gunnison National Forests.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario

Human Actions	
	Uncompahgre Basin (1989) and San Juan/San Miguel (1985) RMPs. These plans set management, protection, and use goals and guidelines for the BLM Uncompahgre Field Office. These plans are being revised in a new RMP planning effort. Decision expected 2014.
	Moab Field Office RMP (2008). This plan sets management, protection, and use goals and guidelines for the BLM Moab Field Office.
	White River Field Office RMP (1996) and Oil and Gas Amendment. The amendment addresses potential oil and gas exploration and development activities within the 1.5 million acres managed by the White River Field Office.
	Mesa County Master Plan (2000). Countywide land use and growth plan for Mesa County.
	Montrose County Master Plan (2010). Countywide land use and growth plan for Montrose County edited several times, including in 2006 and 2010.
	Garfield County Comprehensive Plan (under revision as of 2011). Countywide land use and growth plan for Garfield County.
	Dominguez-Escalante National Conservation Area Land Acquisitions. Decisions expected in 2012 and 2013.
	Energy Gateway South 500kV interstate transmission project with one alternative in northwest corner of Mesa County. Decision expected 2014.
	TransWest Express 600kV interstate transmission project with one alternative in northwest corner of Mesa County. Decision expected 2014.
	Zephyr 500kV interstate transmission project with multiple alternatives through the Grand Junction FO. Decision time frame unknown.
	Designation of Energy Corridors on Federal Lands in the 11 Western States Programmatic EIS (2007). This multi-federal agency Programmatic EIS analyzes the environmental impacts of designating federal energy corridors on federal lands in 11 western states and incorporating those designations into relevant land use and resource management plans.
Roadway development	Road construction has occurred in association with timber harvesting, energy development, and mining on BLM-administered lands, private lands, State of Colorado lands, and National Forest System lands. The bulk of new road building is occurring for community expansion and energy development. Road construction is expected to continue at the current rate on BLM-administered and National Forest System lands; the future rate is unknown on private and State of Colorado lands. Since 1987, 146 additional rights of ways for roads have been authorized under FLMPA. These roads total 1,492 acres of encumbered land.
Water diversions	The GJFO has been and will continue to be affected by irrigation and drinking water diversions. Reservoir operations have affected water supply, aquatic conditions, and timing. Irrigation rights are expected to continue being bought and sold in the future, with some new property owners informally changing how the right was historically used. Due to population growth and land sales, more agricultural water rights may be converted to municipal and industrial uses. Future oil shale development could also result in water diversions.

Table 4-1
Past, Present, and Reasonably Foreseeable Projects, Plans, or Actions that Make up the Cumulative Impact Scenario

Natural Processes	
Spread of noxious/invasive weeds	Noxious weeds, including tamarisk, have invaded and will continue to invade many locations in the planning area. Noxious weeds are carried by wind, humans, machinery, and animals. GJFO currently manages weed infestations through integrated weed management, including biological, chemical, mechanical, and educational methods. The 1991 and 2007 Records of Decision for Vegetation Treatment on BLM Lands in 13 Western States, and the 2007 Programmatic Environmental Report guide the management of noxious weeds in western states. GJFO finalized a noxious weed management EA in December 2010 that updated the field office integrated weed management plan. Noxious and invasive weeds are expected to continue to spread on all lands. Due to their ability to tolerate certain conditions, some species are expected to remain a serious long-term challenge in the planning area.
Wildland fires	Fires within the planning area are both naturally occurring and used as a management tool. Naturally occurring fires have been widely distributed in terms of frequency and severity. Increasing recurrence and severity of drought conditions have been predicted for this area as a result of climate change. This could, in turn, increase the occurrence and severity of wildfires on BLM-administered land.
Spread of forest insects and diseases	Several years of drought in western states have resulted in severe stress on pine trees. This stress has made the trees less able to fend off attacks by insects such as mountain pine beetles. Mountain pine beetle infestation has been occurring in Colorado since 1996, and some pinyon pine stands in the planning area have experienced ips beetle kill. Sudden Aspen Decline is also impacting parts of the planning area.
Drought	For much of the last decade, most of the western US has experienced drought. Inflows to Lake Powell (indicative of the Upper Colorado Basin) have been below average since 2000, and Colorado regularly goes through periods of drought that may be statewide, region-wide, or within a more localized area. Agriculture, drinking water supplies, and wildland fires are all impacted by drought.
Climate change	Increased concern over greenhouse gas emissions and global warming issues may lead to future federal and state regulations limiting the emission of associated pollutants. Regulation could include setting significance thresholds for greenhouse gases like those proposed under the California Environmental Quality Act.

4.3 RESOURCES

This section contains a description of the biological and physical resources of the GJFO and follows the order of topics addressed in **Chapter 3**, as follows:

- Air and Climate Resources
- Soil Resources
- Water Resources
- Vegetation
- Fish and Wildlife

- Special Status Species
- Wild Horses
- Cultural Resources
- Paleontology
- Visual Resources
- Wildland Fire Management
- Lands with Wilderness Characteristics.

4.3.1 Air and Climate Resources

Air resources were evaluated within the planning area to determine how air quality could be affected by future federal actions implemented under this RMP. Actions that initiate or increase emissions of air pollutants can result in negative effects on air resources, including increased concentrations of air pollutants, decreased visibility, increased atmospheric deposition on soils and vegetation, and acidification of sensitive water bodies. Actions that reduce or control emissions of air pollutants can be very effective at improving air quality and preventing degradation. This section addresses the potential effects of emissions of air pollutants from specific activities that would be authorized, allowed, or performed by the BLM under each alternative within the planning area over the life of the RMP. The Colorado Air Resources Protection Protocol (CARPP) provided in **Appendix G** provides details for the processes and approach for protecting air quality and permitting / authorizing activities, and includes a description of the comprehensive Colorado Air Resources Management Modeling Study (CARMMS) that the BLM would use to better understand regional air quality for permitting activities at the time of project proposal. Currently, CARMMS modeling has completed for projected year 2021 oil and gas RFD (high) scenario. CARMMS results are presented at the end of this section.

The following information provides analysis of air quality impacts that could exist / occur if all projected resource growth / development for each Alternative were to occur based on information and existing conditions known at the time of writing this analysis. Air quality modeling and analysis tools (including CARMMS) will be continually updated with new information to reassess the current state of the atmosphere and potential impacts associated with any proposed project.

Summary of Impacts and Conclusions

The potential for BLM actions to contribute to future significant adverse impacts on air quality was analyzed in the context of existing air quality conditions within the planning area and predicted future growth in emission generating activities. Potential emissions of air pollutants were estimated for several BLM

management actions and activities likely to occur under each alternative that have the potential to generate quantifiable emissions of regulated air pollutants. The estimated emissions were compiled in an emissions inventory, summarized in **Appendix O**, Air Emissions Inventory. Total estimated emissions and predicted increases in emissions were analyzed to develop air resource management goals, objectives, and actions that would be effective in minimizing future impacts on air quality. The resulting adaptive management strategy is described in detail in **Appendix G**, Comprehensive Air Resources Protection Protocol.

Emissions were estimated for five criteria pollutants, volatile organic compounds, hazardous air pollutants, and greenhouse gases. A base year of 2008 was used to estimate actual (existing) emissions. Emissions were also estimated for two future years, a short term year (Year 10) and a long term year (Year 20), as the basis to evaluate potential increases in emissions over the life of the plan and the effectiveness of emissions control strategies. Potential emissions were also estimated for reasonably foreseeable future cumulative actions within the planning area and are discussed further in the Cumulative section.

Estimated absolute emissions from BLM actions and estimated changes in emissions from BLM actions over base year levels vary by pollutant and alternative. In general, the major contributor to total pollutant emissions over the life of the plan is predicted to be predominantly attributable to activities associated with oil and gas development. Activities associated with underground coal mining, underground uranium/vanadium mining, and travel management, including off-highway vehicle use and road maintenance, are predicted to contribute to some pollutant emissions as well.

Existing air quality conditions, geographic characteristics, and estimated emissions for each alternative were evaluated to identify pollutants of concern and activities that emit significant quantities of pollutants of concern and to identify potential adverse impacts on air quality. The identification of the following pollutants, activities, and potential impacts under each alternative was used to design air quality management goals and objectives listed in Chapter 2 and the Comprehensive Air Resources Protection Protocol included in **Appendix G**:

- The magnitude of estimated emissions from BLM authorized activities (e.g., fluid minerals, travel management, solid minerals, etc.) at the level of development predicted in Alternatives B and D over the life of the plan have the potential to contribute to increased ambient concentrations of ozone in, adjacent to, and outside and downwind of the planning area during the summer and/or winter ozone seasons. Relative to the base year, the amount of BLM authorized ozone precursor pollutants for Alternatives A

and C is less in the future years (with one exception: a slight increase in NOx in the 20 year timeframe [2020]). Emissions from BLM-authorized oil and gas activities under Alternative D would result in the greatest risk of significant contributions to ozone formation in the region.

- The risk of visibility degradation and atmospheric deposition at sensitive areas such as the Maroon Bells – Snowmass Wilderness Area increase based on the emission impacts associated with each alternative. Alternatives B and D would have a higher potential to impact visibility and other air quality related values in downwind Class I and sensitive Class II areas.
- The estimated emissions at the levels of development predicted in all alternatives for solid mineral development and in Alternative D for oil and gas development have the potential to result in significant increases (greater than 75,000 tons) of greenhouse gases.

In general, Alternative C emission estimates result in the lowest total air pollutant emissions in future project years and decreases in emissions of some pollutants over the base year. Lower emissions are expected for this alternative as it is the alternative with the greatest surface restrictions on solid mineral development and lower predicted reasonably foreseeable development for oil and gas. This alternative would likely result in the least adverse impacts on air quality. Alternative D emission estimates result in the greatest magnitude and increases in total air pollutant emissions. Alternative D imposes the least restrictions on solid mineral development and includes the maximum reasonably foreseeable development rate for oil and gas, resulting in higher emissions than the other alternatives. This alternative has the highest potential for adverse impacts on air quality. The total emissions estimated for Alternative A result in the next to lowest emissions. Alternative B (Proposed RMP) results in the second highest estimated emission levels. **Table 4-2**, Estimated Annual Emissions Summary BLM Actions within the Grand Junction Planning Area, summarizes the estimated annual emissions for each alternative by pollutant.

Methods of Analysis

The air resource impact analysis consisted of a comparative emissions approach to evaluate existing emissions levels and air quality conditions compared with estimated future emissions for each alternative based on predicted rates of growth and decline and the potential for impacts on future air quality conditions. The purpose of conducting the emissions based analysis was to evaluate the magnitude of emissions of each pollutant from BLM authorized activities to identify the potential for those emissions to cause adverse impacts on air quality in the context of existing air quality conditions. By identifying those activities with significant estimated emissions, the BLM can focus its air resource protection and compliance efforts effectively. The emissions based

Table 4-2
Estimated Annual Emissions Summary
BLM Actions within the Grand Junction Planning Area

Total Estimated Emissions by Alternative (tons per year)							
Scenario	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Base Year	1,102	1,992	1,536	2,047	289	66	104
Alternative A - Project Year 10	1,054	1,835	1,513	2,573	463	55	99
Alternative B - Project Year 10	1,669	2,724	2,185	2,454	473	89	167
Alternative C - Project Year 10	931	1,665	1,350	1,903	377	55	83
Alternative D - Project Year 10	5,131	7,814	6,517	3,231	747	283	548
Alternative A - Project Year 20	934	1,811	1,608	3,271	651	49	98
Alternative B - Project Year 20	1,820	2,990	2,196	3,182	667	112	190
Alternative C - Project Year 20	729	1,518	1,319	2,251	532	48	73
Alternative D - Project Year 20	6,784	9,634	6,723	4,034	957	472	709

analysis was also used to evaluate increases in emissions from each activity over a base year for each alternative. This information is useful for evaluating the effect of various management actions on air emissions and for evaluating the effect of emission control strategies. This information is ultimately used to inform the selection of effective resource management actions under this RMP. This approach included the following steps:

1) Evaluate existing air quality conditions based on available air monitoring data and identifying air quality issues (**Section 3.2.1**).
2) Identify management actions and activities authorized, permitted, or allowed by the BLM within the planning area that generate air pollutant emissions.
3) Compile base-year operational and production data for each identified emission generating activity.
4) Compile projected future development, operational, and production data for each identified emission generating activity for the selected future years over the life of the plan (Year 10 and Year 20).
5) Calculate estimated current and projected future emissions of specific air pollutants for identified management actions and activities for each alternative and compiling the calculations in an emissions inventory (**Appendix O**).
6) Analyze the magnitude of predicted emissions for each activity and changes in estimated emissions over the base year and between alternatives to determine the potential for future impacts on air quality.

7) Evaluate increases in estimated emissions from future BLM actions in the context of potential cumulative emissions within the planning area over the life of the plan.

8) Evaluate the effect of development rates, restrictions, and control measures imposed under each alternative and designing management actions and an adaptive management strategy to protect air quality (**Appendix G**).

The following list of emission generating activities were identified as those management actions and activities authorized, permitted, allowed, or performed under this RMP that could potentially emit regulated air pollutants and could potentially cause impacts on air quality within the planning area and Class I areas within 100 kilometers of the planning area:

- Fluid Leasable Minerals – Conventional Oil and Gas
- Fluid Leasable Minerals – Coal Bed Natural Gas
- Fluid Leasable Minerals – Shale Gas
- Solid Leasable Minerals – Coal
- Locatable Minerals – Uranium and Vanadium
- Salable Minerals – Sand and Gravel
- Lands and Realty – Rights-of-Way
- Livestock Grazing
- Comprehensive Travel and Transportation Management
- Vegetation – Prescribed Fire and Mechanical Treatment

The following air pollutants were identified as being pollutants that could potentially be emitted by management actions and activities authorized, permitted, allowed or performed under this RMP. Emissions of each of these pollutants were estimated for each identified activity and addressed for each alternative in this analysis.

- Carbon monoxide (CO)
- Nitrogen oxides (NOx)
- Particulate matter less than or equal to 10 microns in diameter (PM_{10})
- Particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$)
- Sulfur dioxide (SO_2)
- Volatile Organic Compounds
- Hazardous Air Pollutants

The analysis focused on estimating emissions associated with peak construction, production, and operation activities associated with the identified emission generating management actions listed above for the pollutants listed above. Year 2008 was chosen as the base year for estimating actual emissions as this was the most recent year that reliable production and emissions data was available for existing sources within the planning area. Future year estimated emissions were calculated for ten and 20 years after the base year. Year 10 and Year 20 were selected for future year scenarios as these years represent potential peak construction and operation years for projected oil and gas development. Management actions associated with oil and gas development represent the largest single sector of emissions for most of the air pollutants, therefore, peak development years for this sector were considered most conservative for calculating air emissions.

Operational, production, and construction activity data used to estimate emissions for proposed emission sources were obtained from Grand Junction Field Office staff, the Reasonably Foreseeable Development Scenario for Oil and Gas for the Grand Junction Field Office (BLM 2012a), the Mineral Potential Report (BLM 2010b), and from NEPA analyses currently being conducted for BLM actions within the planning area. Emission factors used to estimate proposed emissions were obtained primarily from EPA's AP-42 Compilation of Air Pollutant Emission Factors (EPA 1995), EPA's NONROAD2008a Emissions Model (EPA 2009), EPA's MOVES2010a Motor Vehicle Emissions Simulator (EPA 2010a), API Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry (API 2009), Colorado Department of Public Health and Environment (CDPHE), and Western Governors' Association - Western Regional Air Partnership (WRAP 2005). Emissions of air pollutants were estimated for the base year and the two future years (Year 10 and Year 20) for each identified activity and addressed for each alternative in this analysis. Given the uncertainties concerning the number, nature, and specific location of future emission sources and activities, the emission comparison approach provides an appropriate basis to compare the potential impacts under the various alternatives. Major assumptions used in this impact analysis include the following:

- Air pollutant emissions presented in this analysis are useful for comparing the relative impacts of each alternative and may not represent actual future emissions. Emissions estimates are based on predictions of future mineral resource development potential scenarios rather than actual development projects.
- Stationary sources associated with oil and gas development will operate in accordance with CDPHE Regulation 7, revised January 2011.
- Emissions from the following management actions were not estimated because the potential for development was considered

low or speculative: oil shale research and development; geothermal, potash, gold, copper, and silver exploration and development; and miscellaneous gems and other salable materials development.

- Emissions from the following management actions were not estimated because the level of activity is not expected to change between alternatives and the magnitude of emissions from the activity is considered to be very small in comparison to other management activities, or sufficient operational or production data was not available to reliably quantify emissions: wild (unplanned) fires, fire suppression aircraft, invasive species and pest management, grassland and shrub land management, wild horse management and activities related to heritage and visual resources, socioeconomic resources, and fish and wildlife resources.

For additional information on the emissions inventory please refer to **Appendix O**. For a more detailed description of the methodologies and assumptions used in this analysis please refer to the Technical Support Document for Air Resources available upon request from the BLM.

Effects Common to All Alternatives

Air quality impacts include changes in air pollutant concentrations, changes in visibility, impacts on soils and vegetation from atmospheric deposition, and changes in lake chemistry. Several key factors play a role in determining the severity of these impacts such as the magnitude and chemistry of the air emissions, meteorological conditions, proximity to sensitive resources and/or receptors, and topography. Emissions were quantified for each of the alternatives as an indication of the potential magnitude of impacts on air quality from each alternative. Increases in potential emissions from the base year were also evaluated. All of the alternatives result in changes to emissions of air pollutants relative to the base year and would therefore result in impacts that have the potential to both improve and degrade air quality depending on the pollutant. For this analysis, the magnitude of the change in emissions was analyzed to determine whether the impacts on air quality have the potential to be significant (i.e., exceed NAAQS or exceed screening levels of concern for visibility and atmospheric deposition).

Air quality modeling can be used to determine ambient concentrations of air pollutants and to assess potential impacts on air quality however models are dependent on specific input data to predict impacts. These input data include actual meteorological data, actual emissions data, emission source spatial and temporal data, and actual topographic data. At this stage of the planning process, these project specific data are not known. Proponents of mineral development projects would be required to provide data to BLM to analyze project impacts on ambient air quality standards at the time that a project is proposed through appropriate NEPA analysis. The NEPA analysis may include air quality modeling to determine whether the project has the potential to exceed or violate any ambient

standards or cause significant adverse impacts on air quality. In addition, as part of the adaptive management strategy for managing air resources within the planning area, the BLM would conduct a regional air modeling study to evaluate potential impacts on air quality from future mineral development in western Colorado (see CARMMS discussion later in this section and also **Appendix G**).

The magnitude of emissions predicted for each analyzed pollutant was evaluated for each alternative for several different emissions generating activities. For all of the alternatives, the magnitude of emissions from oil and gas development, coal and uranium mining, and travel and transportation management activities have the potential to impact air quality within the planning area. In addition, there are several federally designated Class I areas located within 100 kilometers of the planning area. Arches National Park and Canyonlands National Park are to the West of the planning area. Flat Tops Wilderness Area lies to the north of the planning area, while Black Canyon of the Gunnison National Park, Maroon Bells-Snowmass Wilderness, Eagles Nest Wilderness, and West Elk Wilderness are to the east of the planning area. For all of the alternatives, the magnitude of emissions from oil and gas development, coal and uranium mining, and travel and transportation management activities have the potential to impact air quality related values (e.g., visibility and atmospheric deposition) within these areas.

Emissions from oil and gas (fluid minerals) development are a major contributor to total estimated emissions under all alternatives. For the planning area this category includes conventional oil and gas, coal bed natural gas, and shale gas development. Activities quantified in this category include: well drilling and completion, road and well pad construction, flaring and venting, compressor operations, dehydrator and separator operations, tank venting and load out, wellhead fugitives, pneumatic device operations, and vehicle traffic.

The quantities of emissions estimated from these activities are based on reasonably foreseeable estimates of development rates, well counts, production rates, and existing technologies. The emissions numbers should not be considered definitive and may not reflect actual emissions at the time of development. Although the quantity of emissions calculated for this category may not represent actual emissions from eventual development, the magnitude of estimated emissions of several pollutants for this source category is considerable. Emissions of NO_x and volatile organic compounds from this category have the potential to impact air quality under each of the alternatives. The estimated emissions of these two pollutants are predicted to decrease for Alternatives A and C over the life of the plan; however, the magnitude of emissions may still be large enough to contribute to air quality impacts. These impacts could include increased ambient concentrations of nitrogen oxides and increased ozone formation in summer and winter.

Predicted NO_x and $PM_{2.5}$ emissions from oil and gas development under all alternatives could result in visibility degradation and atmospheric deposition.

Emissions of PM_{10} from this category could potentially result in increases in ambient concentrations of fugitive dust resulting in localized impacts on vegetation, decreases in visibility, and increases in atmospheric deposition. Emissions of hazardous air pollutants could potentially result in localized increased risk of impacts on human health. The emissions estimated for carbon monoxide under each alternative for this category may have the potential to contribute to the formation of ozone. Estimated sulfur dioxide emissions for this category under each alternative are minor, and, although they could contribute to impacts on visibility and atmospheric deposition, it is unlikely that these emissions would have a significant impact on air quality by increasing ambient concentrations of sulfur dioxide.

Another large contributor to total air pollutant emissions under each alternative is the category of solid minerals development. For the planning area, this category includes underground coal mining, underground uranium and vanadium mining, and sand and gravel sales. The primary pollutant of concern from this category is PM_{10}. Particulate matter emissions (fugitive dust) are primarily caused by earth moving activities and vehicular traffic on unpaved roads and surfaces associated with mine development and operation. Particulate matter emissions from this category under all of the alternatives have the potential to impact air quality including increases in ambient concentrations of fugitive dust resulting in localized impacts on vegetation, decreases in visibility, and increases in atmospheric deposition. Estimated emissions of NO_x, volatile organic compounds, and carbon monoxide from combustion sources at mining facilities are potentially significant. Emissions of these pollutants could result in increased ozone formation. Estimated emissions of sulfur dioxide and hazardous air pollutants from this source category for all alternatives are minor and it is unlikely that these emissions would have a significant impact on air quality.

Estimated emissions from the travel and transportation management category have the potential to contribute to air quality impacts. Emission generating activities quantified under this category include combustion and fugitive dust emissions from off-highway vehicle use and combustion and fugitive dust emissions from road maintenance equipment. Particulate matter, carbon monoxide and volatile organic compound emissions from these sources under all alternatives have the potential to contribute to ozone formation and increase ambient concentrations of fugitive dust resulting in localized impacts on vegetation, decreases in visibility, and increases in atmospheric deposition. Emissions of hazardous air pollutants from this category could potentially result in localized increased risk of impacts on human health.

Estimated emissions from livestock grazing are predicted to be very low for all alternatives and are not expected to contribute to significant air quality impacts.

The CDPHE has the authority to implement emission controls for stationary sources that are required to obtain air permits under Colorado Air Quality

Control Commission Regulations and to ensure that these sources do not contribute to an exceedance of an ambient air quality standard. To facilitate this process, the BLM works in cooperation with CDPHE and other federal agencies to share, review, and analyze emissions data, modeling results, and mitigation measures for development projects. This cooperation would continue under all alternatives. In addition, the BLM could require implementation of Best Management Practices (BMPs) and mitigation measures within its authority to minimize impacts on air quality from development projects. Determination and application of such measures would be completed during project approval, and would be subject to NEPA analysis at that time. Please refer to **Appendix H**, Best Management Practices and Standard Operating Procedures.

Table 4-3, Estimated Annual Emissions by Activity – Base Year, shows the estimated emissions for each pollutant from each emissions generating activity analyzed for the base year. The estimated emissions for each of the alternatives are compared with these base year emissions and are included in the discussion of each alternative.

Table 4-3
Estimated Annual Emissions by Activity – Base Year

Annual Emissions - Base Year (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Natural Gas - Conv. and CBNG	811	1,282	1,295	100	43	59	75
Oil and Natural Gas - Shale gas	2	6	6	1	0	1	0
O&G Minerals Total	**813**	**1,288**	**1,301**	**101**	**43**	**60**	**75**
Coal	-	-	-	-	-	-	-
Sand and Gravel	1	9	14	231	27	0	0
Uranium	-	-	-	-	-	-	-
Non-O&G Minerals Total	**1**	**9**	**14**	**231**	**27**	**0**	**0**
Lands and Realty, ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	229	375	3	1,217	127	0	23
Vegetation –Prescribed Fire and Mechanical Treatment	59	319	217	494	91	6	6
Other Activities Total	**288**	**695**	**221**	**1,715**	**219**	**6**	**29**
TOTAL Base Year	1,102	1,992	1,536	2,047	289	66	104

Alternative A

Total estimated emissions for Alternative A are the second lowest of the four alternatives. This is due primarily to the lower reasonably foreseeable development rate predicted for oil and gas activities than for Alternatives B or D but a higher level of predicted coal mining than Alternative C. Estimated emissions for Alternative A decrease compared with the base year for the following pollutants; volatile organic compounds, carbon monoxide, sulfur dioxide, and hazardous air pollutants. This can be attributed to declining

production on existing oil and gas wells, more stringent regulatory controls on future oil and gas development, and predicted decrease in the use of prescribed fire for this alternative. Estimated emissions for Alternative A increase over the base year for NO_x, PM_{10} and $PM_{2.5}$. NO_x increases can be attributed to engine combustion emissions at increased coal and uranium mining operations. PM_{10} and $PM_{2.5}$ increases are due primarily to fugitive dust and fuel combustion emissions from increased motorized activity as well as surface mining operations. **Tables 4-4 and 4-5**, Estimated Annual Emissions by Activity Alternative A – Project Year 10 and Project Year 20, respectively, show the estimated emissions for each pollutant from each emission generating activity analyzed for Alternative A. Tables of the estimated emissions calculations by source category and the key assumptions used in the calculations are provided in **Appendix O**.

Fluid Leasable Minerals – Oil and Gas

Estimated emissions from oil and gas development for Alternative A were calculated using a reasonably foreseeable development rate based on historical development rates for federal wells within the planning area over the last 20 years. Estimated emissions from oil and gas activities were based on a development level equivalent to 220 new BLM wells and associated drilling, completion, gas treatment, and compression activities over the life of the plan. Estimated emissions from 704 existing base year BLM wells and associated

Table 4-4
Estimated Annual Emissions by Activity
Alternative A – Project Year 10

Alternative A - Year 10 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	609	748	630	58	28	36	59
Oil and Gas - Shale	81	158	162	18	8	8	4
Fluid Minerals Total	**690**	**906**	**792**	**76**	**36**	**45**	**62**
Coal	6	21	217	60	19	0	1
Sand and Gravel	1	9	14	231	27	0	0
Uranium	29	203	364	369	166	7	3
Solid Minerals Total	**36**	**232**	**594**	**661**	**212**	**7**	**4**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	295	484	4	1,569	164	0	29
Vegetation –Prescribed Fire and Mechanical Treatment	33	212	121	263	52	4	3
Other Activities Total	**328**	**697**	**126**	**1,836**	**216**	**4**	**33**
TOTAL	1,054	1,835	1,513	2,573	463	55	99

Table 4-5
Estimated Annual Emissions by Activity
Alternative A – Project Year 20

Alternative A - Year 20 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	366	381	280	32	16	16	47
Oil and Gas - Shale	105	187	191	24	10	15	5
Fluid Minerals Total	**471**	**569**	**471**	**56**	**26**	**31**	**52**
Coal	7	18	269	42	12	0	1
Sand and Gravel	1	9	14	231	27	0	0
Uranium	58	406	727	739	331	13	6
Solid Minerals Total	**66**	**432**	**1,010**	**1,011**	**371**	**14**	**7**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	364	597	5	1,937	202	0	36
Vegetation –Prescribed Fire and Mechanical Treatment	33	212	121	263	52	4	3
Other Activities Total	**397**	**810**	**127**	**2,203**	**254**	**4**	**40**
TOTAL	934	1,811	1,608	3,271	651	49	98

decline over a 20-year period were also included in the estimated emissions calculations. **Appendix O** includes additional details on the assumptions used in calculating emissions from oil and gas activities for this alternative.

The same level of oil and gas development was predicted for Alternatives A and C. However, different levels of emissions controls were assumed in each of these two alternatives. Alternative A controls reflect compliance with regulatory standards and continuation of current technology implementation in the field. Alternative C controls reflect the resource protection goals of that alternative and incorporate more stringent strategies. Alternative A estimated emissions for oil and gas development are based on the following assumptions:

- Drill rig and completion engines that meet or exceed Tier II engine emission standards as defined in 40 CFR Part 89
- Fugitive dust control from pad, road, and pipeline construction using frequent watering and speed control with an assumed control efficiency of 50 percent
- Control of waste gas from well stimulation and completion assuming 90 percent capture of all vented emissions then 50 percent sent to flare and 50 percent sent to "green completion"
- 100 percent of drilling/completion fluids are delivered and disposed of by truck

- 10 percent of well pad tank and gas treatment fugitive emissions are captured and flared
- 100 percent disposal of produced water and condensate is by truck

Comparisons between estimated emissions from oil and gas development between Alternatives A and C show the potential effectiveness of emission control strategies at the predicted level of development for these two alternatives and are included under the Alternative C discussion. Estimated emissions from oil and gas development are predicted to decrease for all pollutants over the base year for this alternative. Decreases in emissions are predicted based on the lower development rated (compared with other alternatives), decline in production from existing wells, and the implementation of regulatory emission controls on new development.

Although emissions are predicted to decrease from base year levels over the life of the plan for this alternative, the magnitude of emissions estimated for some pollutants from oil and gas activities has the potential to impact air quality. The magnitude of NO_x and volatile organic compound emissions has the potential to contribute to ozone formation within the region. Ground-level ozone is formed in the atmosphere through a series of chemical reactions involving NO_x, volatile organic compounds, carbon monoxide, and other compounds in the presence of sunlight. Ozone formation is typically considered a summer time phenomenon, but recent measurements have shown that ozone formation can occur in the winter time under specific meteorological conditions as well. Measurements of ozone concentrations in the Green River Basin in Wyoming, Uinta Basin in Utah, and Piceance Basin in Colorado have shown elevated levels of ozone during stagnant winter atmospheric conditions and increased solar radiation reflected from snow cover. The availability of ozone precursor emissions from oil and gas activities in these basins is believed to contribute towards the elevated winter ozone concentrations.

Solid Minerals – Coal, Uranium, Sand and Gravel

Estimated emissions for solid mineral development activities for Alternative A include underground coal mining, uranium and vanadium mining, and sand and gravel sales. Development and production rates for this alternative are based on the Mineral Potential Report (BLM 2010b), historical production data for the planning area, and surface use restrictions included in this alternative. Solid mineral development and emissions estimates over the life of the plan for this alternative include the following assumptions:

- Development of one large underground coal mine (estimated production rate of 8 million tons per year) in the first five years of the plan
- Development of three smaller underground coal mines (estimated production rate of 2 million tons per year per mine) over the life of the plan

- Development of up to 20 small uranium/vanadium mines over the life of the plan
- Continuous sales of sand and gravel equivalent to the base year
- Fugitive dust control from construction activities using frequent watering and speed control with an assumed control efficiency of 50 percent

Emissions from solid mineral mining are expected to increase for all pollutants over the base year in both Year 10 and Year 20 of the plan due to expected increases in mining activities. Fugitive dust (PM_{10}) emissions from surface disturbing activities associated with uranium and vanadium mining are the most notable increase. These emissions have the potential to contribute to localized increases in particulate matter concentrations and impacts on visibility. NO_x emissions from mining equipment associated with coal and uranium mining are also expected to increase substantially. This increase has the potential to contribute to increased ozone formation and impacts on visibility and atmospheric deposition.

It is important to note that the magnitude and rate of increased mining operations over the life of the plan is dependent on economics and the demand for the materials as well as the construction of product transportation facilities and mineral processing facilities. The rate of mineral development predicted for the emissions inventory is based on mineral potential and may result in overestimating of emissions for this category. For example, the rate of uranium mining development predicted for the emissions calculations is independent of the availability of local processing facilities. The actual permitting and construction of a local uranium processing facility could have a significant effect on actual uranium mineral development over the life of the plan.

Lands and Realty – Rights of Way

Emissions generating activities associated with rights-of-way include construction activities for communication sites, transmission lines, and non-oil and gas pipelines. The GJFO predicts very little activity within the planning area over the life of the plan for these activities. A total of six projects with an average of two acres of disturbance per project were assumed as the level of development for this category. This level of development is not expected to vary by alternative or increase over the life of the plan. Estimated emissions are predicted to be very low for all alternatives and are not expected to contribute to significant air quality impacts.

Livestock Grazing

Emissions generating activities associated with this category include primarily construction activities in support of grazing operations. Construction and maintenance of reservoirs, springs, wells, pipelines, and fences generate fugitive dust and combustion emissions from construction equipment. Estimated emissions are based on animal unit months from cattle grazing permits. Grazing

activities are expected to stay the same as the base year over the life of the plan for this alternative. Livestock grazing activities are predicted to decrease slightly for Alternatives A, B and D and significantly for Alternative C. Estimated emissions from this category are predicted to be very low for all alternatives and are not expected to contribute to significant air quality impacts.

Comprehensive Travel and Transportation Management

Emissions generating activities associated with this category include fugitive dust from road and trail construction and maintenance, fugitive dust from motorized use, and combustion emissions from motorized use. Estimated emissions from these activities were calculated based on vehicle miles traveled and associated miles of roads and trails for vehicles including all-terrain vehicles, dirt motorcycles, and snowmobiles. The GJFO has established traffic counters at several key points of access for off road recreation. Projected growth in motorized use over the life of the plan was calculated based on actual increase in motorized recreation visits over the 2003-2010 period. The magnitude of estimated volatile organic compound emissions predicted for this category has the potential to contribute to ozone formation. Estimated fugitive dust emissions could result in increased ambient concentrations of particulate matter and impacts on visibility.

Vegetation – Prescribed Fire and Mechanical Treatment

Emissions generating activities associated with the category included smoke from prescribed fires and combustion emissions from mechanical equipment used to manage vegetation and wildlife habitat. Estimated emissions were calculated based on historical acres burned and treated in the planning area. Moderate growth was assumed for each alternative in accordance with the management goals for that alternative. Decreases in emissions of all pollutants from this category were predicted over the life of the plan due to decreased activity under Alternative A vegetation management actions. However, the magnitude of emissions from prescribed fire has the potential to result in impacts on visibility, ozone formation, and human and wildlife health.

Alternative B

Total emissions for Alternative B are estimated to be greater than Alternative A and C and lower than Alternative D. This is due primarily to the higher reasonably foreseeable development rate predicted for oil and gas activities than for Alternatives A or C but lower rate than Alternative D. The development rate for coal mining activities is lower than Alternative A and D and the same as Alternative C. Estimated emissions for Alternative B increase over the base year for all pollutants due to increases in oil and gas development, solid minerals mining, and motorized use. **Tables 4-6 and 4-7**, Estimated Annual Emissions by Activity Alternative B – Project Year 10 and Project Year 20, respectively, show the estimated emissions for each pollutant from each emission generating activity analyzed for Alternative B.

Table 4-6
Estimated Annual Emissions by Activity
Alternative B – Project Year 10

Alternative B - Year 10 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	1,061	1,261	976	104	50	53	117
Oil and Gas - Shale	246	551	563	62	27	26	13
Fluid Minerals Total	**1,307**	**1,812**	**1,538**	**167**	**77**	**79**	**131**
Coal	4	10	154	24	7	0	0
Sand and Gravel	0	2	3	58	7	0	0
Uranium	29	203	364	369	166	7	3
Solid Minerals Total	**33**	**215**	**521**	**451**	**180**	**7**	**3**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	295	484	4	1,569	164	0	29
Vegetation –Prescribed Fire and Mechanical Treatment	33	212	121	263	52	4	3
Other Activities Total	**328**	**697**	**126**	**1,836**	**216**	**4**	**33**
TOTAL	1,669	2,724	2,185	2,454	473	89	167

Table 4-7
Estimated Annual Emissions by Activity
Alternative B – Project Year 20

Alternative B - Year 20 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	1,049	1,105	650	88	42	45	128
Oil and Gas - Shale	312	657	534	70	26	49	16
Fluid Minerals Total	**1,360**	**1,762**	**1,185**	**158**	**68**	**95**	**144**
Coal	4	10	154	24	7	0	0
Sand and Gravel	0	2	3	58	7	0	0
Uranium	58	406	727	739	331	13	6
Solid Minerals Total	**62**	**418**	**884**	**820**	**345**	**14**	**6**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	364	597	5	1,937	202	0	36
Vegetation –Prescribed Fire and Mechanical Treatment	33	212	121	263	52	4	3
Other Activities Total	**397**	**810**	**127**	**2,203**	**254**	**4**	**40**
TOTAL	1,820	2,990	2,196	3,182	667	112	190

Fluid Leasable Minerals – Oil and Gas

Oil and gas development predicted for Alternative B is based on a reasonably foreseeable development rate using the maximum annual number of federal wells drilled in the planning area in a single year over the last 20 years. Estimated emissions from oil and gas activities were based on a development level equivalent to 780 new BLM wells and associated drilling, completion, gas treatment, and compression activities over the life of the plan. Estimated emissions from 704 existing base year BLM wells and associated decline over a 20-year period were also included in the estimated emissions calculations. **Appendix O** includes additional details on the assumptions used in calculating emissions from oil and gas activities for this alternative.

Alternative B estimated emissions for oil and gas development are based on the following assumptions:

- Drill rig and completion engines that meet Tier II engine emission standards as defined in 40 CFR Part 89 through Year 10 and then phase in of engines that meet Tier IV engine emission standards as defined in 40 CFR Part 1039 by Year 20
- Fugitive dust control from pad, road, and pipeline construction using frequent watering and speed control with an assumed control efficiency of 50 percent
- Control of waste gas from well stimulation and completion assuming 90 percent capture of all vented emissions then 25 percent sent to flare and 75 percent sent to "green completion"
- 50 percent of drilling/completion fluids are delivered and disposed of by truck and 50 percent through overland pipeline
- 50 percent of well pad tank and gas treatment fugitive emissions are captured and flared
- 50 percent disposal of produced water and condensate is by truck and 50 percent through liquids gathering system[1]

Estimated emissions from oil and gas development are predicted to increase for all pollutants over the base year for this alternative due to the increased level of development. Comparisons between short term (Year 10) and long term (Year 20) emissions show that emissions can be improved over the life of the plan with the implementation of control strategies listed above. For example, the comparison showed that the phased in use of Tier IV diesel engines by Year 20 reduced NO_x and volatile organic compound emissions by approximately 40

[1] Feasibility of implementing a liquid gathering system is evaluated on a project-specific basis depending on terrain, field layout and other considerations.

percent and particulate matter emissions by over 75 percent over the use of Tier II engines assumed initially for the estimated development rate assumed in the two scenarios.

Similar to Alternative A, the magnitude of emissions estimated for pollutants from oil and gas activities has the potential to impact air quality under this alternative. NO_x and volatile organic compound emissions have the potential to contribute to increased ozone formation within the region. NO_x and particulate matter emissions have the potential to contribute to visibility degradation and increased atmospheric deposition with the region. Emissions of hazardous air pollutants could potentially result in localized increased risk of impacts on human health.

Solid Minerals – Coal, Uranium, Sand and Gravel

Estimated emissions for solid mineral development activities for Alternative B include underground coal mining, uranium and vanadium mining, and sand and gravel sales. The potential for the development of underground coal mining operations is predicted to be significantly less than Alterative A due to leasable minerals management actions included in this alternative. Solid mineral development and emissions estimates over the life of the plan for this alternative include the following assumptions:

- Development of one large underground coal mine (estimated production rate of 8 million tons per year) in the first 5 years of the plan
- Development of up to 20 small uranium/vanadium mines over the life of the plan
- Decline in sales of sand and gravel by 75 percent
- Fugitive dust control from construction activities using frequent watering and speed control with an assumed control efficiency of 50 percent

Emissions from solid mineral mining are expected to increase for all pollutants over the base year in both Year 10 and Year 20 of the plan but increases are lower than Alternative A. The magnitude of predicted NO_x, PM_{10}, and $PM_{2.5}$ emissions has the potential to impact air quality from these activities. Fugitive dust emissions have the potential to contribute to localized increase in particulate matter concentrations and impacts on visibility. NO_x emissions have the potential to contribute to increased ozone formation and NO_x and $PM_{2.5}$ could contribute to visibility degradation and increases in atmospheric deposition.

Lands and Realty – Rights of Way

Estimated emissions and impacts on air quality are predicted to be the same as Alternative A for this category.

Livestock Grazing
Estimated emissions and the potential for associated impacts on air quality are expected to decrease from the base year and be slightly lower for this alternative than for Alternative A due to lower permitted animal unit months and other Livestock Grazing management actions included for this alternative.

Comprehensive Travel and Transportation Management
Estimated emissions and impacts on air quality are predicted to be the same as Alternative A.

Vegetation – Prescribed Fire and Mechanical Treatment
Estimated emission and impacts on air quality are predicted to be the same as Alternative A for this category.

Master Leasing Plan
The greatest potential for impacts on air resources in the Shale Ridges and Canyons MLP analysis area would be from oil and gas development, although air quality protection measures in Alternative B would provide an adequate basis to include more-stringent emission controls on oil and gas equipment and activities than those currently in use. See Table VI-1 within Appendix G (the CARPP) for more specific control measure that could be implemented on a project as determined necessary by the required subsequent implementation analysis. Emissions from oil and gas development would vary from year to year, depending upon the number of active wells. Emissions under the Proposed RMP (Alternative B) would be less than emissions under current management, due to the more stringent emission controls recently enacted by EPA (e.g., NSPS OOOO), and due to the reduction in acreage available for leasing and development.

Alternative C
Total estimated emissions for Alternative C are predicted to be the lowest of the four alternatives. This is due primarily to the lower reasonably foreseeable development rate for oil and gas development compared with Alternatives A, B, and D and the lower solid minerals development rate compared with Alternatives A and D. Alternative C also includes additional emission controls and strategies for oil and gas development compared with Alternative A.

Estimated emissions for Alternative C decrease compared to the base year for all pollutants except particulate matter. The decreases can be attributed to declining production from existing oil and gas wells, more stringent regulatory controls on future oil and gas development, decreased motorized activity, priority toward using planned and unplanned fire treatments, and decreases in sand and gravel sales and livestock grazing over the life of the plan. Estimated emissions for Alternative C increase over the base year for PM_{10} and $PM_{2.5}$ due to increased surface mining operations. **Tables 4-8 and 4-9**, Estimated Annual Emissions by Activity Alternative C – Project Year 10 and Project Year 20, respectively, show the estimated emissions for each pollutant from each emission generating activity analyzed for Alternative C.

Table 4-8
Estimated Annual Emissions by Activity
Alternative C – Project Year 10

Alternative C - Year 10 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	590	734	598	54	26	36	51
Oil and Gas - Shale	60	158	125	13	5	8	4
Fluid Minerals Total	**650**	**892**	**723**	**67**	**31**	**45**	**55**
Coal	4	10	154	24	7	0	0
Sand and Gravel	0	2	3	58	7	0	0
Uranium	29	203	364	369	166	7	3
Solid Minerals Total	**33**	**215**	**521**	**451**	**180**	**7**	**3**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	0	0	1	0	0	0
Travel and Transportation Management	219	360	3	1,166	122	0	22
Vegetation –Prescribed Fire and Mechanical Treatment	28	197	103	217	44	3	3
Other Activities Total	**247**	**558**	**107**	**1,386**	**166**	**3**	**25**
TOTAL	931	1,665	1,350	1,903	377	55	83

Table 4-9
Estimated Annual Emissions by Activity
Alternative C – Project Year 20

Alternative C - Year 20 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	342	355	215	27	14	16	37
Oil and Gas - Shale	78	187	113	18	7	15	5
Fluid Minerals Total	**419**	**542**	**328**	**45**	**21**	**31**	**42**
Coal	4	10	154	24	7	0	0
Sand and Gravel	0	2	3	58	7	0	0
Uranium	58	406	727	739	331	13	6
Solid Minerals Total	**62**	**418**	**884**	**820**	**345**	**14**	**6**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	0	0	1	0	0	0
Travel and Transportation Management	219	360	3	1,166	122	0	22
Vegetation –Prescribed Fire and Mechanical Treatment	28	197	103	217	44	3	3
Other Activities Total	**247**	**558**	**107**	**1,386**	**166**	**3**	**25**
TOTAL	729	1,518	1,319	2,251	532	48	73

Fluid Leasable Minerals – Oil and Gas

Estimated emissions from oil and gas development for Alternative C were calculated using a reasonably foreseeable development rate based on historical development rates for federal wells within the planning area over the last 20 years. Estimated emissions from oil and gas activities were based on a development level equivalent to 220 new BLM wells and associated drilling, completion, gas treatment, and compression activities over the life of the plan. Estimated emissions from 704 existing base year BLM wells and associated decline over a 20-year period were also included in the estimated emissions calculations. **Appendix O** includes additional details on the assumptions used in calculating emissions from oil and gas activities for this alternative.

The same level of oil and gas development was predicted for Alternatives A and C. However, different levels of emissions controls were assumed in each of these two alternatives. Alternative A controls reflect compliance with regulatory standards and continuation of current technology implementation in the field. Alternative C controls reflect the resource protection goals of this alternative and incorporate more stringent strategies. Alternative C estimated emissions for oil and gas development are based on the following assumptions:

- Drill rig and completion engines that meet Tier IV engine emission standards as defined in 40 CFR Part 1039
- Fugitive dust control from pad, road, and pipeline construction using frequent watering, chemical dust suppressants, and speed control with an assumed control efficiency of 80 percent
- Control of waste gas from well stimulation and completion assuming 100 percent capture of all vented emissions then 20 percent sent to flare and 80 percent sent to "green completion"
- 50 percent of drilling/completion fluids are delivered and disposed of by truck and 50 percent through overland pipeline
- 50 percent of field compression is electrified
- 80 percent of well pad tank and gas treatment fugitive emissions are captured and flared
- 50 percent disposal of produced water and condensate is by truck and 50 percent through liquids gathering system[2]

Estimated emissions from oil and gas development are predicted to decrease for all pollutants over the base year for this alternative. Decreases in emissions are

[2] Feasibility of implementing a liquid gathering system is evaluated on a project-specific basis depending on terrain, field layout and other considerations.

predicted based on the lower development rates compared with Alternatives B and D, decline in production from existing wells, and the implementation of regulatory emission controls and emission control strategies on new development.

Estimated emissions are also predicted to decrease compared with Alternative A, even though the predicted development levels are the same for these two alternatives. Comparisons between estimated emissions from oil and gas development between Alternatives A and C show the potential effectiveness of emission control strategies at the predicted level of development for these two alternatives. The same level of activity for drilling and completion operations was assumed for Alternatives A and C. However, Tier II engines were assumed for all years for Alternative A while for Alternative C, Tier IV diesel engines were assumed for Year 10 and Tier IV diesel-electric generator sets were assumed for Year 20. This allowed for a comparison of the effectiveness of improved engine technology over the life of the plan. The comparison showed that the use of Tier IV diesel engines reduced NO_x and volatile organic compound emissions by approximately 40 percent and particulate matter emissions by over 75 percent over the use of Tier II engines for the estimated development rate used in the two alternatives. The comparison also showed that the phased in use of Tier IV diesel-electric generator sets could reduce NO_x, volatile organic compound, and particulate matter emissions by approximately 80 percent over Tier II engines. Fugitive dust control with chemical suppressants, watering, and speed control was estimated to reduce particulate matter emissions under Alternative C by approximately 40 percent compared with Alternative A. The electrification of small in-field compressors was assumed to be feasible for approximately 50 percent of the estimated compression requirements for this alternative. This showed a reduction in volatile organic compound emissions of approximately 40 percent, and NO_x, carbon monoxide, and particulate matter reductions of less than 20 percent compared with Alternative A. Capture and control of miscellaneous volatile organic compound sources including tanks, dehydrators, pneumatic devices, and venting were shown to reduce volatile organic compounds and hazardous air pollutants emissions by approximately 50 percent between the two alternatives.

Although emissions are predicted to decrease from base year levels over the life of the plan, the magnitude of emissions estimated for some pollutants from oil and gas activities for this alternative has the potential to impact air quality similar to those described under Alternative A. However, Alternative C includes emission reduction measures in addition to those included in Alternative A so the magnitude of potential impacts is expected to be less. A comparison of estimated emissions between Alternatives A and C shows that improved engine technology (Tier II vs. Tier IV) can reduce predicted emissions of NO_x, volatile organic compounds, $PM_{2.5}$, and hazardous air pollutants by about one half for drilling and completion engines. Liquids gathering and delivery systems for drilling water, produced water, and condensate reduce fugitive dust and

combustion emissions from truck traffic as well as fugitive volatile organic compound emissions from well pad storage of these liquids. Capture and control of volatile organic compound emissions from tanks and other well pad equipment can reduce volatile organic compound emissions significantly and illustrate that in-field centralization of gas and product treatment and storage facilities should be encouraged so that equipment can be sized to effectively control emissions.

Solid Minerals – Coal, Uranium, Sand and Gravel
Estimated emissions for solid mineral development activities for Alternative C include underground coal mining, uranium and vanadium mining, and sand and gravel sales. Management actions related to solid minerals development and levels of development are the same as Alternative B. Estimated emissions and potential impacts from this category are predicted to be the same as for Alternative B.

Lands and Realty – Rights of Way
Estimated emissions and impacts on air quality are predicted to be the same as Alternative A for this category.

Livestock Grazing
Estimated emissions and the potential for associated impacts on air quality are expected to decrease from the base year and be lower for this alternative than for Alternatives A and B due to lower permitted animal unit months and other livestock grazing management actions included for this alternative.

Comprehensive Travel and Transportation Management
Estimated emissions and associated impacts on air quality are expected to decrease from the base year for this category and be lower than Alternatives A or B due to closure of some routes and open areas for motorized use.

Vegetation – Prescribed Fire and Mechanical Treatment
Estimated emissions and impacts on air quality from this category are expected to decrease from the base year and be similar to but slightly lower than Alternative A. While there is increased use of prescribed fire under this alternative, there is decreased use of mechanical treatments under the management actions for this alternative; taken together the result is an estimated decrease in emissions and impacts from the base year and slightly lower emissions from prescribed fire and mechanical treatments and impacts than Alternative A.

Alternative D
Total estimated emissions for Alternative D are predicted to be the highest of the four alternatives. This is due primarily to the highest reasonably foreseeable development rate predicted for oil and gas activities than all alternatives and a higher level of potential solid minerals development than Alternatives B and C and the same increased level of motorized use as predicted for Alternative A.

Estimated emissions for Alternative D increase significantly from the base year for all analyzed pollutants. Increases in emissions are similar to those for Alternative A for all source categories except oil and gas development. **Tables 4-10 and 4-11**, Estimated Annual Emissions by Activity Alternative D – Project Year 10 and Project Year 20, respectively, show the estimated emissions for each pollutant from each emission generating activity analyzed for Alternative D.

Fluid Leasable Minerals – Oil and Gas

Estimated emissions from oil and gas development for Alternative D were calculated based on the Reasonably Foreseeable Development Scenario for Oil and Gas, Grand Junction Field Office, Colorado (BLM 2012a). This document evaluated the geologic potential of oil and gas reservoirs underlying the planning area. The geologic potential along with other significant factors, including economics, technology, physical limitations on access, existing or anticipated infrastructure, and transportation were taken into account to estimate a future oil and gas development scenario for a period of 20 years from the base year. Estimated emissions from oil and gas activities were based on a development level equivalent to 3,938 new BLM wells and associated drilling, completion, gas treatment, and compression activities over the life of the plan. Estimated emissions from 704 existing base year BLM wells and associated decline over a 20-year period were also included in the estimated emissions calculations. **Appendix O** includes additional details on the assumptions used in calculating emissions from oil and gas activities for this alternative.

Table 4-10
Estimated Annual Emissions by Activity
Alternative D – Project Year 10

Alternative D - Year 10 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	3,436	3,902	2,752	344	166	137	440
Oil and Gas - Shale	1,325	2,964	3,021	332	144	135	72
Fluid Minerals Total	**4,761**	**6,866**	**5,773**	**676**	**310**	**272**	**511**
Coal	6	21	217	60	19	0	1
Sand and Gravel	1	9	14	231	27	0	0
Uranium	29	203	364	369	166	7	3
Solid Minerals Total	**36**	**232**	**594**	**661**	**212**	**7**	**4**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	295	484	4	1,569	164	0	29
Vegetation –Prescribed Fire and Mechanical Treatment	39	230	144	321	61	4	4
Other Activities Total	**334**	**715**	**149**	**1,894**	**225**	**4**	**33**
TOTAL	5,131	7,814	6,517	3,231	747	283	548

Table 4-11
Estimated Annual Emissions by Activity
Alternative D – Project Year 20

Alternative D - Year 20 (tons/year)							
Emissions Generating Activity	**VOC**	**CO**	**NOx**	**PM10**	**PM2.5**	**SO2**	**HAPs**
Oil and Gas - Conventional/CBNG	4,634	4,837	2,696	386	183	194	576
Oil and Gas - Shale	1,681	3,537	2,867	375	139	260	86
Fluid Minerals Total	**6,315**	**8,374**	**5,563**	**761**	**323**	**454**	**662**
Coal	7	18	269	42	12	0	1
Sand and Gravel	1	9	14	231	27	0	0
Uranium	58	406	727	739	331	13	6
Solid Minerals Total	**66**	**432**	**1,010**	**1,011**	**371**	**14**	**7**
Lands and Realty ROW	0	0	1	2	0	0	0
Livestock Grazing	0	1	0	1	0	0	0
Travel and Transportation Management	364	597	5	1,937	202	0	36
Vegetation –Prescribed Fire and Mechanical Treatment	39	230	144	321	61	4	4
Other Activities Total	**403**	**828**	**150**	**2,262**	**264**	**4**	**40**
TOTAL	6,784	9,634	6,723	4,034	957	472	709

Alternative D estimated emissions for oil and gas development are based on the following assumptions:

- Drill rig and completion engines that meet Tier II engine emission standards as defined in 40 CFR Part 89 through Year 10 and then phase in of engines that meet Tier IV engine emission standards as defined in 40 CFR Part 1039 by Year 20
- Fugitive dust control from pad, road, and pipeline construction using frequent watering and speed control with an assumed control efficiency of 50 percent
- Control of waste gas from well stimulation and completion assuming 90 percent capture of all vented emissions then 25 percent sent to flare and 75 percent sent to "green completion"
- 50 percent of drilling/completion fluids are delivered and disposed of by truck and 50 percent through overland pipeline
- 50 percent of well pad tank and gas treatment fugitive emissions are captured and flared

- 50 percent disposal of produced water and condensate is by truck and 50 percent through liquids gathering system[3]

The reasonably foreseeable potential for oil and gas development for Alternative D is five times greater than Alternative B and 17 times greater than Alternatives A and C. The estimated emissions for oil and gas development under this alternative reflect this substantially higher level of development. The magnitude of NO_x and volatile organic compound emissions would likely contribute to increased concentrations of ozone formation and has the potential to contribute to adverse impacts associated with ozone formation. The phased in use of Tier IV diesel engines by Year 20 was shown to reduce NO_x and volatile organic compound emissions by approximately 40 percent and particulate matter emissions by over 75 percent compared to the use of Tier II engines initially selected for this alternative. Ambient concentrations of NO_x, sulfur dioxide, $PM_{2.5}$, and volatile organic compounds could be increased due to emissions from this level of development. NO_x, sulfur dioxide, and particulate matter emissions have the potential to contribute to visibility degradation and increased atmospheric deposition with the region. Emissions of hazardous air pollutants could potentially result in localized increased risk of impacts on human health.

Solid Minerals – Coal, Uranium, Sand and Gravel
Estimated emissions for solid mineral development activities for Alternative D are the same as Alternative A. Estimated emissions and associated impacts on air quality from this category are the same as for Alternative A

Lands and Realty – Rights of Way
Estimated emissions and impacts on air quality are predicted to be the same as Alternative A for this category.

Livestock Grazing
Estimated emissions and impacts on air quality are predicted to be the same as Alternative A for this category.

Comprehensive Travel and Transportation Management
Estimated emissions and impacts on air quality are predicted to be the same as Alternative A for this category.

Vegetation – Prescribed Fire and Mechanical Treatment
Estimated emissions from this category (i.e., prescribed fire and vegetation treatments) are predicted to decrease from the base year due to management actions that limit the use of prescribed fire. However the management actions

[3] Feasibility of implementing a liquid gathering system is evaluated on a project-specific basis depending on terrain, field layout and other considerations.

are less restrictive for Alternative D than Alternatives A, B, and C; therefore emissions are slightly higher. Potential impacts on air quality are the same as those described for Alternative A.

Cumulative

Greenhouse Gases and Climate Change

Concentrations of certain gases in the earth's atmosphere have been identified as being effective at trapping heat reflected off the earth's surface thereby creating a "greenhouse effect." As concentrations of these greenhouse gases increase, the earth's surface warms, the composition of the atmosphere changes, and global climate is affected. Concentrations of greenhouse gases have increased dramatically in the earth's atmosphere in the past century. Anthropogenic (man-made) sources and human activities have been attributed to these increases particularly for carbon dioxide, methane, nitrous oxide, and fluorinated gases (EPA 2010b).

The EPA has determined that six greenhouse gases are air pollutants and subject to regulation under The Clean Air Act: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (EPA 2013). Of these greenhouse gases, carbon dioxide, methane, and nitrous oxide are commonly emitted by the types of activities included in this analysis, while the remaining three greenhouse gases are emitted in extremely small quantities or are not emitted at all. Greenhouse gas emissions from management actions and activities were estimated for each alternative in this analysis for the following pollutants:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)

As the major component of natural gas, methane emissions from underground mining operations and oil and gas exploration and development can be considerable. Emissions of carbon dioxide and nitrous oxide from fossil fuel combustion and fire can also be of concern. This analysis quantified emissions of carbon dioxide, methane, and nitrous oxide from the same management actions and activities for each alternative as for the criteria pollutants.

A greenhouse gas's ability to contribute to global warming is based on its longevity in the atmosphere and its heat-trapping capacity. In order to aggregate greenhouse gas emissions and assess their contribution to climate change, the EPA has assigned each greenhouse gas a global warming potential that is used to calculate carbon dioxide equivalents (CO_{2eq}). The carbon dioxide equivalent for each greenhouse gas is calculated by multiplying the quantity of emissions by the global warming potential for that greenhouse gas. Total carbon dioxide equivalent emissions for all greenhouse gases are then determined by adding the

carbon dioxide equivalent emissions of each greenhouse gas. Global warming potentials used for greenhouse gas emission calculations and reporting are CO_2 = 1, CH_4 = 25, and N_2O = 310. Carbon dioxide equivalents were then converted to million metric tonnes, the typical reporting unit for greenhouse gas emissions. **Table 4-12**, Estimated Annual Greenhouse Gas Emissions Summary for BLM Actions within the Grand Junction Planning Area, shows the estimated annual emissions of the greenhouse gases for each alternative.

Greenhouse gas emissions are estimated to increase for all alternatives over estimated base year emissions. Alternative A shows increases of greenhouse gas emissions from the base year by approximately five times in the short term and six times in the long term. Alternatives B and C show increases over the base year by approximately four times in the short term and the long term. Alternative D shows increases over the base year by approximately seven times in the short term and ten times in the long term. Coal mining activities are predicted to be the largest contributor to greenhouse gas emissions for all alternatives followed by oil and gas development. Coal mining greenhouse gas emissions are primarily from fugitive methane emissions. The largest sources of greenhouse gas emissions within the oil and gas sector include carbon dioxide emissions from natural gas compressors and drill rig engines, and fugitive methane emissions from wellhead equipment, pneumatic devices and tanks.

Table 4-13, Greenhouse Gas Emissions from BLM Actions as a Percentage of Colorado Statewide Greenhouse Gas Emissions, shows the comparison of greenhouse gas emissions from BLM actions for each of the alternatives to a statewide inventory of greenhouse gas emissions completed in 2007. The inventory was compiled for the CDPHE by the Center for Climate Strategies and was based on actual emissions for 2005 and projected emissions for 2010 and 2020. Greenhouse gas emissions estimated for each of the alternatives comprise between 1 percent and 3 percent of statewide greenhouse gas emissions. As another means of comparison, the total estimated greenhouse gas emissions estimated for Alternative B (Proposed RMP) are approximately equivalent to 2.6 times the reported carbon dioxide emissions from the Nucla Power Plant located in Montrose county for 2008 (EPA 2012a). The total estimated greenhouse gas emissions for Alternative B (Proposed RMP) of 2.27 million metric tonnes are approximately equal to 0.03 percent of the total US 2008 greenhouse gas emissions of 7,048 million metric tonnes of carbon dioxide equivalents (EPA 2012b).

Several activities contribute to the phenomena of climate change, including emissions of greenhouse gas (especially carbon dioxide and methane) from fossil fuel development, large wildland fires and activities using combustion engines; changes to the natural carbon cycle; and changes to radiative forces and reflectivity (albedo). It is important to note that greenhouse gas will have a sustained climatic impact over different temporal scales. For example, recent emissions of carbon dioxide can influence climate for 100 years.

Table 4-12
Estimated Annual GHG Emissions Summary for BLM Actions within the Grand Junction Planning Area

Total Estimated Emissions by Alternative (tonnes per year)					
Scenario	**CO2**	**CH4**	**N2O**	**CO2e**	***CO2eq (million metric tonnes)***
Base Year	351,875	8,383	7	530,150	*0.53*
Alternative A - Year 10	284,012	103,351	7	2,456,664	*2.46*
Alternative B - Year 10	430,816	87,378	9	2,268,493	*2.27*
Alternative C - Year 10	274,830	83,074	8	2,021,729	*2.02*
Alternative D - Year 10	1,287,175	124,950	18	3,916,765	*3.92*
Alternative A - Year 20	230,750	140,305	6	3,179,103	*3.18*
Alternative B - Year 20	457,904	88,092	9	2,310,599	*2.31*
Alternative C - Year 20	218,917	81,395	6	1,930,155	*1.93*
Alternative D - Year 20	1,761,955	177,448	25	5,496,241	*5.50*

Table 4-13
GHG Emissions from BLM Actions as a Percentage of Colorado Statewide GHG Emissions

Grand Junction Planning Area		Colorado Statewide Inventory [a]		% Contribution
Scenario	**Estimated GHG Emissions**	**Year**	**Estimated GHG Emissions**	**BLM GHGs to Colorado GHGs**
	(MMt CO_{2eq})		***(MMt CO_{2eq})***	
Base Year	0.53	Actual Estimated 2005	116	0.46%
Alternative A - Year 10	2.46	Projected 2020	148	1.67%
Alternative A - Year 20	3.18			
Alternative B - Year 10	2.27	Projected 2020	148	1.54%
Alternative B - Year 20	2.31			
Alternative C - Year 10	2.02	Projected 2020	148	1.37%
Alternative C - Year 20	1.93			
Alternative D - Year 10	3.92	Projected 2020	148	2.66%
Alternative D - Year 20	5.50			

[a] *Source: Colorado Greenhouse Gas Inventory and Reference Case Projections 1990-2020 (CCS 2007)*

It may be difficult to discern whether global climate change is already affecting resources in the planning area (as opposed to on a global level). It is important to note that projected changes locally are likely to occur over several decades to a century. Therefore many of the projected changes in the planning area associated with climate change may not be measurably discernible within the

reasonably foreseeable future. Existing climate prediction models are global or continental in scale; therefore they are not appropriate to estimate potential impacts of climate change on the planning area. The current state of the science involves calculating potential quantities of greenhouse gases that may be added to the atmosphere from a particular activity. However, tools to analyze or predict how global or regional climate systems may be affected by a particular activity or activities within the planning area are not currently available. Assessing the impacts of greenhouse gas emissions on global climate change requires modeling on a global scale which is beyond the scope of this analysis. Potential impacts on climate change are influenced by greenhouse gas emission sources from around the globe and it is not possible to distinguish the impacts on global climate change from greenhouse gas emissions originating from the planning area.

CARMMS

The Draft RMP/EIS focused on qualitative impacts on air quality. The analysis was based on quantitative emissions data, and conclusions were relative to the alternatives and a base year emissions inventory. The emissions inventories were based on formal emissions controls and specific levels or forecasted BLM management actions unique to each alternative.

In consideration of disclosing reasonably foreseeable development and cumulative impacts from federal and non-federal oil and gas development, the BLM is conducting the Colorado Air Resources Management Modeling Study (CARMMS). The CARMMS is an umbrella approach for analyzing cumulative impacts to the year 2021. The emissions inventories were revised to comport to the modeling effort, but no longer cover the expected lifespan of the RMP. However, this provides a more gradual and granular look at actual development given the changing nature of air quality and the regulations that drive the need for further future analysis.

CARMMS utilizes the Comprehensive Air-quality Model with extensions (CAMx) to assess statewide impacts to air quality and air quality related values from projected oil and gas development out to year 2021 for three development scenarios (low, medium, and high). CAMx is a one-atmosphere model that considers all future projected emissions (e.g., mining, on-road off-road vehicle travel, stationary sources, natural sources, etc.), not just those from oil and gas activities. CAMx emission estimates are described in this section. CARMMS projections for oil and gas development are based on either the most recent BLM field office Reasonably Foreseeable Development (RFD) documents / analyses (high), or by projecting the current 5-year average oil and gas development paces forward to year 2021 (low). The medium scenario includes the same oil and gas well count projections as the high scenario, but will assume additional emission restrictions, where the high / RFD scenario assumed current O&G development practices and "on the books" emissions controls and regulations (as of year 2013). Each BLM field office / planning area

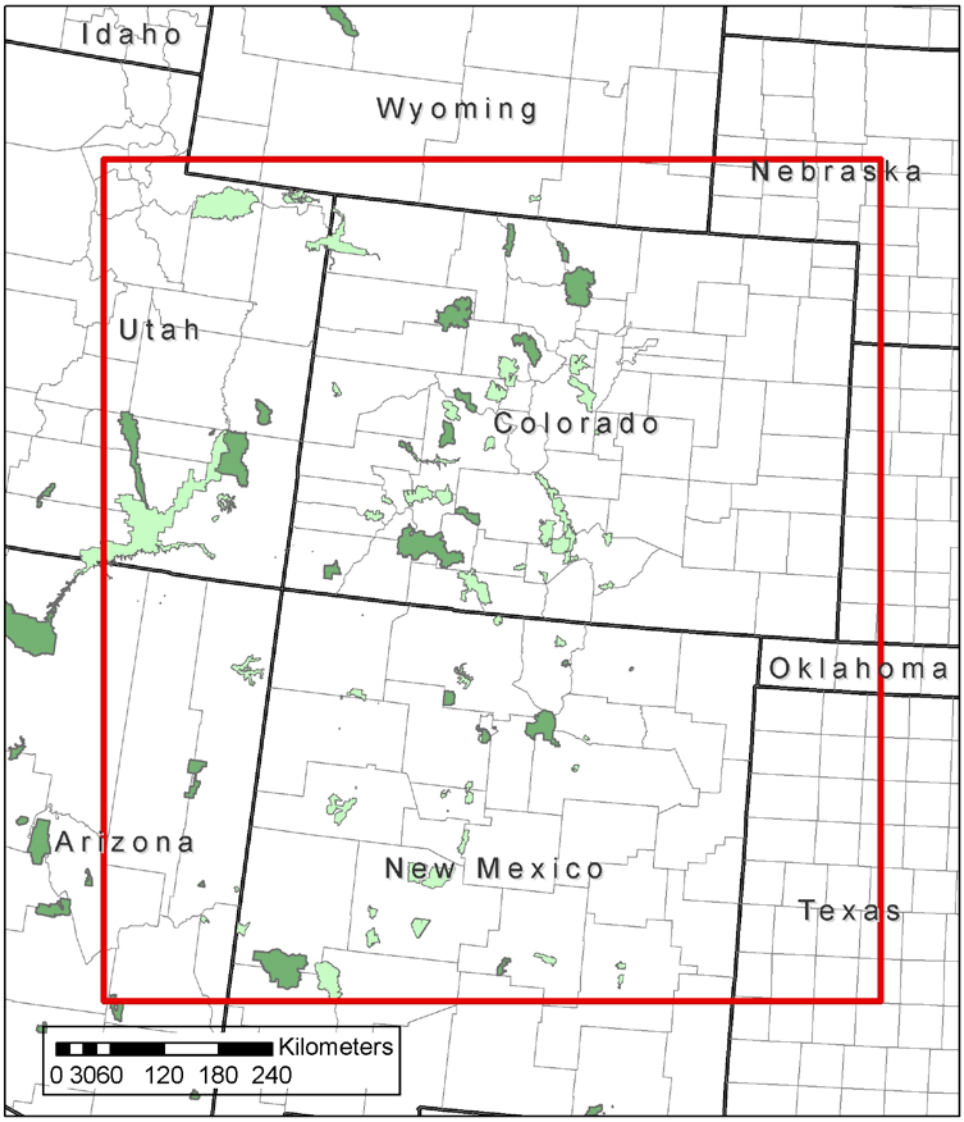
was modeled with CAMx source apportionment technology, meaning that incremental impacts to air pollution, regional ozone and AQRVs from emissions sources in these planning areas are essentially tracked to better understand the significance of oil and gas / minerals development on impacted resources and populations. The CARMMS project leverages the work completed by the WestJumpAQMS and the base model platform and model performance metrics are based on those products (baseline year ~ 2008). At this time, only the CARMMS high / RFD modeling scenario is complete, and thus those results will be used to describe potential air quality impacts for approximately 10 years of future projected federal oil and gas development for GJFO. The 4-kilometer modeling domain used for CARMMS is shown in **Diagram 4-1**.

With respect to the GJFO source apportionment area, the CARMMS high RFD scenario modeled 2,521 additional Federal wells to be developed for years 2012 through year 2021. The annual rate of development (~252 Federal wells per year) was held constant for the modeled scenario timeline. **Table 4-14**, Grand Junction Field Office Oil and Gas Emissions (Tons) - CARMMS RFD Scenario, shows year 2011 and year 2021 GJFO Federal oil and gas emissions for CARMMS.

The annual O&G emissions rates shown in the table above were developed using the following datasets, assumptions and procedures for developing a GJFO specific year 2021 emissions inventory for CARMMS (see Appendix O for more details):

- Emissions for 2011 baseline were estimated and then projected to future year 2021, accounting for O&G activity growth and for applicable air pollutant emissions source controls. On-the-books (current as of year 2013) emissions controls were assumed for future year 2021 western Colorado oil and gas emissions sources.
- For estimating future western Colorado oil and gas emissions, four emissions calculators were developed by well type (oil, gas, CBNG and shale gas) with input data from literature sources including the GJFO AQTSD and western Colorado oil and gas operators input.
- Well pad construction and development emissions inventories account for construction equipment and traffic; drilling, fracking and completion equipment and traffic; wind erosion and natural gas venting and flaring.
- Production phase emissions inventories account for heaters; dehydrators; storage tanks; pneumatics and equipment fugitives; blow-downs; work-overs and re-completions.
- Midstream emissions source inventories account for: natural gas compressor and processing facilities; and gas sweetening.

Diagram 4-1
CARMMS 4-Kilometer Modeling Domain



Legend

- CARMMS 4km Domain
- Class I Areas
- Sensitive Class II Areas

Coordinates of 4km Domain:

SW Corner: (-1260,-720) km
NE Corner: (-396,216) km
(nx,ny) = (216,234)

Projection = Lambert Conformal
parameters:(-97, 40, 33, 45)

Table 4-14
GJFO Federal O&G Emissions (Tons) – CARMMS RFD Scenario*

CARMMS Area ID	Year	PM_{10}	$PM_{2.5}$	VOC	CO	NO_X	SO_2
GJFO	2011	50	24	634	655	535	2
	2021	1,519	328	13,744	5,333	7,670	15

*CARMMS RFD Scenario assumes 252 new Federal O&G wells being developed each year in the GJFO.

For CARMMS, the western Colorado oil and gas emissions calculators were designed to estimate emissions for both Federal and non-Federal activities within the western Colorado BLM planning areas. The emissions for mines on Federal lands were estimated for year 2011 baseline and future year 2021, and were based on a current CDPHE APENs database and available EAs and EISs for mines including the Books Cliff Area and McClane mines in the GJFO Planning Area.

The CARMMS year 2021 cumulative emissions inventory for sources other than additional western Colorado oil and gas development and Colorado Federal mining is made up of the following datasets / emissions inventories:

- For BLM Colorado Royal Gorge Field Office (eastern half of Colorado), year 2011 oil and gas permitted emissions were based on CDPHE APENs database and projected to year 2021 for future projected oil and gas production rates. WRAP Phase III DJ Basin "non-permitted" emissions inventory factors were applied to projected oil and gas production rates to develop RGFO non-permitted year 2021 oil and gas emissions. RGFO year 2021 oil and gas construction / development emissions were estimated using spreadsheet calculators based on oil and gas industry survey data specific to the northern RGFO / PNG Planning Area. Construction emissions were based on current practices (provided by industry) and "on the books" emissions controls for the CARMMS High (RFD) year 2021 modeling scenario.
- Projected year 2021 oil and gas emissions inventories for nearby States / Basins were based on recent RMP / EIS air quality analyses and Regional modeling studies including the Utah ARMS and Wyoming CDC Projects.
- Other anthropogenic for the year 2021 future year were based on 2020 emissions projections compiled by the Three-State Air Quality Study (3SAQS) that were based on EPA's 2020 projections used in the PM2.5 NAAQS rulemaking, which used the EPA's 2007v5 modeling platform. Oil and gas emissions for Colorado, southwestern Wyoming and the Uinta Basin (Utah) were removed from the 3SAQS 2020 emissions inventory and replaced with

CARMMS Colorado-specific oil and gas emissions estimates to avoid double-counting emissions.

- Emissions for the CARMMS year 2021 emissions inventory that remained at year 2008 levels (from WestJUMPAQMS) are biogenic, fire, lightening, sea salt, windblown and Canada and offshore sources emissions. The Western Regional Air Partnership (WRAP) windblown dust model was used to generate windblown emissions, smoke emissions from fires were based on the 2008 fire emissions inventory developed in the Joint Fire Sciences Program DEASCO3 study, and biogenic emissions were generated using enhanced version of the Model Emissions of Gases and Aerosols in Nature (MEGAN).
- On-road mobile source emissions were based on the MOVES2010a model with county-specific data and new spatial surrogates for emissions were developed using the latest 2010 Census data.

The following sub-sections provide CARMMS RFD scenario modeling results for ~ 2,521 new Federal oil and gas wells within the GJFO and cumulative emissions sources.

PSD Pollutant Concentrations

The PSD program is a Clean Air Act permitting program for new and modified major air pollution sources and is administered in Colorado by the CDPHE Air Pollution Control Division (APCD). In this air quality assessment, PSD increment consumption comparisons are provided to evaluate the extent of environmental effects only, and do not constitute a regulatory consumption analysis.

Table 4-15, CARMMS RFD Year 2021-GJFO New Federal Oil and Gas – Max PSD Consumption at Any Domain Class I Area, presents the highest percentage of PSD pollutant consumption at any Class I area due to the projected new Federal oil and gas emissions for the entire GJFO. To leverage modeling data from other studies, CARMMS uses a longitude/latitude origin at (-97, 40) and standard latitude parallels of 33 and 45 degrees. All PSD pollutants contributions from the projected wells and emissions associated with the GJFO source apportioned group are less than 5% of any PSD Class I increment and are thus exceedingly low.

Table 4-16, CARMMS RFD Year 2021-GJFO New Federal Oil and Gas – Max PSD Consumption at Any Domain Class II Area, presents the highest percentage of PSD pollutant consumption at any sensitive Class II area due to the projected new Federal oil and gas emissions for the entire GJFO. All PSD pollutants contributions from the projected O&G wells and emissions associated with the GJFO source apportioned group are less than 15% of any PSD Class I increment at nearby Class II area Colorado National Monument that is located in the GJFO Planning Area.

Table 4-15
CARMMS RFD Year 2021- GJFO New Federal O&G – Max PSD Consumption at Any Domain Class I Area

Pollutant, Averaging Time	PSD Class I Increment	Max @ any Class I Area	Percent of PSD Class I Increment	Class I Area where Max Occurred
NO2, Annual	2.5	0.078	3.1%	Arches
PM10, 24-hour	8	0.130	1.6%	Arches
PM10, Annual	4	0.020	0.5%	Flat_Tops
PM2.5, 24-hour	2	0.094	4.7%	Arches
PM2.5, Annual	1	0.009	0.9%	Flat_Tops
SO2, 3-hour	25	0.003	0.0%	Dinosaur_CO
SO2, 24-hour	5	0.002	0.0%	Arches
SO2, Annual	2	0.000	0.0%	Arches

Table 4-16
CARMMS RFD Year 2021- GJFO New Federal O&G – Max PSD Consumption at Any Domain Sensitive Class II Area

Pollutant, Averaging Time	PSD Class I Increment	Max @ any Class I Area	Percent of PSD Class I Increment	Sensitive Class II Area where Max Occurred
NO2, Annual	2.5	0.170	6.8%	Colorado_NM
PM10, 24-hour	8	0.295	3.7%	Colorado_NM
PM10, Annual	4	0.036	0.9%	Colorado_NM
PM2.5, 24-hour	2	0.242	12.1%	Colorado_NM
PM2.5, Annual	1	0.023	2.3%	Colorado_NM
SO2, 3-hour	25	0.006	0.0%	Colorado_NM
SO2, 24-hour	5	0.003	0.1%	Colorado_NM
SO2, Annual	2	0.001	0.0%	Colorado_NM

AQRV and Ozone Impacts Associated with New GJFO Federal Oil and Gas

Table 4-17, CARMMS RFD Year 2021 - GJFO New Federal Oil and Gas Contribution to Modeled AQRV Impacts, provides a quasi-cumulative summary of ozone, visibility and nitrogen deposition impacts for all of the new projected GJFO Federal oil and gas emissions (since year 2011) associated with the RFD (High) modeling scenario. These impacts show the relative contribution to full cumulative (all world-wide emissions sources) impacts for the projected year 2021 GJFO oil and gas emissions associated with the RFD (high) modeling scenario.

As shown in **Table 4-17** below, there are three and 22 days that the projected new GJFO year 2021 Federal oil and gas emissions (since year 2011) have a significant (~ 0.5 dv) visibility change impact at any Class I and sensitive Class II area, respectively. For visibility change above 1.0 dv (just noticeable change), there are zero and three days predicted for Class I and sensitive Class II areas

Table 4-17
CARMMS RFD Year 2021- GJFO New Federal O&G Contribution to Modeled AQRV Impacts*

Source Group	Maximum Number of Annual Days Above 0.5 dv Change @ Class I Area	Maximum Number of Annual Days Above 0.5 dv Change @ Sensitive Class II Area	Maximum Modeled Annual Nitrogen Deposition @ Any Class I / Sensitive Class II Area (kg/ha-yr)	Maximum 4th High Daily 8-hour Ozone Contribution (ppb)
GJFO	3 (Arches NP)	22 (Colorado NM)	0.0718 (Flat Tops Wilderness)	4.4

* Maximum modeled concentrations / values for any Class I / sensitive Class II area (AQRV – visibility and deposition) or grid cell (ozone) within the CARMMS 4km modeling domain (includes all of Colorado).

(the three days occur at Colorado NM), respectively. As shown, the maximum modeled nitrogen deposition contributions are minimal with respect to the cumulative critical nitrogen deposition load of 1.5 kg/ha-yr value. Maximum sulfur deposition at any Class I or sensitive Class II area is less than 0.001 kg/ha-yr for new GJFO Federal oil and gas emissions. The maximum contributions to 4th high daily maximum 8-hour concentrations are minimal (shown in table) with respect to the 75 ppb 8-hour ozone standard. The information above shows that the predicted air quality impact contributions associated with an aggressive 10-year oil and gas development scenario for the entire GJFO are relatively small, and it is reasonable to conclude that project-level O&G development (based on actual development plans) would have even lower contributions to the overall cumulative air quality.

For a Project, the ANC Level of Acceptable Change (LAC) threshold is no change greater than 10% for lakes with base ANC > 25 μeq/l and no change greater than 1 μeq/l for lakes with base ANC values < 25 μeq/l. The ANC calculations due to nitrogen and sulfur deposition from the GJFO Federal O&G RFD scenario are shown in **Table 4-18**, CARMMS RFD Year 2021 - GJFO New Federal Oil and Gas- ANC Changes. Specifically, the table shows all of the lakes where the delta in ANC % showed a change as a result of the new projected GJFO Federal oil and gas emissions (since year 2011) associated with the CARMMS RFD modeling scenario. All of the values are below the USFS ANC LAC threshold at all sensitive lakes. The USDA Forest Service methodology reports both Delta ANC calculations and LAC thresholds as positive quantities; however they reflect a decrease in lake ANC.

AQRV Impacts Associated with Cumulative Sources

Table 4-19, CARMMS Modeled AQRV Impacts - High 2021 Scenario - Full Cumulative Emissions Inventory, provides a full cumulative summary of ozone, visibility and nitrogen deposition impacts for all (i.e., world-wide) new and existing emissions sources associated with the CARMMS RFD (High) year 2021 modeling scenario.

Table 4-18
CARMMS RFD Year 2021- GJFO New Federal O&G – ANC Changes*

National Forest	Wilderness Area - Lake	10th Percentile Lowest ANC Value (μeq/L)	Delta ANC (%)	Delta ANC (μeq/L)	USFS LAC Threshold	Below Threshold?
White River	Upper Ned Wilson Lake	12.9	3.15%	0.4059	<1(μeq/L)	yes
Gunnison	Deep Creek Lake	20.6	2.40%	0.4949	<1(μeq/L)	yes
San Juan-Rio Grande	White Dome Lake	2.1	3.22%	0.0664	<1(μeq/L)	yes

*Highest impacts (associated with CARMMS RFD Scenario new GJFO Federal O&G) for top three lakes (with respect to highest Delta ANC percent change) for all sensitive lakes within the CARMMS 4km modeling domain.

Table 4-19
CARMMS Modeled AQRV Impacts - High 2021 Scenario - Full Cumulative Emissions Inventory*

Class I Area	Best 20% Days Visibility Metric (dv) - 2021 High Improvement from 2008	Worst 20% Days Visibility Metric (dv) - 2021 High Improvement from 2008	Modeled Annual Nitrogen Deposition (kg/ha-yr)
Arches NP	-0.11	0.39	1.5559
Flat Tops Wilderness	0.04	0.61	2.3908

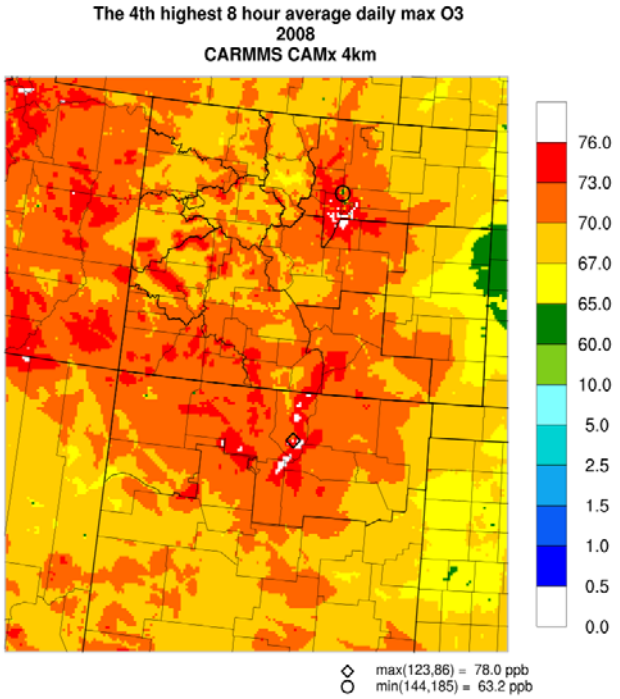
* Positive visibility related values mean overall visibility improvement and deposition values are average for all grid cells making up the Class I area.

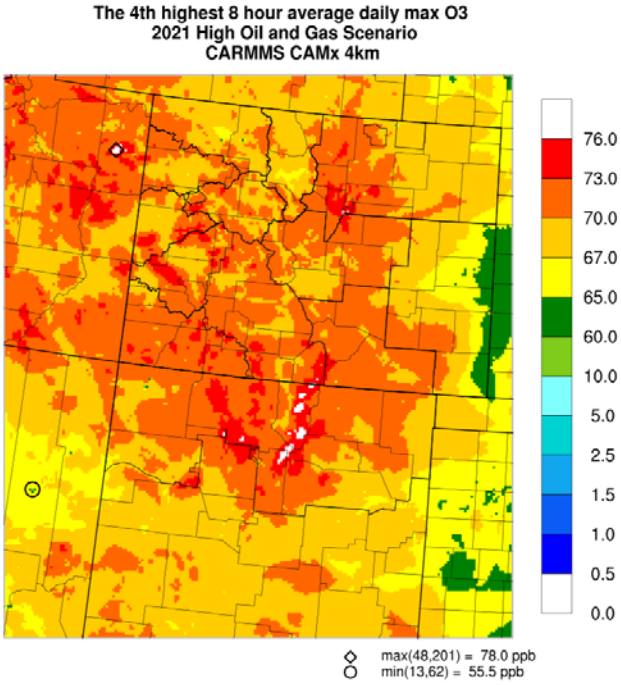
As shown in **Table 4-19**, the model predicted that the highest impacted Class I areas (relative to potential GJFO oil and gas development) would see improvements for worst visibility days and could see slight (~ 0.1 dv) degradation for best visibility days at Arches NP and improvement for best visibility days at Flat Tops Wilderness. Modeled year 2021 annual nitrogen deposition for nearby Class I areas compare well to the total actual observed nitrogen deposition values for current years (see Chapter 3 ~ Affected Environment for current conditions information), suggesting little change in cumulative deposition from baseline years monitored to future year 2021. Using the baseline / current years monitored nitrogen and sulfur deposition rates data with year 2021 CARMMS cumulative modeling results, it is reasonable to conclude that the ANC of Lakes within the immediate area in year 2021 would be similar to baseline / current ANC conditions since ANC changes are directly related to the amount of nitrogen and sulfur deposition.

Cumulative Ozone and Other Criteria Pollutants Impacts

For full cumulative ozone design value projections at regional ozone monitoring sites, the maximum current year 8-hour ozone design concentration (DVC; based on 2006-2010 observations) is 82.0 ppb at the Rocky Flats North (CO_Jefferson_006) monitor that is projected to be reduced to 79.5 ppb for the CARMMS 2021 High Development Scenario. With the exception of the Larimer County, Colorado monitors, modeled ozone predictions at all monitors within the modeling domain result in lower future 2021 values. For the ozone design value projection unmonitored area analysis (analysis for areas with no monitors), the geographical extent (i.e., size) of the overall area of ozone design value exceedances is reduced (from years 2008 to 2021) and CARMMS plots show the largest ozone reductions in the Denver and Salt Lake City areas and ozone increases in Garfield County, Colorado.

The following plots show the projected cumulative impacts to the 4th highest daily maximum 8-hour ozone concentration at locations throughout the modeling domain. The modeled values presented are the maximum predicted for each location and would not necessarily occur on the same day for all locations. Areas colored in white are those locations / grid cells with a projected maximum value at or above 76 ppb, indicating a projected exceedance of the ozone standard. Other colors represent areas with projected maximum values at or below the standard of 75 ppb. The projected values for the year 2008 base case are shown on the first map. The second map shows projected values for the CARMMS year 2021 RFD / high O&G development scenario. The modeling analysis predicts exceedances of the ozone standard in some areas,

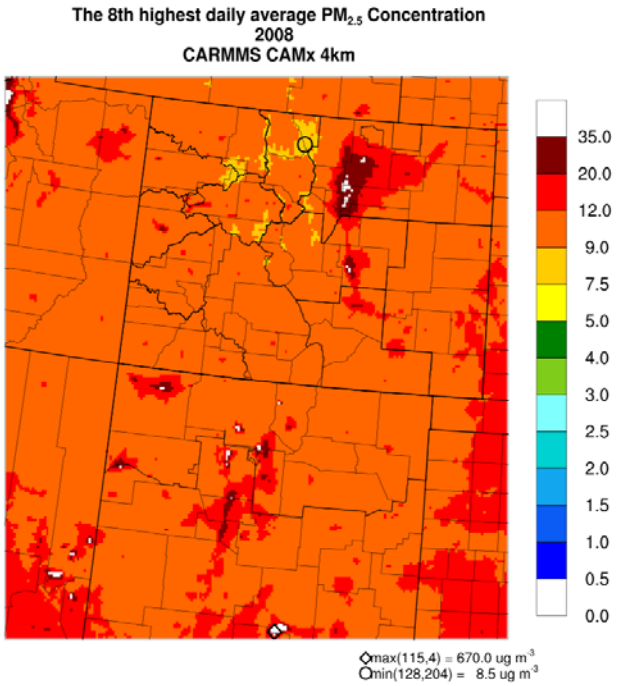


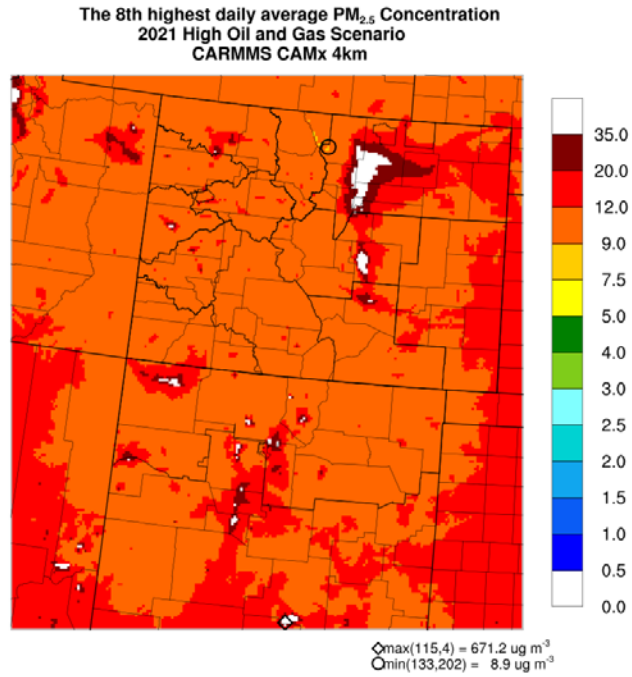


particularly in the Front Range urban area, which is consistent with monitoring data / information. The model predicts some increases and some decreases by year 2021 in the 4th highest daily maximum 8-hour ozone concentration, but the overall extent of exceedances is predicted to decrease, particularly in the Denver Metro area.

The following plots show CARMMS cumulative predicted values for the 8th highest daily average $PM_{2.5}$ concentration for the year 2008 base case and the CARMMS 2021 RFD / high scenario across the modeling domain. White shading indicates areas that are projected to exceed the $PM_{2.5}$ 24-hour standard. The maximum 8th high 24-hour $PM_{2.5}$ in 2008 (670 µg/m³) and 2021 (671 µg/m³) exceed the 35 µg/m³ NAAQS. These high values occur on the southern border of the CARMMS domain and are due to smoke emissions from wildfires. Within Colorado, the modeling results show that western Colorado areas with elevated $PM_{2.5}$ 24-hour average concentrations for base year 2008 are projected to grow by year 2021.

The CARMMS cumulative highest annual average $PM_{2.5}$ concentration is ~30 µg/m³ (annual ambient standard ~ 12 µg/m³) in both the year 2008 and 2021 modeling scenarios and occurs in the southern most portion of the modeling domain near Ruidoso, New Mexico; this maximum concentration is due to wildfires. The maximum predicted contribution from new GJFO Federal oil and gas emissions to the 8th highest 24-hour and annual $PM_{2.5}$ concentrations under the 2021 RFD / high oil and gas development scenario are 1.2 µg/m3 and 1.0 µg/m3, respectively.





As described for $PM_{2.5}$ 24-hour average concentrations, the modeling results show that western Colorado areas with elevated PM_{10} 24-hour average concentrations for base year 2008 are projected to grow by year 2021. The maximum 2nd highest 24-hour PM10 contribution for projected new (post year 2011) GJFO Federal oil and gas emissions is 7.9 ug/m^3.

New projected GJFO oil and gas emissions have very small contributions to SO_2 concentrations with contributions for all SO_2 averaging times being less than 1 ug/m^3.

As described earlier, the CARMMS includes two other future modeling scenarios (other than the RFD / high scenario): low scenario developed by projecting the current 5-year average development paces forward to year 2021, and the medium scenario that includes the same oil and gas well count projections as the RFD / high scenario, but assumes additional air pollutant emission restrictions beyond current "on-the-books" regulations. As future oil and gas development occurs in Colorado, modeling results for all CARMMS scenarios will be used to correctly assess the levels (pace) of oil and gas development and corresponding air quality impacts for each BLM Colorado planning area / Field Office for making implementation decisions.

As part of an accounting process to validate the applicability of CARMMS (and other modeling studies) during the authorization of future emission-generating activities, the BLM Colorado will add project-specific emissions to actual total regional air pollutant emissions estimates to compare to the GJFO oil and gas and other regional emissions rates modeled in cumulative air quality modeling studies (CARMMS). Regional study / CARMMS results for each modeling scenario / emissions inventory will be evaluated to confirm that the activities being approved by the BLM Colorado are within the modeled inventory levels that correlate with acceptable air quality impacts. Substantial emission-generating activities cannot occur without further BLM analysis and approval of proposals for exploration and development operations. Using CARMMS, new air pollutant monitoring data and other air quality analyses, the BLM may make its approval of these activities subject to conditions of approval (COA) addressing air pollutant emissions, as appropriate.

Near-Field Impacts Analysis Tools

As described in the CARPP (see Appendix G), project-specific near-field analyses based on actual resource development plans and details will be conducted on a case-by-case basis at the project-level / APD stage. Currently, the BLM Colorado has several near-field modeling analyses and tools that could be used to assess project-specific impacts at the APD / project-level stage for future GJFO O&G or other resource development. These tools / analyses include:

- BLM Colorado near-field modeling screening tool that estimates near-field impacts for 5-years of Colorado-based meteorology for

various receptor distances and elevations from centralized point and volume sources. The modeling tool also includes air quality impacts analysis for ~ ½ mile roadway development and traffic. This tool could be used to access impacts associated with oil and gas and other resource development.

- The near-field modeling analyses completed for the GJFO Fram Whitewater Master Development Plan Environmental Assessment (BLM 2013a) and Black Hills DeBeque Exploratory Proposal Environmental Assessment (BLM 2013b) are for multiple oil and gas wells development projects in the GJFO Planning Area. Near-field modeling analyses were conducted for both projects that indicated that pollutant impacts from the proposed development plans would be in compliance with National Ambient Air Quality Standards (NAAQS), Colorado Ambient Air Quality Standards (CAAQS), and that hazardous air pollutant (HAP) concentrations of benzene, ethyl benzene, formaldehyde, n-hexane, toluene and xylene would be below acceptable threshold values. Near-field impacts from oil and gas field development and field production were analyzed.

For instances when the project-level oil and gas development plans compare well with levels analyzed in recent GJFO oil and gas development EAs, the BLM may utilize and apply the discussion and analyses that have already been completed for future NEPA documents. For new development plans that seem "unique" with respect to topography or location, or have levels of projected resource development beyond what has been already analyzed, new near-field modeling analyses will be conducted on a case-by-case basis.

4.3.2 Soil Resources

This section discusses impacts on soils from proposed management actions of other resources and resource uses. Existing conditions are described in **Section 3.2.4**, Soil Resources. Impacts on soil resources from implementation of each alternative are summarized in the subsections that follow.

Direct and indirect impacts from resource programs on soil resources are generally mitigated by avoiding or minimizing the impact to the degree practicable using stipulations (e.g., NSO and CSU). The various management actions and allowable use decisions outlined in **Chapter 2** and stipulations described in **Appendix B** emphasize this approach for maintaining, improving, and conserving soil resources. Impacts that cannot be avoided would at least be minimized by the application of COAs, BMPs, and standard operating procedures (SOPs; see **Appendix H**).

Impacts on soil resources can result from a number of causes, including livestock grazing, recreation, mineral resource activities, renewable energy development, road construction, and other surface-disturbing activities. Impacts on soil resources include compaction, composition alteration, and erosion. The

intensity and extent of impacts on soil resources are determined in part by the type and location of the surface-disturbing activities and surface occupancy. For example, soil erosion from roads depends on physical soil factors, road or trail grade and position on the landscape, road design factors, traffic type and volumes, and the effectiveness of drainage maintenance. Impacts on soil resources can also be affected by any applicable stipulations (**Appendix B**) and plans of operations that address site-specific environmental concerns and require mitigation to stabilize soil, to prevent unnecessary erosion, and to revegetate disturbed surfaces. Impacts on soil resources are described below.

Surface-disturbing activities and surface occupancy can impact soil resources by destroying biological soil crusts and desert pavement. Where present, biological soil crusts could be crushed during surface disturbance. Underlying soils would no longer be protected from wind and water erosion. The destruction of biologic soil crusts reduces soil surface resistance to erosion, increasing soil loss and sediment transport in these areas.

Surface-disturbing activities and surface occupancy can impact soil resources by compacting soil. In some cases, soil compaction aids in plant establishment and growth. However, too much compaction decreases water infiltration rates and gas exchange rates. Decreased gas exchange rates can cause aeration problems, induce nitrogen and potassium deficiency, and negatively impact root metabolism, all stressing agents of vegetation, which is a key component of soil stabilization. As soil compaction increases, the soil's ability to support vegetation diminishes because the resulting increase in soil strength and change in soil structure (loss of porosity) inhibit root system growth and reduce water infiltration. As vegetative cover, water infiltration, and soil stabilizing crusts are diminished or disrupted, the surface water runoff rates increase, further accelerating rates of soil erosion.

Mixing of soil horizons can also result from surface-disturbing activities, as well as loss of the A horizon, which is the top layer of the soil horizon or the topsoil, via such erosional forces as wind and water. Mixing of topsoil and subsoil and loss of the A horizon remove surface cover for erosion control and organic matter inputs for nutrient recycling. The result is decreased soil productivity in the long term, inhibiting revegetation, decreasing soil reclamation potential, and increasing suitability for noxious and invasive species.

Surface-disturbing activities and surface occupancy that remove desirable plant communities can impact soil resources. Because plants stabilize the soil, the loss of plants increases the potential for soil erosion by water and wind. The erosion of soil diminishes soil productivity. Furthermore, the movement of soil during erosion mixes soil, thereby altering soil chemistry and composition. Soil resources, especially on steep slopes and in fragile soil areas, are susceptible to impacts from surface disturbance and compaction, which can lead to accelerated erosion, soil loss, and reduced productivity.

Surface-disturbing activities and removal of effective ground cover (vegetation and litter accumulation) can impact soil resources by altering the reproductive capabilities of desirable vegetative communities. Alteration of the reproductive capabilities of desirable vegetative communities by livestock, for example, can increase the potential for undesirable plant species (noxious or invasive weeds) to become established. These species may lack soil stabilizing characteristics, compared to desirable plant species.

Studies indicate that impacts on soils from motorized recreation are generally more pronounced than those resulting from mechanized and nonmotorized use but that trail design has the largest impact on soil conditions (Marion and Olive 2006; White et al. 2006; Wilson and Seney 1994). Research also indicates that intense horse use can cause significant impacts on soil erosion, which could be an even more significant impact in areas with poorly designed or maintained trails (Aust et al. 2004; Wilson and Seney 1994). Soils in areas that receive intense recreation tend to become compacted, less able to hold moisture, less biodiverse, and more vulnerable to erosion. Localized vegetation loss is also experienced on trails, parking areas and campsites, and the loss of these root systems further degrades soil health. Alternatives that direct recreation into areas that have more stable soils can limit the overall damaging effects on soils in the planning area.

Dispersed recreation tends to result in more dispersed, less intensive impacts related to compaction and loss of soils. Areas damaged by dispersed recreation can generally return to pre-damaged conditions better than areas that had been used for intensive recreation because of the surrounding vegetation, microclimates, and soil biology needed for the decompaction and recolonization of soils.

Impacts from recreation on roads and trails manifest themselves as compaction, muddiness, displacement, and erosion. Poorly constructed or poorly maintained roads and trails would have the greatest potential to negatively impact soil resources regardless of the type of use. Recreational habits (e.g., creating unauthorized trails, trail braiding, etc.) can also play a role in potential road and trail widening and resultant impacts on soil resources. Impacts can be magnified by the intensity of use, especially on poorly designed or maintained roads and trails.

Surface disturbance associated with livestock grazing (hoof action) can also improve soil health. Impacts can occur when grazing animals help incorporate seeds into soil surfaces. Another example of an impact that can improve soil resources is where the soil surface becomes pocked from animals' hoofs. The pocked surface can help trap seeds and moisture essential for establishing desirable vegetation. Pocking also can increase surface roughness in disturbed areas, slowing erosion associated with surface water runoff. The impacts on soil

resources from hoofs vary by soil characteristic, slope, aspect, site potential, and intensity/type of livestock use (for example, trailing versus extended grazing).

Impacts on soil resources related to planned and unplanned wildland fires are complex and involve changes in nutrient cycling, water infiltration and runoff, and erosion potential (Moody et al. 2008; Martin and Moody 2001; Moody and Martin 2001). Impacts are a function of the severity of the burn, whether the vegetation community is adapted to fire, the fire condition class of the vegetation community, and the condition of soils before the burn. Impacts include soil erosion by wind and water, changes in soil structure and chemistry, and soil compaction and displacement. Effective fire prescriptions on planned fires, effective suppression tactics on unplanned wildfires, and other surface-disturbing tactics to suppress fires can minimize or mitigate some of these impacts.

Methods of Analysis

Indicators of impacts on soil resources include the following:

- Declining soil surface health, with soils either unable to support vegetation and crusts or soils that are not up to the potential for a particular ecological site (e.g., vegetation type, diversity, density, and vigor)
- The inability to meet BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado

All land uses would conform to BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado, which describe conditions needed to sustain public land health and relate to all uses of the public lands. Standard 1 addresses soil resources and is incorporated as a goal. Environmental consequences resulting from proposed management action or allowable use decisions are analyzed based on their ability to contribute to help maintain, to achieve, or to hinder meeting Standard 1.

Impact discussions under Effects Common to All Alternatives and Alternatives A through D are based on the general descriptions of soil impacts presented here. General impacts are discussed first based on uses that cause surface disturbance and compaction; then impacts are discussed based on brief overviews of potential impacts from roads and trails, travel, mineral development, livestock grazing, utility lines, fire, and changes in vegetation communities. A brief listing of other soil impacts is also presented.

The analysis includes the following assumptions:

- Soil resources will be managed to meet Standard 1 of the BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado.

- Soils will be managed to minimize erosion and maintain soil productivity.

Impact analyses and conclusions are based on interdisciplinary team knowledge of resources in the planning area, a literature review, and information provided by experts in the BLM or other agencies. Impacts are based on the design of the alternatives under consideration, and effects are quantified where possible. In the absence of quantitative data, best professional judgment prevailed.

Effects Common to All Alternatives

Primary impacts on soil resources are anticipated to result from surface disturbance associated with travel and transportation management, motorized/mechanized forms of recreation, mineral development, livestock grazing, alteration of native/desirable vegetative communities, ROWs/land use authorizations, and fire management actions. Resource management actions that minimize, preclude, or stipulate surface-disturbing actions, such as those associated with special management areas (e.g., ACECs, SRMAs), lands with wilderness characteristics, water, WSRs, fish and wildlife, and special status species would help maintain or improve soil conditions. As possible, impacts on soils are presented in the order listed in this paragraph in the following subsections. Minor impacts on soils from other resources also are described where applicable.

Each of the alternatives would maintain the goal that upland soils meet Standard 1, including maintaining soil moisture necessary for optimal plant growth and vigor, while minimizing surface runoff and soil erosion. Management actions would focus on maintaining or improving soil health. Maintenance or improvement of soil health would help maintain or improve proper function and condition of vegetative communities and watersheds within the planning area.

Under all alternatives, surface disturbance associated with existing roads and trails, construction of new roads and trails, or increased access and maintenance activities would impact soil resources. Impacts would be mitigated using BMPs for road and trail design, layout, construction, and maintenance.

BLM on-site management of recreation, as well as designation and closure of travel routes, could prevent impacts. For example, where recreation is managed within an SRMA, and to a lesser extent ERMAs, rules and guidelines would limit or control activities through specialized management tools such as designated campsites, permits, area closures, and limitations on number of users and duration of use. Impacts would vary depending on the RMA, as each RMA would be managed for certain recreation outcomes and setting prescriptions. Impacts on soil resources would be concentrated in these areas but would limit more extensive, widespread impacts, and would reduce adverse impacts on soils throughout the decision area.

Where allowed, development of coal resources would involve impacts on soils from infrastructure (e.g., roads, railways, waste piles, water pipelines) and subsidence (caused by mining minerals). Land subsidence would impact soil resources by establishing new drainage patterns, which could cause erosion. Dewatering from wet coal seams could impact soils depending on the rate and volume of water being discharged.

Impacts on soils from the development of fluid mineral (e.g., oil and gas, tar sands, and geothermal resources), locatable mineral, mineral material, and non-energy leasable mineral development could include erosion; alteration of runoff intensity, timing, and volume; soil contamination; mixing of soil horizons; soil compaction; and weed infestations in disturbed areas. Stipulations designed to protect other resources would indirectly protect soil resources from erosion, compaction, alterations to natural drainage patterns, and modifications to timing and intensity of runoff from these areas, or other related impacts. **Appendix B**, Stipulations Applicable to Fluid Mineral Leasing and Other Surface-disturbing Activities, includes the full list of stipulations that would restrict surface disturbances. Proposed mineral withdrawals to protect bats could also prevent surface-disturbing impacts on soils.

Emissions associated with mineral development/energy production could contribute airborne pollutants under all alternatives. Deposition of airborne pollutants could contaminate soils, impairing vegetation function and condition, which could increase the potential for bare ground, resulting in erosion and future fugitive dust production.

Livestock grazing would continue within the planning area under all alternatives. The types of impacts on soil resources from grazing are consistent throughout all alternatives. However, the severity of these impacts would vary greatly depending on grazing intensity, season of use, climatic conditions, and range site potential. Under all alternatives, soil conditions and land health would be evaluated when allotment management plans are required. Actions under each alternative that would allow periods of rest, as needed, in livestock grazing allotments would help elevate effective ground cover and promote higher rates of litter accumulation. Increasing litter and ground cover would reduce erosion from overland flow and allow water to infiltrate more efficiently into soils, improving soil moisture and reducing erosion potential. Increased soil moisture also would help establish and maintain desirable plant species, which also reduces erosion potential.

High-severity fires remove vegetation and soil surface cover, drastically increasing the potential for soil erosion by wind and water. These fires also change soil structure and chemistry, resulting in the potential development of hydrophobic layers that increase post-fire runoff. Use of heavy equipment for surface-disturbing fire suppression tactics can cause soil compaction and displacement, and chemical retardant can alter soil chemistry. Effective fire

prescriptions on planned fires, effective suppression tactics on unplanned wildfires, and other surface-disturbing tactics to suppress fires can minimize or mitigate some of these impacts.

Proposed vegetation management would affect soil resources. The condition of soil resources is intricately tied to the condition of vegetation resources within the planning area. Goals under all alternatives are to meet BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado and to improve and maintain vegetation resources, which would benefit soils by reducing the likelihood of erosion, desertification, and related impacts on soil resources. Managing riparian habitat to meet Public Land Health Standard 2 and managing plant and animal communities to meet Public Land Health Standard 3 would improve soil health.

In situations where sediment control structures, commonly referred to as check dams, are causing excessive erosion, restoration may be necessary. Restoration may include notching or removal of the structure entirely, as well as revegetating the affected area.

Special status species and fish and wildlife habitat improvement projects aimed at restoring natural vegetative communities or fire regimes would improve the stability and condition of soil resources by improving vegetative cover and enhancing soil moisture. Habitat improvement projects involving stock tanks or other water developments would affect the distribution of livestock/wildlife. Some areas could receive less traffic and positively impact soil resources, where other areas (near water) could experience heavier grazing and negatively impact soil resources.

Under all alternatives, the Badger Wash ACEC would be maintained as a study area which would help evaluate soil erosion and sediment and salt delivery to surface waters in the Lower Colorado River Basin. This area would be designated to protect rare plants and used as a hydrologic study area involving paired watersheds. The ungrazed watersheds in the study area would be closed to grazing under all alternatives. The information gained in this ACEC could benefit soil management throughout the planning area.

Each of the alternatives would manage wild horses (*Equus ferus*) to the appropriate management level (AML) in the LBCWHR, which would prevent overuse and potential impacts on soils, such as erosion and compaction.

Climate change would impact soil resources under all alternatives, but soil resources may be more vulnerable to the impacts of climate change under certain alternatives. Resource uses in the planning area (e.g., livestock grazing, forestry, recreation, travel, lands and realty, and energy and minerals leasing and development) are stressors that may generally impact soil's ability to adapt to climate change. These impacts would likely be more harmful to soil resources under Alternatives A and D where there are fewer restrictions on resource

uses. Under Alternative C, more stringent restrictions would limit the impact of these stressors (as described in the analysis under Alternative C, below). Soil's ability to adapt to climate change under Alternative B would likely fall between the other alternatives because resource use restrictions are generally more stringent than under Alternatives A and D, but less stringent than under Alternative C.

Implementing management for the following resources would have negligible or no impact on soil resources and are therefore not discussed in detail: paleontology; lands with wilderness characteristics; national trails; and national, state, and BLM byways.

Alternative A

Overall, proposed resource management actions and resource uses under Alternative A would impact soils. The most substantial impacts would come from the large extent of the planning area that would be open to cross-country travel and intensive motorized use (**Tables 4-20**, Acres of Travel Management Designations for Motorized Use by Soil Characteristic under Alternative A, and **4-21**, Miles of Roads and Trails by Soil Characteristic under Alternative A), which would result in loss of vegetation, destruction of soil crusts, and destabilization of surface soils. The degree of impacts on soil resources from motorized recreation is most severe in or near existing high use areas. Impacts from motorized recreation would however not be isolated to these existing high use areas and would have the potential to occur throughout the planning area. Similar impacts on soil resources could result from intensive non-motorized recreation (bike, horse, foot). However, many of these impacts would be centered on existing travel facilities (e.g., roads, trails, campgrounds) that typically experience higher user volumes. Impacts on soils from intensive non-motorized uses in these areas would be expected to grow as do the number or recreationists. Alternative A also would leave large areas open to mineral development with few NSO and CSU stipulations (**Table 4-22**, Areas of Stipulations for Soil Resources and All Stipulations by Alternative) to protect resources, which would have a substantial impact on soil resources. The likely level of mineral development would result in a progressive increase in the amount and severity of soil disturbance. The impacts of mineral development on soils are described in detail at the beginning of this section. Under Alternative A, soil surface health could decline, being able to support less vegetation and biological soil crust. Soil productivity would be expected to decline over time as user-created routes and diffuse off-road use increased.

Under Alternative A, there would be fewer targeted management actions to facilitate recreation experiences in SRMAs. As a result, more dispersed recreation would occur under this alternative, including non-motorized and motorized uses. Under this alternative, 445,400 acres would continue to be open to cross-country motorized use and 12,500 acres to intensive motorized

Table 4-20
Acres of Travel Management Designations for Motorized Use by Soil Characteristic under Alternative A

Travel Management Designations	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Closed to Motorized Use	100	3,400	2,900	0	10,200
Motorized Vehicles Limited to Designated Routes	85,200	41,100	70,200	26,400	65,100
Motorized Vehicles Limited to Existing Routes	137,700	113,500	148,100	7,400	90,600
Open to Intensive Motorized Use	0	11,400	10,600	8,100	1,600
Open to Cross-country Motorized Use	257,600	1,800	75,700	0	179,000
Total	**480,600**	**171,200**	**307,500**	**41,900**	**346,500**

Source: BLM 2010a
Note: Soil characteristics may overlap in certain areas.

Table 4-21
Miles of Roads and Trails by Soil Characteristic under Alternative A

Roads and Trails with Motorized Use	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Undesignated	849	905	1,038	129	177
Designated for Full-sized Motorized Vehicles	21	102	109	2	5
Designated for Full-sized Motorized Vehicles (Seasonal Limitations*)	3	1	1	0	0
Designated for Vehicles Under 50 Inches in Width	0	3	5	0	1
Designated for Vehicles Under 50 Inches in Width (Seasonal Limits*)	0	0	0	0	0
Designated for Motorcycle, Mechanized, Foot, and Horse Travel	0	42	42	0	2
Designated for Mechanized, Foot, and Horse Travel	1	21	18	0	4
Designated for Mechanized and Foot Travel	0	0	0	0	1
Designated for Foot and Horse Travel	1	0	0	0	1
Designated for Mechanized Travel	0	0	0	0	0
Designated for Foot Travel	1	0	0	0	1
Designated for Administrative/Permitted Use	10	31	40	2	3
Designated for Closure and Rehabilitation	16	7	17	3	4
Total	**886**	**1,105**	**1,253**	**133**	**195**

Source: BLM 2010a
* Winter Closure (December 1 through May 1)
Notes: Soil characteristics may overlap in certain areas. Under Alternative A, mechanized, horse, and foot travel are only subject to route designations in Bangs Canyon SRMA RMZs 1, 2, and 3.

Table 4-22
Areas of Stipulations for Soil Resources and All Stipulations by Alternative

Stipulation	Description	Alt A	Alt B	Alt C	Alt D
Stipulations for Soil Resources					
NSO-1	Soils in the Baxter/Douglas Slump Area	53,100	0	0	0
NSO-1	Soils in the Plateau Area	900	0	0	0
NSO-3	Steep Slopes (40 Percent or Greater)*	318,200	0	0	0
NSO-9	Slumping Soils (Slump Areas)	0	54,500	0	0
GEOLOGY SOIL NSO CO/NSO-10	Fragile Soils	0	0	481,600	0
GEOLOGY SLOPE NSO CO/NSO-11	Steep Slopes Greater than or Equal to 40 Percent	0	347,700	347,700	347,700
Subtotal of NSO stipulations for soil resources		*372,200*	*402,200*	*829,300*	*347,700*
GEOLOGY SOIL CSU CO	Fragile Soils	0	481,600	0	0
CSU-6	Mapped Mancos Shale and Saline Soils	0	355,500	355,500	355,500
CSU-7	Natural Slopes (25 to 40 Percent)	0	0	173,100	0
Subtotal of CSU stipulations for soil resources		*0*	*837,100*	*528,600*	*355,500*
All Stipulations					
Total NSOs	Combined for all resources	433,000	670,300	858,000	497,800
Total CSUs	Combined for all resources	98,800	642,400	664,400	471,500
Total TLs	Combined for all resources	266,200	526,400	507,200	487,900

Source: BLM 2010a
* Acreage was not calculated using GIS and thus differs from the other alternatives.

use, resulting in impacts on soils described at the beginning of this section. Approximately 35,300 acres would continue to be permanently closed to motorized use (and motorized and mechanized use would be limited to existing ways in the WSAs). Because recreational use would not be managed and marketed in specific areas, it would occur throughout the planning area. The combination of these factors likely would result in soil impacts from recreational use being more widely distributed throughout the planning area, including areas with fragile soils, steep slopes, or otherwise less suitable soils.

Seasonal travel limitations on 106,200 acres would continue to limit erosion during sensitive times of the year. (Criteria used for selection of area and route designations can be found in **Appendix M**, Travel Management Plan.) Impacts on soils where roads or trails could be expanded through cross-country travel are described at the beginning of this section. Under Alternative A, 11,400 acres of Mancos Shale mapped areas and 10,600 acres of saline soils would continue to be open to intensive motorized use. Another 257,600 acres of fragile soils,

1,800 acres of Mancos Shale mapped areas, 75,700 acres of saline soils, and 179,000 acres of steep slopes would be open to cross-country motorized use (see **Table 4-20**, Acres of Travel Management Designations for Motorized Use by Soil Characteristic under Alternative A). Total roads and trails use by road and trail designation is shown in **Table 4-21**, Miles of Roads and Trails by Soil Characteristic under Alternative A. These values include designated roads and trails, those roads and trails without a use designation, and roads and trails that are proposed for closure and rehabilitation.

Management of soil resources would continue to limit disturbance when soils are saturated or frozen and would determine soil suitability to support surface-disturbing projects. Impacts that could be avoided would be minimized by the application of COAs, BMPs, and SOPs (**Appendix H**). NSO stipulations NSO-1 and NSO-3, which were developed specifically to address soils, would continue to protect soils from surface-disturbing impacts associated with fluid mineral development. The acres of stipulations that were developed for soil resources, as well as the total acres of stipulations by alternative are presented in **Table 4-22**, Areas of Stipulations for Soil Resources and All Stipulations by Alternative. Alternative A would include 433,000 acres of NSO stipulations, which would protect soil resources from surface disturbances, soil erosion, and compaction associated with fluid mineral development.

Under Alternative A, 300,700 acres of the planning area would continue to be acceptable for coal leasing and development, 964,800 acres would be open to fluid mineral development, 433,000 acres would be open to leasing subject to NSO stipulations, 74,100 acres would be open to leasing subject to CSU stipulations, 233,000 acres would be open to leasing subject to TL stipulations. Approximately 1,047,100 acres would be open to locatable mineral development, and 787,100 acres would be open to mineral material disposal. The impacts of these activities on soils are described in detail at the beginning of this section.

Because of lands and realty management, some areas would be unsuitable for utility development and therefore would be excluded from surface disturbance. Some areas would be identified as sensitive to development and would be protected, minimizing soil loss and erosion, as described at the beginning of this section. Development and use of seven public utility corridors would reduce the total areas of disturbance and corresponding potential for soil impacts.

Surface disturbances, shading impacts on vegetation, and changes in soil stability and erosion potential could accompany solar and wind development and related infrastructure, as described at the beginning of this section.

Under Alternative A, approximately 542,700 acres would be unsuitable for timber harvest, and harvest would be prohibited in riparian areas, in woodlands on steep slopes, and in slump hazard areas. Small clear cuts would be allowed in specific areas. These limitations would minimize the impacts of forest

management on soil resources by minimizing surface disturbances, soil compaction from heavy machinery, and the associated road network, which would include staging areas for equipment and areas used for log decks. Limiting timber harvests also would reduce impacts on soils from spills or leaks of engine fuels, lubricants, or coolants, which would contaminate soils.

Under Alternative A, 978,600 acres would be open for livestock grazing, resulting in impacts as described under Impacts Common to All Alternatives.

Under Alternative A, 28,900 acres would be managed as ACECs (see **Table 2-1**, Comparative Summary of Alternatives). Impacts on soils from surface disturbance, described at the beginning of this section, would be minimized in these areas, as surface-disturbing activities would be limited.

The objective of VRM Class I is to retain the existing character of the landscape, and so in these areas large-scale surface disturbances (i.e., levels of change to the characteristic landscape that would attract attention) are precluded. These areas are protective of soil resources, which can be impacted by surface disturbances. Alternative A would include 27,100 acres of VRM Class I.

Emphasis on managing riparian areas to meet Public Land Health Standard 2 would involve continuing PFC riparian assessments to determine the health of these habitats. Additional riparian monitoring tools, such as Multiple Indicator Methods for monitoring riparian habitats, may also be utilized to evaluate riparian condition. Based on PFC determinations, the BLM would implement appropriate mitigation measures to allow riparian habitats to meet or move towards meeting Standard 2. This approach would help protect soils from accelerated rates of erosion in riparian areas.

Water resources management could continue to impact soil resources under Alternative A. Sediment and salinity control structures in Indian Wash and Leach Creek, if properly maintained, could reduce soil erosion. These structures were built to minimize salt and sediment contributions to the Colorado River and to help with flood control. Other water resource actions under Alternative A include NSO-1, CSU-6, and LN-17, designed to maintain or improve existing water quality and protect the municipal watersheds that provide domestic water for the cities of Palisade and Grand Junction. These stipulations would minimize impacts on soils. Stream stabilization work along 63 miles of critically eroding stream channels would stabilize soils in and adjacent to those areas.

Management of streams as eligible WSRs would provide indirect protection of soil resources because actions would not be permitted that would impact free-flowing nature, ORVs, or preliminary classifications (i.e., wild, scenic, or recreational). WSR designation may also attract more recreationists, increasing potential to degrade soils near these streams.

The lack of interpretation and environmental education activities in the decision area could continue to result in user actions that could degrade soil resources.

Alternative B

Overall, proposed resource management actions under Alternative B would protect soils. Compared to Alternative A, the reduction in open routes and areas open to intensive use would minimize related soil impacts. In addition, more areas would be closed to mineral development than under Alternative A, and more acres would be limited by NSO and CSU stipulations to protect resources, which would minimize related soil impacts. Alternative B would result in little overall change to soil health. Soil surface health could decline locally where disturbed, but soil productivity is not expected to decline over time. With active monitoring, mitigation, and reclamation, this alternative would meet the intent of Public Land Health Standard 1.

Under Alternative B, recreation users would be directed toward the 87,200 acres of SRMAs (75 percent fewer acres than the SRMAs and IRMAs under Alternative A; note that planning guidance and definitions of recreation management areas in Alternative A are different than those in Alternatives B, C, and D) and 217,400 acres of ERMAs (69 percent fewer acres than under Alternative A; note that planning guidance and definitions of recreation management areas in Alternative A are different than those in Alternatives B, C, and D). Recreation objectives in these areas define the types of use and desired outcomes and may reduce impacts on soil by limiting the types of use, use patterns, user numbers, trail types and construction standards, and other factors. Under this alternative, 126,200 acres would be closed to motorized use (3.6 times more acres than under Alternative A) and 10,200 acres open to intensive cross-country motorized and mechanized travel (18.4 percent fewer acres than under Alternative A). Areas open to intensive travel could experience soil compaction, destruction of soil crusts and desert pavement, soil erosion, spread of invasive species, and dust production, as described at the beginning of this section. In all other areas motorized and mechanized recreationists would be limited to designated roads and trails. Because travel would be managed and marketed in specific areas, potential effects outside of specified areas would be limited throughout the rest of the planning area. Impacts on soils in intensive use areas would increase with increasing use, but because soil impacts from recreational use would be localized to these specific areas, they could be monitored and mitigated more efficiently. Impacts on soil resources outside of intensive use areas would be expected to be reduced from current conditions as a result of comprehensive travel management under Alternative B.

The mileages of routes are proposed to be designated administrative-only or closed based upon soils planning criteria are shown in **Table 4-23**.

Table 4-23
Route Designations and Soils Planning Criteria under Alternative B

Planning Criteria	Final Designation Administrative Use (miles)	Final Designation Closed (miles)	Total miles designated as Administrative Use or Closed
Fragile Soils	164.5	280.2	444.7
Mancos Soils	81.2	203.9	285.1
Severe Erosion Hazard	201.3	427.5	628.8
Slumping Soils	24.6	25.4	50
Steep Slopes	26.8	52.8	79.6
Lands not meeting Soils Land Health Standard	55.3	134.4	189.7
Total	**553.7**	**1,124.2**	**1,677.9**

Source: BLM 2010a

Motorized and mechanized seasonal travel limitations on 105,200 acres (6 percent fewer acres than under Alternative A, though year-round closures would increase 5.3 times) would limit erosion during sensitive times of the year. Under Alternative B, 9,300 acres of Mancos Shale mapped areas, 9,500 acres of saline soils, and 750 acres of steep soils would be open to all modes of travel (see **Table 4-24**, Acres of Travel Management Designations by Soil Characteristic under Alternative B; soil characteristics could overlap). Total roads and trails use by road and trail designation is shown in **Table 4-25**, Miles of Roads and Trails by Soil Characteristic under Alternative B. These values include designated roads and trails, those roads and trails without a use designation, and roads and trails that are proposed for closure and rehabilitation.

Table 4-24
Acres of Travel Management Designations by Soil Characteristic under Alternative B

Travel Management Designations	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Closed to Motorized Travel	47,700	6,400	26,000	300	51,500
Limited to Designated Routes for Motorized Travel (Includes Seasonal Limitations*)	425,900	156,400	272,800	41,700	295,600
Open to Intensive Motorized Travel	0	9,300	9,500	0	750
Closed to Mechanized Travel	47,400	5,500	25,000	300	49,400
Limited to Designated Routes for Mechanized Travel	426,200	157,400	273,800	41,700	297,600
Open to Cross-country Mechanized Travel	0	9,300	9,500	0	750
Closed to Horse Travel	800	0	300	0	230
Limited to Designated Routes for Horse Travel	200	300	1,000	10	800
Open to Cross-country Horse Travel	472,600	171,800	307,000	42,000	346,700
Closed to Foot Travel	800	0	300	0	230

Table 4-24
Acres of Travel Management Designations by Soil Characteristic under Alternative B

Travel Management Designations	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Limited to Designated Routes for Foot Travel	200	300	1,000	10	2800
Open to Cross-country Foot Travel	472,600	171,800	307,000	42,000	346,700
Total	**1,894,400**	**688,500**	**1,233,200**	**168,000**	**1,393,000**

Source: BLM 2010a
* Includes the following: Winter Limitation (December 1-May 1), Spring Limitations (March 1-June 20, May 15-June 15, and March 1-May 15), and routes open only during rifle hunting season.
Note: Soil characteristics may overlap in certain areas.

Table 4-25
Miles of Roads and Trails by Soil Characteristic under Alternative B

Roads and Trails	Steep Slopes	Saline Soils	Mancos Shale	Fragile Soils
Limited to vehicles under 50 inches wide only	4.2	13.2	5.1	21.8
Limited to vehicles under 50 inches wide only with winter seasonal limitation*	1.4	--	0.1	7.0
Limited to Bicycle Only	0.1	--	--	--
Administrative and Permitted Use Only	17.1	78.6	65.3	125.9
County Maintained	8.5	12.0	--	76.0
Limited to Foot and Bicycle Only	1.6	0.6	--	1.6
Limited to Foot Only	2.3	--	0.5	1.4
Limited to Foot and Horse Only	9.8	10.6	0.2	16.8
Linear Disturbance	9.1	13.6	7.1	3.8
Limited to Foot, Horse, Bicycle and Motorcycle Only	3.8	58.4	59.4	1.6
Limited to Foot, Horse, Bicycle and Motorcycle Only with winter seasonal limitation*	0.3	1.4	0.9	3.2
Limited to Foot, Horse and Bicycle Only	10.3	28.5	34.2	19.6
Limited to Foot, Horse and Bicycle Only with winter seasonal limitation*	2.0	4.9	3.8	4.5
Open to all uses	59.2	237.9	161.9	326.8
Open to all uses with a seasonal limitation*	12.4	24.3	13.0	65.3
Undesignated (Zone L)	13.9	489.1	518.2	--
Open (in OHV open areas)	7.6	279.4	271.1	--
Closed to all uses	45.6	223.8	167.4	198.6
Total	**209.2**	**1,476.3**	**1,308.2**	**873.9**

Source: BLM 2010a
* Includes the following: Winter Limitation (December 1-May 1), Spring Limitations (March 1-June 20, May 15-June 15, and March 1-May 15), and routes open only during rifle hunting season.
Note: Soil characteristics may overlap in certain areas.

The BLM would restrict surface-disturbing actions when soil is saturated. On a case-by-case basis, the BLM would allow construction actions to occur when soils are frozen and such actions would result in reduced environmental

impacts. These actions would protect soils during times when they are more sensitive to disturbance.

Implementing the BMPs and COAs listed in **Appendix H** would help protect soils throughout planning area. COAs are site-specific and enforceable requirements that would be included in approved Applications for Permit to Drill or Sundry Notices. Stipulations developed specifically to address soils, including GEOLOGY SLOPE NSO CO, GEOLOGY SOIL NSO CO, GEOLOGY SOIL CSU CO, CSU-6, and CSU-7, would help protect soils from surface-disturbing impacts from fluid mineral development and other surface-disturbing activities. The number of acres associated with stipulations developed specifically to protect soil resources by alternative are outlined in **Table 4-22**, Acres of Stipulations for Soil Resources and All Stipulations by Alternative. Alternative B would include 670,300 acres (federal mineral estate) of total NSO stipulations (55 percent more acres than under Alternative A, though Alternative A's acreage only includes NSO stipulations in areas open to leasing), which would protect soil resources from surface disturbance and associated impacts. BMPs must be approved by the Authorized Officer prior to any surface disturbance.

Under Alternative B, 252,100 acres of the planning area (16 percent fewer acres than under Alternative A) would be acceptable for coal leasing, 790,700 acres would be open to fluid mineral leasing and development, 783,800 acres would be open to consideration for mineral material disposal (mineral material disposal would not be allowed in areas where an NSO stipulation is applied, resulting in fewer acres open to consideration for mineral material disposal), and 518,600 acres would be open to consideration of non-energy leasable mineral prospecting and development. However, the only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area. The impacts of these activities on soils are described in detail at the beginning of this section.

As described under Effects Common to All Alternatives, emissions associated with mineral development/energy production could contribute airborne pollutants, which could contaminate soils, impair vegetation function and condition, and increase erosion and future fugitive dust production. Alternative B would require drill rig engines to conform to guidance provided by CARMMS modeling and CARRP protocol for engine type requirements. These actions would indirectly improve soil health by reducing airborne soil contaminants (nitrogen oxides, hydrocarbons, and particulate matter) and related losses in vegetative cover.

Proposed vegetation management actions under Alternative B, described in **Chapter 2**, would improve soil health. Restoration and revegetation, especially focused on reducing pinyon-juniper (*Pinus edulis*, *Juniperus osteosperma*)

encroachment and cheatgrass-dominated landscapes, would improve soil health by providing more stability and resistance to erosion. This focus on soil stability and resistance to erosion through vegetation management would help soils meet Standard 1 of the BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado. Specific erosion control measures in greasewood (*Sarcobatus vermiculatus*) communities would minimize accelerated soil erosion. Impacts on soils would be minimized under Alternative B through management prescriptions developed to restrict surface-disturbing activities during extended droughts.

Under lands and realty management, fragile soils and steep slopes would be managed as ROW avoidance areas, minimizing soil loss and erosion and promoting soil stability. Use of five corridors for facilities would reduce the total areas of disturbance and corresponding potential for soil impacts. Alternative B would include 2,400 acres of wind and 8,700 acres of solar emphasis areas. As described at the beginning of this section, surface disturbances, shading impacts on vegetation, and changes in soil stability and erosion potential could accompany solar and wind development and related infrastructure. Acquiring additional riparian areas could allow for better soil management, and acquiring water rights to improve vegetative cover would improve soil health.

The special status species and fish and wildlife management actions under Alternative B that could affect soil resources are as follows. Management actions to improve habitat, including ACECs (e.g., Dolores River Riparian ACEC, Palisade, Roan and Carr Creeks ACEC) and NSO and CSU stipulations, would limit impacts from all surface-disturbing activities on soil health in these sensitive areas. Explicitly minimizing impacts from resource uses like ROWs or recreation in locations with core conservation populations of special status plant species would also minimize impacts on soils. Impacts from mechanical vegetation and habitat alterations such as roller chopping and disking, which cause surficial disturbances and increased short-term erosion potential, for Gunnison and Greater Sage-Grouse would be minimized by implementing BMPs. Closure of the Lynx Analysis Unit to wood product sales and harvest (including Christmas tree harvest) would prevent related surface disturbances and soil compaction. Managing specific areas as ROW exclusion or avoidance areas to protect habitat (i.e., Ant Research Station, Owl Banding Station, several wildlife emphasis areas) also would minimize surface disturbances and localized commitment of soil resources to permanent structures such as wind turbines or solar infrastructure. Under Alternative B, domestic sheep (*Ovis aries*) grazing would be prohibited in occupied bighorn sheep (*Ovis canadensis Canadensis, Ovis canadensis nelson, and Ovis canadensis mexicana*) habitat. This would improve soil health by minimizing localized soil compaction, rerouting of runoff along animal trails, and disturbances to vegetative cover created by improper grazing techniques. Concentrating ROWs to already-disturbed areas would minimize new disturbances on soil resources.

Under Alternative B, approximately 239,400 acres would be closed to wood product sales and/or harvest (not including Christmas tree harvest) (56 percent fewer acres than under Alternative A), including areas identified as unsuitable for timber harvest based on other resource concerns. Small clear cuts would be allowed in specific areas. Where clear cuts occur, these limitations would minimize the impacts of forestry on soil resources by reducing surface disturbances, soil compaction from heavy machinery, and the associated road networks, staging areas for equipment and areas used for log decks. No large-scale forestry product collection areas would be located on steep slopes or fragile soils, which would minimize impacts on soil resources or unwanted runoff. BMPs contained in **Appendix H** would provide additional mitigation against forestry-related impacts.

The impacts of wildland fire management are described at the beginning of this section. Alternative B would promote mechanical treatments on a site-specific basis and implement them to achieve resource objectives. While short-term reductions in protective vegetative cover could elevate erosion potential over a brief period of time, these actions are anticipated to have an overall positive impact on soil resources, as burn intensity of unplanned fire would be reduced. This outcome would minimize impacts on soil resources from severe wildfire, as described at the beginning of this section.

Proposed soils management under Alternative B would protect and improve soil health by requiring professional geotechnical engineering and reclamation plans on fragile soils and steep slopes when site conditions warrant. In OHV open areas, monitoring and identifying thresholds for evaluating vulnerability to erosional processes and using the best available science to limit erosion and sedimentation/salt loading to the Colorado River. Identifying, avoiding, and mitigating impacts on biologic soil crusts would improve soil health. Managing fragile soils, Mancos shale mapped areas, and saline soils as ROW avoidance areas would mitigate impacts on soils in those particularly sensitive areas. Avoiding motorized travel off of designated routes, over fragile soils, and over saturated soils would help prevent impacts on soil resources.

Under Alternative B, 123,000 acres would be managed as ACECs (4.2 times more acres than under Alternative A). Impacts on soils, described at the beginning of this section, would be minimized in these areas because of limits on surface-disturbing activities.

As described under Alternative A, large-scale surface disturbances, which would also impact soil resources, would not occur in areas classified as VRM Class I. Alternative B would include 98,700 acres of VRM Class I (3.6 times more acres than under Alternative A).

As described under Alternative A, the emphasis on managing riparian areas to meet Public Land Health Standard 2 would involve continuing PFC riparian assessments to determine the health of these habitats. Based on PFC

determinations, the BLM would implement appropriate mitigation measures to allow riparian habitats to meet or move towards meeting Standard 2. This approach and stipulations protecting riparian areas would help protect soils from accelerated rates of erosion in riparian areas. Additional specific mitigation measures listed under Alternative B in Chapter 2 would reduce surface-disturbing activities, which would reduce impacts on sensitive riparian soils.

Restrictions proposed to protect water resources would also contribute to improved soil health. Examples include closing river corridors of the Colorado, Dolores, and Gunnison Rivers to mineral materials sales and non-energy mineral leasing and development, which would help protect soils in these areas from erosion, compaction, and contamination; establishing buffer zones to major rivers, streams possessing lotic riparian attributes, definable streams, and lentic riparian areas that would minimize or heavily stipulate disturbances; and restricting seismic operations near springs and perennial streams. CSU stipulations in municipal watersheds, which would heavily stipulate surface-disturbing actions in these areas also would benefit soil resources, as would establishing a ROW exclusion in the high sensitivity area for the Palisade municipal watershed. Improving water quality to achieve delisting of 303(d) (water quality-impaired) streams also would benefit soils, particularly for streams with salinity issues or those listed for selenium or sedimentation impairments where monitoring, mitigation, and reclamation would focus on vegetative health and soil stabilization. Removing nonfunctional structures such as sediment basins, ponds, and associated structures and implementing erosion control/soil stabilization measures would improve soil health locally. For soils in riparian areas, requiring professionally engineered design, construction, and reclamation plans to mitigate riparian damage would protect soils in those areas.

Management of the Dolores River as suitable for WSR designation would provide indirect protection of soil resources because actions would not be permitted that would impact free-flowing nature or ORVs. The ROW avoidance also could minimize potential impacts on soils.

Under Alternative B, management of cultural resources could impact soils. Soil resources would be protected from disturbance by expansion of surface use restrictions in the Indian Creek area for cultural resources. In addition, protections related to scientific, public, conservation, and traditional uses also would protect soil resources from impacts. Managing the integrity of cultural resources outside of sensitive site areas and mitigation of cultural impacts could prevent impacts on soil resources by limiting surface disturbances.

Implementation of an interpretation and environmental education program under Alternative B would enhance awareness and appreciation of soil resources within the decision area. This could result in increased protective efforts by the general public.

Master Leasing Plan

Fluid mineral resource development would cause negative impacts on soils in the Shale Ridges and Canyons MLP analysis area, including the loss of vegetation cover and soil productivity. In particular, noxious weed infestations resulting indirectly from disturbance of difficult-to-reclaim soils could impact soil productivity. Biological soil crusts could be crushed or fragmented during surface disturbance, and would no longer be protected from wind or water erosion. Loss of organic matter and decreases in soil microorganism populations would reduce soil fertility, especially on soils in harsh sites with exposure to wind, droughts, and a short growing season. Soil compaction and displacement would occur with the construction of well and facility pads, roads, and pipelines. Furthermore, runoff associated with these compacted surfaces would result in nearby erosion.

The acreage and the intensity of soil impacts would be based upon the level or intensity of surface-use restrictions. Areas that are closed to development or are subject to NSO leasing stipulations would experience little or no surface disturbance from minerals development; no adverse impacts on soil resources would occur. NSO stipulations for all resources would be applied to about 328,700 acres of federal mineral estate, providing indirect protection via restrictions targeted at protecting other resources. This includes approximately 306,000 acres of NSO stipulations for slumping soils and steep slopes (note that all stipulations would protect soils regardless of the resource program under which the stipulation originates). CSU stipulations would be applied to about 362,500 acres of federal mineral estate, including on fragile soils and mapped Mancos shale and saline soils (see Appendix B). Areas where Standard Conditions or CSU and TL leasing stipulations are applied would experience short- and long-term impacts on soils from surface disturbance associated with minerals development. These short- and long-term negative impacts include destruction of biological soil crusts; erosion and subsequent sedimentation of surface waters; changes in surface hydrology and infiltration; and possible alteration of soil chemistry and productivity. Stipulations would minimize impacts in these areas.

Alternative C

Overall, proposed resource management actions under Alternative C would be the most protective of soil resources. The closure of the planning area to cross-country travel and the limited motorized use acreages (**Table 4-26**, Acres of Travel Management Designations by Soil Characteristic under Alternative C, and **Table 4-27**, Miles of Roads and Trails by Soil Characteristic under Alternative C) would substantially limit related impacts on soils. In addition, more areas would be closed to mineral development than under any other alternative, and more acres would be limited by NSO and CSU stipulations (**Table 4-22**, Areas of Stipulations for Soil Resources and All Stipulations by Alternative) to protect resources, which would minimize related soil impacts. Alternative C would result in improvements to soil health. Soil surface health could decline locally

Table 4-26
Acres of Travel Management Designations by Soil Characteristic under Alternative C

Travel Management Designations	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Closed to Motorized Travel	200,900	8,000	77,300	14,600	163,600
Limited to Designated Routes for Motorized Travel (Includes Seasonal Limitations*)	273,300	163,900	231,200	23,700	
Open to Intensive Motorized Travel	0	0	0	0	0
Closed to Mechanized Travel	200,300	7,600	75,600	14,600	159,700
Limited to Designated Routes for Mechanized Travel	273,900	164,300	232,900	27,400	188,000
Open to Cross-country Mechanized Travel	0	0	0	0	0
Closed to Horse Travel	800	0	300	0	230
Limited to Designated Routes for Horse Travel	10,100	8,300	15,900	400	12,300
Open to Cross-country Horse Travel	463,300	163,600	292,300	41,600	335,200
Closed to Foot Travel	0	0	0	0	0
Limited to Designated Routes for Foot Travel	10,100	8,300	15,900	400	12,300
Open to Cross-country Foot Travel	464,100	163,600	292,600	41,600	335,400
Total	**1,896,800**	**687,600**	**1,234,000**	**168,000**	**1,390,900**

Source: BLM 2010a
* Includes the following: Winter Limitation (December 1-May 1) and Spring Limitations (March 1-June 20, May 15-June 15, and March 1-May 15).
Note: Soil characteristics may overlap in certain areas.

Table 4-27
Miles of Roads and Trails by Soil Characteristics under Alternative C

Roads and Trails with Motorized Use	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Designated for Full-sized Motorized Vehicles	71	358	364	12	21
Designated for Full-sized Motorized Vehicles (Seasonal Limitations*)	26	5	12	5	2
Designated for Vehicles Under 50 Inches in Width	1	2	2	0	2
Designated for Vehicles Under 50 Inches in Width (Seasonal Limits**)	57	0	9	16	7
Designated for Motorcycle, Mechanized, Foot, and Horse Travel	0	34	36	0	2
Designated for Mechanized, Foot, and Horse Travel	2	24	22	0	5
Designated for Mechanized and Foot Travel	0	0	0	0	1
Designated for Foot and Horse Travel	16	0	8	3	10
Designated for Mechanized Travel	0	0	0	0	0
Designated for Foot Travel	1	1	0	0	4

Table 4-27
Miles of Roads and Trails by Soil Characteristics under Alternative C

Roads and Trails with Motorized Use	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Designated for Administrative/Permitted Use	384	201	266	54	57
Designated for Closure and Rehabilitation	231	669	718	37	80
Total	**789**	**1,294**	**1,437**	**127**	**191**

Source: BLM 2010a
* Includes the following: Winter Limitation (December 1-May 1) and Spring Limitations (March 1-June 20, May 15-June 15, and March 1-May 15).
** Includes the following: Winter Limitation (December 1-May 1), Spring Limitations (May 15-June 15, and March 1-May 15), and routes open only during rifle hunting season
Note: Soil characteristics may overlap in certain areas.

where disturbed, especially in areas of mineral development, but soil productivity is expected to increase over time. This alternative would meet the intent of Public Land Health Standard 1.

Impacts on soils from proposed management for interpretation and environmental education, riparian resources, and cultural resources would be the same as those described under Alternative B.

Under Alternative C, non-motorized recreationists (e.g., hikers, cyclists, equestrians) and motorized recreationists would be directed toward the 60,000 acres of SRMAs (83 percent fewer acres than the SRMAs and IRMAs under Alternative A; note that planning guidance and definitions of recreation management areas in Alternative A are different than those in Alternatives B, C, and D). Recreation objectives in these areas define the types of use and desired outcomes and may reduce impacts on soil by limiting the types of use, use patterns, user numbers, trail types and construction standards, and other factors. Recreational use would be limited to designated trails in specific areas, limiting potential impacts. As described under Alternative B, impacts on soils would increase in SRMAs with increasing use, but because impacts would be localized to specific areas, they could be monitored, mitigated, and reclaimed more efficiently. Under Alternative C, quiet recreational uses with fewer impacts on soil resources would be emphasized.

Under Alternative C, 379,500 acres (10.8 times more acres than under Alternative A) would be permanently closed to motorized use. In addition, seasonal motorized travel limitations on 50,100 acres (2.1 times fewer acres than under Alternative A, though many seasonally closed areas would be closed year-round under this alternative) would limit erosion during sensitive times of the year. None of the planning area would be open to cross-country motorized use (see **Table 4-26**, Acres of Travel Management Designations by Soil Characteristic under Alternative C). Total roads and trails use by road and trail designation is shown in **Table 4-27**, Miles of Roads and Trails by Soil Characteristic under Alternative C. These values include designated roads and

trails, those roads and trails without a use designation, and roads and trails that are proposed for closure and rehabilitation.

Stipulations to protect soils that are described under Alternative B would apply under Alternative C. Additional stipulations to protect other resources would also protect soils from surface-disturbing impacts. Alternative C would include 858,000 acres of NSO stipulations on federal mineral estate (see **Table 4-22**, Areas of Stipulations for Soil Resources and All Stipulations by Alternative), which would protect soil resources from surface disturbance, as described at the beginning of this section.

Under Alternative C, 251,200 acres would be acceptable for coal leasing (16 percent fewer acres than under Alternative A), 58,200 acres would be unacceptable for coal leasing (59 percent more acres than under Alternative A), 506,700 acres would be open to fluid mineral development (48 percent fewer acres than under Alternative A), 609,400 acres would be open to consideration for mineral material disposal (20 percent fewer acres than under Alternative A), and 298,600 acres would be open to consideration of non-energy leasable mineral prospecting and development (no similar action under Alternative A). However, the only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area. The impacts of these activities on soils are described in detail at the beginning of this section.

As described under Effects Common to All Alternatives, emissions associated with mineral development/energy production could contribute airborne pollutants, which could contaminate soils, impair vegetation function and condition, and increase erosion and future fugitive dust production. Alternative C would require drill rig engines to meet Tier 4 emission standards, regardless of when they begin operation. Implementing this comprehensive program would improve soil health by reducing airborne soil contaminants (nitrogen oxides, hydrocarbons, and particulate matter) and minimizing related losses in vegetative cover.

Proposed vegetation management under Alternative C would have similar impacts on soil resources as those described under Alternative B. Alternative C would more actively reduce noxious and invasive species and restore native plant communities, and more actively focus on controlling cheatgrass (*Bromus tectorum*), which would improve soil health, as described at the beginning of this section. Alternative C would limit the use of mechanical treatments to create openings within dense stands, which would result in fewer short-term impacts on soils from the disturbance, but could lead to more high-intensity wildland fires in dense stands and fewer long-term soil health improvements from vegetation restoration.

Impacts on soils from lands and realty would be the same as those described under Alternative B, except that Alternative C would include 5,300 acres of

solar emphasis areas (57 percent fewer acres than under Alternative B). Approximately 6,900 fewer acres of solar emphasis area would allow fewer impacts on soils because surface disturbances, shading impacts on vegetation, and changes in soil stability and erosion potential could accompany solar development and related infrastructure, as described under Alternative A.

Impacts on soils from special status species and fish and wildlife would be the same as those described under Alternative B, except that Alternative C would include more areas (52,100 more acres) as ROW avoidance areas or exclusion areas for habitat, which would reduce impacts from ROWs on soils. Alternative C would designate upland habitats within the drainage area of live water as part of priority habitats, which could result in increased monitoring and management of soil resources in those upland areas. Prohibiting domestic sheep grazing in bighorn sheep habitat would minimize those related impacts on soils (described under Alternative B).

The types of impacts from forestry management would be the same as described under Alternative B, except that Alternative C would close approximately 435,300 acres to wood product sales and/or harvest (2.1 times more acres than under Alternative B). More areas closed to harvest would translate into fewer impacts on soils.

The types of impacts from wildland fire management would be the same as described under Alternative B, but prioritizing planned and unplanned fire to meet resource objectives could limit the options available to choose vegetation type treatments that reduce impacts on soil resources.

Proposed soil resource management under this alternative would protect soil resources, as described under Alternative B, except that Alternative C would include no areas open for cross-country motorized or mechanized use. As described at the beginning of this section, intensive use can result in accelerated soil erosion and compaction, as well as changes in vegetative cover, alterations to natural drainage patterns, and modifications to timing and intensity of runoff from these areas, which are damaging to overall soil health and may lead to increased spread of noxious or invasive species. Not allowing intensive use under this alternative would therefore avoid related impacts on soils.

Under Alternative C, 168,000 acres would be managed as ACECs (5.8 times more acres than under Alternative A). Impacts on soils, described at the beginning of this section, would be minimized in these areas because of limits on surface-disturbing activities.

As described under Alternative A, large-scale surface disturbances, which would also impact soil resources, would not occur in areas classified as VRM Class I. Alternative C would include 100,100 acres of VRM Class I (3.7 times more acres than under Alternative A).

In addition to the impacts from water resources management disclosed under Alternative B, Alternative C also would close municipal watersheds to livestock grazing, which would avoid the grazing impacts discussed at the beginning of this section in those watersheds.

Management of 99.5 miles of streams as eligible WSRs would provide indirect protection of soil resources because actions would not be permitted that would impact free-flowing nature or preliminary classifications (i.e., wild, scenic, or recreational). The ROW exclusion and avoidance areas also could minimize potential impacts on soils. WSR designation could also result in increased recreational use which may degrade soil resources near these streams.

Alternative D

Impacts on soils from proposed management of riparian resources and interpretation and environmental education under this alternative would be the same as those described under Alternative B.

Under Alternative D, motorized and non-motorized recreation users would be directed toward the 79,000 acres of SRMAs (78 percent fewer acres than the SRMAs and IRMAs under Alternative A; note that planning guidance and definitions of recreation management areas in Alternative A are different than those in Alternatives B, C, and D) and 61,900 acres of ERMAs (91 percent fewer acres than under Alternative A; note that planning guidance and definitions of recreation management areas in Alternative A are different than those in Alternatives B, C, and D). Recreation objectives in these areas define the types of use and desired outcomes and may reduce impacts on soil by limiting the types of use, use patterns, user numbers, trail types and construction standards, and other factors. Under this alternative, some areas currently open to cross-country motorized use would be closed, leaving 10,200 acres open to intensive use (18 percent fewer acres than under Alternative A). Because travel would be managed and marketed in specific areas, potential effects outside of those areas would be limited. As described under Alternative B, impacts on soils would increase in SRMAs with increasing use, but because impacts would be localized to specific areas, they could be monitored, mitigated, and reclaimed more efficiently. Recreational use in the decision area would be marketed nationally and internationally under Alternative D, which would likely increase visitor numbers, with corresponding increases in soil impacts from recreational uses.

Seasonal motorized and mechanized travel limitations on 54,700 acres (2 times fewer acres than under Alternative A) would limit erosion during sensitive times of the year. In addition, 111,300 acres would be permanently closed to motorized use (3.2 times more acres than under Alternative A) (see **Table 4-28**, Acres of Travel Management Designations by Soil Characteristic under Alternative D). As described at the beginning of this section, where roads or

Table 4-28
Acres of Travel Management Designations by Soil Characteristic under Alternative D

Travel Management Designations	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Closed to Motorized Travel	39,800	4,800	25,200	300	47,600
Limited to Designated Routes for Motorized Travel (Seasonal Limitations*)	434,300	157,900	274,200	41,800	299,400
Open to Intensive Motorized Travel	0	9,300	9,100	0	600
Closed to Mechanized Travel	39,200	4,000	23,500	300	43,600
Limited to Designated Routes for Mechanized Travel	434,900	158,700	275,900	41,800	303,400
Open to Cross-country Mechanized Travel	0	9,300	9,100	0	600
Closed to Horse Travel	800	0	300	0	200
Limited to Designated Routes for Horse Travel	2,000	800	3,100	20	4,400
Open to Cross-country Horse Travel	471,300	171,200	305,100	42,100	343,000
Closed to Foot Travel	0	0	0	0	0
Limited to Designated Routes for Foot Travel	2,000	800	3,100	20	4,400
Open to Cross-country Foot Travel	472,100	171,200	305,400	42,100	343,200
Total	**1,896,400**	**688,000**	**1,234,000**	**168,500**	**1,390,400**

Source: BLM 2010a
* Includes the following: Winter Limitation (December 1-May 1), Spring Limitations (May 15-June 15, and March 1-May 15), and routes open only during rifle hunting season.
Note: Soil characteristics may overlap in certain areas.

trails would be expanded, soil compaction, vegetation crushing, alteration to natural drainage patterns, and modification to timing and intensity of runoff from these areas would occur. Under Alternative D, 9,300 acres of Mancos Shale mapped areas, 9,100 acres of saline soils, and 600 acres of steep soils would be open to all modes of travel. Total roads and trails use by road and trail designation is shown in **Table 4-29**, Miles of Roads and Trails by Soil Characteristic under Alternative D. These values include designated roads and trails, those roads and trails without a use designation, and roads and trails that are proposed for closure and rehabilitation.

Stipulations CSU-6 and NSO-10 were developed specifically to address soils, and would help protect soils from surface-disturbing impacts. As described under Alternative A, **Table 4-22**, Areas of Stipulations for Soil Resources and All Stipulations by Alternative, lists acres of stipulations developed for soil resources for all alternatives. Alternative D would include 497,800 acres of NSO stipulations on federal mineral estate (15 percent more acres than under Alternative A), which would help protect soil resources from surface disturbances, as described at the beginning of this section.

Table 4-29
Miles of Roads and Trails by Soil Characteristic under Alternative D

Roads and Trails with Motorized Use	Fragile Soils	Mancos Shale	Saline Soils	Slump Areas	Steep Slopes
Designated for Full-sized Motorized Vehicles	415	615	697	51	77
Designated for Full-sized Motorized Vehicles (Seasonal Limitations*)		14	31	33	12
Designated for Vehicles Under 50 Inches in Width	38	6	18	9	5
Designated for Vehicles Under 50 Inches in Width (Seasonal Limits**)	19	3	3	10	2
Designated for Motorcycle, Mechanized, Foot, and Horse Travel	9	62	67	1	7
Designated for Mechanized, Foot, and Horse Travel	3	22	25	1	9
Designated for Mechanized and Foot Travel	7	0	1	1	2
Designated for Foot and Horse Travel	17	1	10	3	11
Designated for Mechanized Travel	0	0	0	0	0
Designated for Foot Travel	1	1	0	0	2
Designated for Administrative/Permitted Use	91	129	141	16	39
Designated for Closure and Rehabilitation	61	206	210	3	17
Total	**661**	**1,059**	**1,203**	**128**	**183**

Source: BLM 2010a
* Includes the following: Winter Limitation (December 1-May 1), Spring Limitations (May 15-June 15, and March 1-May 15), and routes open only during rifle hunting season.
** Includes the following: Winter Limitation (December 1-May 1), and Spring Limitations (March 1-Jun 20, May 15-June 15, and March 1-May 15).
Note: Soil characteristics may overlap in certain areas.

Under Alternative D, 265,600 acres of the decision area would be acceptable for coal leasing (12 percent fewer acres than under Alternative A), 961,400 acres would be open to fluid mineral development (1 percent fewer acres than under Alternative A), 349,700 acres would be open to leasing subject to NSO stipulations (19 percent fewer acres than under Alternative A), 433,000 acres would be open to leasing subject to CSU stipulations, and 405,900 acres would be open to leasing subject to timing limitation stipulations (74 percent more acres than under Alternative A). In addition, 906,100 acres would be open to consideration for mineral material disposal (14 percent more acres than under Alternative A), and 925,400 acres would be open to consideration of non-energy leasable mineral prospecting and development (no similar action under Alternative A). However, the only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area. The impacts of these activities on soils are described in detail at the beginning of this section.

As described under Effects Common to All Alternatives, emissions associated with mineral development/energy production could contribute airborne pollutants, which could contaminate soils, impair vegetation function and condition, and increase erosion and future fugitive dust production. Alternative D would not require drill rig engines to meet Tier 2 or 4 emission standards. Airborne soil contaminants (nitrogen oxides, hydrocarbons, and particulate matter) would not be reduced, which would not improve soil health by minimizing related losses in vegetative cover.

The types of impacts on soils from wildland fire management under Alternative D would be similar to Alternatives B and C, in that all three alternatives share the same objectives of restoring natural fire regimes. However, Alternative D would allow unplanned fire for resource benefit on 96,000 acres (857,400 fewer acres than under Alternatives B and C). Manual and mechanical treatments would be priorities above using planned and unplanned fires to meet resource objectives. The long term effect of using unplanned wildfire to manage vegetation densities on fewer acres could increase the potential for larger, high-severity fires that can damage soils.

Proposed vegetation management under this alternative would affect soil resources as described under Alternative B, except that instead of maintaining and restoring vegetation to provide soil stability and resistance to erosion, Alternative D would focus vegetative treatments on increased forage. In the short term, increased forage would provide additional vegetative cover, improving soil health, but in the long term, increased grazing of that forage could result in soil compaction and increased erosion. Careful monitoring of land health and implementation of BMPs would reduce potential impacts on soils from increased livestock grazing.

Under lands and realty management, the use of eight corridors for facilities would reduce the total areas of disturbance and corresponding potential for soil impacts. Alternative D would include 3,700 acres of wind emphasis areas (42 percent more acres than under Alternative B), 36,300 acres of solar emphasis areas (2 times more acres than under Alternative B), and 9,200 acres of SEZs that are entirely within the solar emphasis areas boundary. As described under Alternative A, surface disturbances, shading impacts on vegetation, and changes in soil stability and erosion potential could accompany solar and wind development and related infrastructure.

Impacts on soils from special status species and fish and wildlife would be similar to those described under Alternative B, except that Alternative D would not specify areas as ROW avoidance or exclusion areas (which minimize soil impacts) for habitat. Alternative D also would not consolidate ROWs in wildlife emphasis areas to already disturbed areas, which would not minimize new disturbances to soil resources. Like Alternative C, Alternative D would avoid

domestic sheep grazing inside of bighorn sheep habitat, which could reduce the potential for impacts (described under Alternative B).

The impacts of forestry management on soils would be the same as under Alternative B, except that Alternative D would close approximately 108,600 acres to wood product sales and/or harvest (not including Christmas trees). This would result in 80 percent less acres than Alternative A. Only limited wood product sales and/or harvest would be allowed in riparian areas, where soils are sensitive to disturbances.

Proposed soil resource management actions under this alternative would protect soil resources, as described under Alternative B, except that Alternative D would not specifically avoid impacts on biological soil crusts. Without focused monitoring, surface-disturbing activities could damage biological soil crusts directly or through accelerated soil erosion and runoff. In addition, Alternative D would not limit seismic activity, require engineering plans for work in riparian areas, or identify the high sensitivity area in the Palisade municipal watershed as a ROW exclusion area, all of which could increase the likelihood for impacts on soil resources.

Under Alternative D, 33,200 acres would be managed as ACECs (15 percent more acres than under Alternative A). Impacts on soils, described at the beginning of this section, would be minimized in these areas because of limits on surface-disturbing activities.

As described under Alternative A, large-scale surface disturbances, which would also impact soil resources, would not occur in areas classified as VRM Class I. Alternative D would include 96,500 acres of VRM Class I (3.6 times more acres than under Alternative A).

Impacts on soils from proposed cultural resource management under this alternative would be the same as described Alternative B, except that 1,180 fewer acres (a 49 percent decrease) would be protected near Indian Creek under Alternative D, resulting in greater potential for surface disturbances that could impact soil resources.

Overall, proposed resource management actions and resource uses under Alternative D would impact soils. The most substantial impacts would come from areas open to intensive use, with the related impacts on soils. Alternative D would leave large areas open to mineral development with fewer NSO and CSU stipulations to protect resources than under Alternatives B or C (**Table 4-22**, Areas of Stipulations for Soil Resources and All Stipulations by Alternative), which would result in substantial impacts on soil resources. The likely level of mineral development also would result in related impacts on soils. Under Alternative D, soil surface health could decline where disturbed, which would result in soils that were less able to support vegetation and biological soil crust. Implementation of the required BMPs and COAs could mitigate declines

in soil productivity over time, though this alternative would likely require extensive monitoring, mitigation, and reclamation to meet Public Land Health Standard 1.

Cumulative

The CIAA used to analyze cumulative impacts on soils includes the entire planning area. Surface-disturbing activities occurring within the planning area are not expected to affect soil resources outside of the planning area.

Combined with the proposed management actions, cumulative impacts on soil resources could present challenges to meeting Public Land Health Standard 1 under Alternatives A or D. Impacts on soil resources would not be as substantial under Alternative D when compared to Alternative A. In part because of the required implementation of BMPs and COAs protective of soil resources on BLM-administered lands, cumulative effects in the planning area are not likely to affect soil health as substantially under Alternatives B or C. Alternative C would provide the greatest protection of soil resources, followed by Alternative B.

Additional mineral development, including oil and gas, uranium and vanadium, coal, and other minerals, could cause localized impacts on soils, as described under the Effects Common to All Alternatives. Intensive mechanical vegetation treatments likely have and would continue to impact soils resources locally, but they would increase vegetation cover, and thus soil health, over the long term. Past livestock grazing has impacted soil resources. As described in **Chapter 3**, active management of grazing allotments has led to improvements in soil health over time.

An important trend in the planning area is rapidly increasing recreational use. This growth in recreation on public lands is due to local population growth, as well as the area's reputation as a national and international recreation destination. All forms of recreational activities can increase potential for erosion, sedimentation, gully creation, biologic soil crust damage, and riparian and upland vegetation damage. Recreation activities may also directly and indirectly impact water quality due to erosion and sediment production potential. However, the significance of such impacts varies with the nature and degree of disturbance as well as site specific environmental conditions. Typically larger disturbances in sensitive areas represent greater potential to damage soils and vegetation, degrade water quality, and impair overall watershed function and condition than smaller disturbances in less sensitive areas.

Public Law 98-569 includes direction to BLM for development of a comprehensive program for minimizing salt contributions from lands under its management. Colorado's Grand Valley is recognized as the largest non-point source of salinity in the Upper Colorado River Basin and much of the lands currently open to all modes of travel are situated in areas mapped to be highly erodible (i.e., fragile) or saline. The cumulative erosion in these areas resulting

from a dispersed, expanding, unmaintained, and in many cases poorly designed route system would be considered a nonpoint source of pollution.

Recent drought and potential climate change resulting in more frequent future droughts could decrease vegetative cover, increasing the potential for soil erosion, desertification, and fugitive dust production. Furthermore, increased fugitive dust production could elevate the severity of dust-on-snow events triggering earlier melt-out, earlier peak stream flows, and increasing water consumption through transpiration and evaporative processes. As a result, soil moisture in areas reliant on snow melt or flooding would be depleted earlier in the season stressing vegetation. These additional stresses to vegetative communities could contribute towards vegetative loss and/or establishment of less desirable species.

4.3.3 Water Resources

This section discusses impacts on water resources from proposed management actions of other resources and resource uses. Existing conditions concerning water resources are described in **Section 3.2.5**, Water Resources.

The mandate to manage public land for multiple uses requires the BLM to consider land uses that have the potential to degrade water quality, destabilize natural stream morphologic conditions, impair sustainability of water resources (water quantity), alter groundwater aquifer properties, and modify natural stream hydrographs. Minimizing such impacts is a theme common to all of the alternatives.

Water quality is influenced by both natural and human factors. Water quality concerns created by natural conditions are hard to control. In general, water quality in the planning area is typically good in reaches of streams where riparian vegetation is good and streams are fed directly by snowmelt, precipitation, and shallow ground water. As water flows downstream, biological, physical, and chemical parameters deteriorate water quality.

Water quality impacts can result from a number of causes, including transport of eroded soils into streams due to improper livestock grazing, introduction of waste matter into streams from domestic livestock and wildlife, poorly designed and/or maintained stream crossings, route proliferation, as well as energy and mineral development. Potential energy and mineral development impacts relate to both the transport of soil eroded from roads and developed areas, and the potential for release of chemical pollutants into area ponds, streams, tributaries, or unconfined aquifers.

Surface-disturbing activities can result in removal of essential soil stabilizing agents such as vegetation, soil crusts, litter, and woody debris. These soil features function as living mulch by retaining soil moisture and discouraging annual weed growth (Belnap et al. 2001). Loss of one or more of these agents increases potential erosion and sediment transport to water bodies, leading to

water quality degradation. Surface-disturbing activities can also lead to soil compaction, which decreases infiltration rates and elevates potential for overland flow. Overland flow can increase erosion and sediment delivery potential to area water bodies, leading to water quality degradation.

Surface-disturbing activities can elevate production of fugitive dust which may then be deposited over snow. Dust-covered snow can have albedo (reflectivity) values as low as 0.35, doubling the amount of absorbed solar radiation versus clean snow. Research and simulations based on observations in the Senator Beck Basin Study Area near Silverton, Colorado indicate that excess dust on snow (versus pre-1800 conditions) increased the rate of snowmelt and advanced the timing of meltout by about 3 to 4 weeks (Painter et al. 2007). Furthermore, results of studies conducted by Painter and others indicate that annual runoff at Lees Ferry is reduced by five percent under current dust conditions. Primary contributing factors for decreased run-off were identified as follows:

1. Greater absorption of energy during snowmelt causes more of the snow to sublimate directly into the atmosphere.
2. Earlier meltout exposes the ground surface to sunlight and warmth, which both allow more evaporation of water directly from the soil, and extends the growing season for plants that then can transpire additional water. It is this combined increase in evapotranspiration that appears to have the most impact on stream flow.

The effects of dust on snow may extend beyond alteration of natural hydrographs and increased water consumption. Soil moisture in areas reliant on snow melt or flooding would likely be depleted earlier in the season stressing vegetation. These additional stresses to vegetative communities could contribute towards vegetative loss and/or establishment of less desirable species which may not possess adequate soil stabilizing characteristics. As a result, potential soil erosion and stream sedimentation would be increased causing water quality degradation.

Surface-disturbing activities occurring in areas of low reclamation potential (e.g., "fragile soils," slopes greater than 40 percent, soils derived from Mancos shale) or sensitive areas such as stream channels, floodplains, and riparian habitats are at higher risk for erosion. Disturbance in these areas creates greater potential for erosion and sediment delivery to surface waters, thereby degrading water quality.

Surface-disturbing activities within stream channels, floodplains, and riparian habitats are more likely to alter natural morphologic stability and floodplain function. Morphologic destabilization and loss of floodplain function cause accelerated stream channel/bank erosion, increased sediment supply, dewatering of near-stream alluvium, loss of riparian habitat, loss of fish habitat, and

deterioration of water quality (Rosgen 1996). Alteration or removal of riparian habitats can reduce the hydraulic roughness of the bank and increase flow velocities near the bank (National Research Council 2002). Increased flow velocities near the bank can cause accelerated erosion, decreasing water quality.

Surface disturbance can alter natural drainage patterns. Runoff critical to recharging and sustaining locally important aquifers, springs/seeps/fens, wetlands, and associated riparian/xeririparian habitats is redirected elsewhere. As a result, these sensitive areas can be dewatered, compromising vegetative health and vigor while also degrading proper function and condition of the watershed.

Subsurface disturbances can alter natural aquifer properties (e.g., enhance hydraulic conductivity of existing fractures, breach confining units, and change hydraulic pressure gradients), which can increase potential for contamination of surface and groundwater resources. Furthermore, alteration of natural aquifer properties can result in dewatering of locally important fresh water sources (e.g., groundwater, springs, seeps, fens, and streams).

Surface water runoff is dependent on both natural factors and land management. Natural factors include climate, geology and soils, slope, channel conditions, and vegetation type and density. Land use or management actions that alter these natural factors play a role in altering surface water runoff. Such actions include grading or compacting soils for new roads or well pads, and management prescriptions that alter the type or density of vegetation.

Reductions in water flow can have adverse impacts on the ecology of a watershed, its recreational potential, the availability of drinking water and water for other uses, and groundwater quality and quantity. Water quality impacts from reduced water supplies include increased water temperatures, ph levels, and alkaline levels. Reductions in water supply could result from consumptive uses of surface water or tributary groundwater sources that do not result in return of the water to the basin. Examples include reduced flood frequency and magnitude (limiting near stream alluvial recharge potential) caused by peak flow diversions, evaporative loss from new surface water features, evapotranspiration from irrigation of vegetation, injection into deep wells, or use in drilling fluids that are later disposed outside of the basin.

Chemicals, some hazardous, are used and produced by oil and gas exploration and production (EPA 2004, URS 2006, and Thyne 2010, as cited in BLM 2014). Oil and gas waste management practices have the potential to contaminate soils and water. Long-term impacts depend on the volume and toxicity of the spilled materials or fluids. Spills with low levels of hydrocarbons 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. Contamination of soils could cause long-term reduction in site productivity resulting in increased erosion and potential

sediment and contaminant delivery to nearby waterways during runoff. Use, storage, and transportation of fluids, such as produced water, hydraulic fracturing fluids, and condensate, have the possibility of spills that could migrate to surface or groundwater. Additionally, tanks used to store produced water and condensate would be placed in secondary containment to prevent offsite release. Stormwater runoff controls enforced by CDPHE reduce this potential of offsite migration of sediment and pollutants. 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.

State regulations can help mitigate impacts from fluid minerals development. For example, COGCC Rule 609 for statewide groundwater baseline sampling and monitoring requires operators to collect baseline water quality samples at two different groundwater sources within 0.5-mile of the well site before drilling any new oil or gas well. The rule also requires the operator to take subsequent water samples to ensure no groundwater contamination occurred during drilling or after production. Operators are required to comply with all applicable state laws and regulations regardless of the RMP alternative that is implemented.

Activities beneficial to water resources are primarily defined as improving conditions by enhancing or restoring degraded water quality or by reducing ongoing groundwater depletion. Road maintenance that includes installing stormwater controls and replacing improperly sized and designed culverts are beneficial to water resources. Changing grazing patterns in riparian areas and modifying recreation uses in sensitive watersheds further benefit water quality and geomorphic function of streams. Management actions regarding closure or avoidance of specific areas or restrictions of disturbance are considered protective of environmental conditions and so are also regarded as beneficial. Mitigation measures also reduce the impacts on water resources associated with ongoing or future activities.

Methods of Analysis

Indicators of impacts on water resources include the following:

- Alteration of the physical characteristics of streams, springs/seeps/fens, wetlands, riparian areas, and groundwater aquifers to a point that these resources are not properly functioning and/or sustainable
- Sustainable yield of groundwater resources cannot be obtained
- Meeting state and federal water quality standards for surface and groundwater
- Impaired water quality to a degree that could affect the survival rate of downstream aquatic or riparian species

Every management action that directly or indirectly has the potential to alter aquifer properties, water quality, water quantity, and the natural hydrograph can have accompanying temporary and/or permanent impacts on water resources. The discussion of impacts on water resources includes the effects of surface- and subsurface-disturbing actions on water quality, water quantity, and cumulative watershed health.

The analysis includes the following assumptions:

- The degree of impact attributed to any one disturbance or series of disturbances will be influenced by several factors, including proximity to drainages, proximity to existing groundwater wells, location within the watershed, time and degree of disturbance, reclamation potential of the affected area, existing vegetation, precipitation, and mitigating actions applied to the disturbance.
- New transportation facilities will be properly designed (BLM minimum standards).
- Surface-disturbing actions related to fluid mineral development will comply with Gold Book surface operating standards (and subsequent updates).
- Aquifers with shallower depths to water are more susceptible to contamination. Mineral development is the primary BLM-authorized activity with a potential to impact shallow groundwater quality and quantity. Locations in the planning area with depths to groundwater of less than 100 feet or unconfined aquifers are considered the most likely to be impacted by mineral development. Unconfined aquifers or aquifers with water table elevations of 100 feet below ground surface are more vulnerable to leaks and/or spills of contaminants at the surface. However, groundwater at greater depths is vulnerable to mine dewatering, casing failure, contamination resulting from enhanced hydraulic conductivity caused by hydraulic fracturing and drilling, and contamination caused by chemicals utilized in the hydraulic fracturing and drilling processes.
- Ephemeral systems are a critical piece of the hydrologic cycle and warrant protection. They are typically steep headwater channels that provide water, sediment, and nutrients to downstream aquatic habitat. Destabilization of these systems directly (e.g., surface disturbance to channel and/or banks) or indirectly (e.g., increased surface run-off caused by improper road drainage or soil compaction) can alter the streams' ability to efficiently move sediment and water to lower portions of the watershed. Decreased water quality and morphologic destabilization can result. Intermittent streams flow continuously at certain times of the year, such as when snow melts or after rain, but shrink in dry times to

become individual pools filled with water. They typically flow for several months and can be important to fish habitat.

Effects Common to All Alternatives

The BLM would continue to manage the LBCWHR (35,200 acres) to accommodate an AML of 90 to 150 wild horses. The AML would be adjusted so as to not degrade range conditions, which include water resources. For example, maintaining the horse herd at the AML would prevent overgrazing, minimizing the loss of vegetative cover. Maintaining vegetative cover would limit erosion, thereby limiting stream sedimentation during stormwater runoff. These indirect impacts would continue under all alternatives, because there would be no change in management actions.

Wildland fire can result in substantial water resource impacts in a short period of time. Fire can reduce soil infiltration rates, resulting in reduced water retention potential of the affected soils and more runoff following precipitation and snowmelt. Loss of vegetation also contributes to these effects. Fires also create openings where snow and ice accumulate to greater depths than in forested areas. These openings can produce high runoff during short periods of rapid thawing, resulting in soil erosion and high peak flows. Excessive sediment delivery to stream channels can result in water quality impacts for long periods of time, while sediment-clogged channels can cause flooding. Similarly, chemical products of wood combustion are carried into streams with runoff.

The BLM would continue to use surface water as a source of water for fire-suppression activities. Because surface water sources for fire suppression are not specified, the primary general impacts on surface water sources used for fire suppression include the lowering of surface water levels and the loss of water for groundwater recharge.

In situations where sediment-control structures, commonly referred to as check dams, are causing excessive erosion, restoration may be necessary. Restoration may include "notching" or removal of the structure entirely, as well as revegetating the affected area.

Potential impacts from coal, locatable mineral, mineral material, and non-energy leasable mineral activities and development would include the release of pollutants capable of contaminating surface water during stormwater runoff or contaminating aquifers during groundwater recharge. Mineral activities and developments could also alter drainage patterns, which would affect stream hydrographs and water supplies. Discharge of mine water can alter water chemistry and impair natural stream morphologic conditions.

Direct and indirect negative impacts on water resources from fluid minerals development can occur during the drilling, completion, or operational phases of wells. Other impacts occur from surface-disturbing activities, traffic, waste management, water use, and the use, storage, and transportation of fluids (i.e.,

chemicals, condensate, and produced water). Surface-disturbing activities associated with facilities, such as well pads, roads, and pipelines, cause loss of vegetation cover, soil compaction and displacement, reduced infiltration, increased volume and velocity of runoff, and increased sedimentation and salinity in surface waters. 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. Short- and long-term negative impacts would include physical changes in channel configuration associated with poorly aligned culverts, improperly sized culverts, and fill material. 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. Impacts can be minimized initially by properly casing wells, managing stormwater, stockpiling topsoil, controlling erosion, and quickly rehabilitating disturbed surfaces. Long-term soil protection could be achieved by continued maintenance, which would reduce erosion and minimize the size of the long-term pad footprint through interim reclamation measures.

Oil and gas waste management practices have the potential to contaminate soils, surface water, and groundwater in the event of a spill of fluids/chemicals, leaks from pipelines, leaks from pits, and compromised wells. Produced and flowback water would be either recycled for reuse in future hydraulic fracturing or disposed of in disposal wells or surface evaporation pits. Use, storage, and transportation of fluids such as produced water, hydraulic fracturing fluids, and condensate have the possibility of spills that could migrate to surface or groundwater. Contamination of soils from drilling and production wastes or chemicals spilled on the surface could migrate to surface or groundwater and cause reduction in site productivity.

The possibility that hydraulic fracturing fluids may migrate to shallow groundwater sources is still speculative based on ongoing studies by the EPA (EPA 2011a). Additional detail about oil and gas drilling and hydraulic fracturing is presented in **Section 3.2.5**, Water Resources, **Section 3.6.2**, Public Health and Safety, and **Section 4.6.2**, Public Health and Safety.

Management under all alternatives could impact rates of soil erosion and could therefore affect water quality, water quantity, and the hydraulic characteristics of streams. BMPs are interventions designed to minimize the impacts of human activities on water quality and quantity caused by discharge of sediment or chemical constituents. The BLM would implement BMPs designed to minimize the impacts of human activities on water quality and quantity. Since the effectiveness of BMPs vary, and since they are seldom 100 percent effective, the net impact on water quality and quantity that would result from activities that produce chemical contaminants to soils, or that affect soil erosion rates, would depend on the type, duration, and amount of activity. Stipulations designed to protect other resources would indirectly protect water resources from erosion,

sedimentation, changes in runoff, or other related impacts. **Appendix B**, Stipulations Applicable to Fluid Mineral Leasing and Other Surface-disturbing Activities, includes the full list of stipulations that would restrict surface disturbances that cause impacts on water resources. Appendix A, Figures, displays areas subject to management actions for ROWs, travel management, minerals, and other resources and uses discussed in the following analysis.

Climate change would impact water resources under all alternatives, but water resources may be more vulnerable to the impacts of climate change under certain alternatives. Resource uses in the planning area (e.g., livestock grazing, forestry, recreation, travel, lands and realty, and energy and minerals leasing and development) are stressors that may generally impact this resource's ability to adapt to climate change. These impacts would likely be more harmful to water resources under Alternatives A and D where there are fewer restrictions on resource uses. Under Alternative C, more stringent restrictions would limit the impact of these stressors (as described in the analysis under Alternative C, below). The ability of water resources to adapt to climate change under Alternative B would likely fall between the other alternatives because resource use restrictions are generally more stringent than under Alternatives A and D, but less stringent than under Alternative C.

The acreages of perennial stream habitat potentially impacted by travel management actions under each alternative are shown in **Table 4-30**, Travel Management Impacts on Perennial Stream Habitat.

Table 4-30
Travel Management Impacts on Perennial Stream Habitat

Actions	Acres of Perennial Stream Habitat Impacted			
	Alternative A	Alternative B	Alternative C	Alternative D
Open to All Modes of Travel within 100 Feet of Perennial Streams	2,200	0	0	0
Closed to Motorized Vehicles within 100 Feet of Perennial Streams	100	200	1,900	200
Limited to Existing Routes for Motorized Vehicles within 100 Feet of Perennial Streams	1,200	0	0	0
Limited to Designated Routes for Motorized Vehicles within 100 Feet of Perennial Streams	1,200	4,800	3,000	4,600
Seasonal Limitations for Motorized Vehicles within 100 Feet of Perennial Streams	400	500	200	300

Source: BLM 2010a

Implementing management for paleontology would have a negligible impact on water resources and is therefore not discussed in detail.

Alternative A

The BLM would continue general activities to maintain or improve water quality, natural stream morphologic conditions, sustainability of water resources (water quantity), groundwater aquifer properties, and natural stream hydrographs. For example, the BLM would continue stream stabilization work, which would minimize deposition of sediment in streams and help maintain natural stream morphologic stability. These direct impacts would maintain or improve water resource conditions.

Under Alternative A, the BLM would continue to manage 234,900 acres of ROW exclusion areas and 441,400 acres of ROW avoidance areas in the planning area. Those activities and developments capable of affecting water resources would not occur in exclusion areas and would be limited in avoidance areas. ROW actions that could release pollutants capable of contaminating surface water during runoff events or contaminating aquifers during groundwater recharge would not occur or would be limited. Also, ROW actions that could alter drainage patterns and recharge rates for groundwater, which affect stream hydrographs and water supplies, would not occur or would be limited. On the 385,100 acres not managed as exclusion or avoidance areas, there would be fewer management actions implemented to prevent these impacts from occurring. The severity of these direct and indirect impacts would vary, depending on the different types of ROW activities, intensity of development, and site-specific geomorphic conditions.

There would continue to be 96,500 acres of federal mineral estate closed to fluid mineral leasing and 1,134,600 acres of federal mineral estate open to fluid mineral leasing (refer to **Table 2-1**). By managing lands as closed to fluid mineral leasing, actions would not occur that could release pollutants capable of contaminating surface water during runoff events, or contaminating aquifers during groundwater recharge. Also, actions would not occur that could alter drainage patterns, which affect stream hydrographs and water supplies. However, by managing lands as open to fluid mineral leasing, there is the potential for these impacts to occur in areas of fluid minerals development. The severity of these direct and indirect impacts would vary, depending on the different types of fluid mineral leasing activities and the intensity of development, as well as the type and volume of contaminants released to the environment.

There would continue to be 433,000 acres where NSO stipulations would be applied to fluid mineral leases (refer to **Table 2-1**). The NSO stipulations would protect water resources either directly or indirectly. By prohibiting use or occupancy of the land surface, associated actions capable of affecting water resources would not occur, unless allowed by an exception, in areas with this stipulation. Actions would not occur that could release pollutants capable of

contaminating surface water during runoff events, or contaminating aquifers during groundwater recharge. Also, actions that could alter drainage patterns, which affect stream hydrographs and water supplies, would not occur. In areas not managed as NSO (or areas of NSO where exceptions are granted), there is the potential for these impacts to occur in areas of minerals development. Practices such as directional or horizontal drilling, that access resources from outside the boundary of an NSO stipulation, could impact water resources. In addition, impacts from down-hole operations (e.g., well completion, hydraulic fracturing) would still occur. The severity of these impacts would vary depending on the different types of mineral leasing activities and intensity of development.

There would continue to be 74,100 acres where CSU stipulations would be applied to fluid mineral leases (refer to **Table 2-1**). The CSU stipulations would protect water resources either directly or indirectly. By constraining use or occupancy of the land surface, associated actions capable of affecting water resources would be limited. Actions that could release pollutants capable of contaminating surface water during runoff events or contaminating aquifers during groundwater recharge would be limited. Also, actions that could alter drainage patterns, which affect stream hydrographs and water supplies, would be limited. However, by not constraining use or occupancy of the land surface, there would be fewer management actions to prevent these impacts from occurring. The severity of these impacts would vary, depending on the different types of surface-disturbing activities and intensity of development.

The BLM would continue to apply LN-17: Palisade Municipal Watershed, wherein the lessee is notified that the lease contains the privately owned surface of the Town of Palisade, located within the town's designated watershed, and is covered by a Watershed Protection Ordinance. The ordinance would continue to influence activities and developments in a manner appropriate to protecting the Palisade Municipal Watershed. Applying LN-17 would help maintain water resource conditions in the watershed.

Under Alternative A, fluid mineral well bores and storage and use of hazardous chemicals would not be limited near domestic water wells or in Water Intake Zone 3. These activities could contaminate water resources from the use of hazardous chemicals that could infiltrate or percolate into domestic and municipal water resources if a spill or other accident were to occur. If these types of accidents became common, they could compromise existing water resource conditions given reasonably foreseeable development in the future.

There would be no specific management actions under Alternative A to restore and maintain healthy, productive plant communities of native and other desirable species at self-sustaining population levels commensurate with the species' and habitats' potentials. By not restoring plant communities, the soil surface remains exposed and, consequently, susceptible to erosion. Soil erosion

during runoff events and mineral constituents of eroded parent material affect surface water by depositing sediment in streams and other water bodies, thereby affecting water quality and stream morphology. Exposed soil also allows wind to more easily erode soil and deposit it on the surface of snow. Soil covering the surface of snow affects the melting rate and timing of meltout, thereby altering stream hydrographs and water availability to downstream users.

The BLM would continue to manage 28,900 acres of ACECs for purposes that directly or indirectly affect water resources. Management of ACECs would indirectly affect water resources through the management for other special resource values, such as vegetation. Vegetation helps filter contaminants from runoff, contributes to soil stabilization, and is an important component to flood-plain function in riparian/xeririparian areas. Under Alternative A, the BLM would not designate additional ACECs, and there would be no additional protection of water resources from ACEC management.

Alternative A would continue to provide minimal management actions specific to protecting riparian areas or dry washes, both of which are important components of watershed health. Impacts on riparian areas may include trampling of vegetation and soil disturbance by livestock grazing, recreation activities, or motorized use. These types of alterations to riparian areas would destabilize stream banks and reduce water storage capacity and releasing capability of these areas. The large water storage capacity of alluvial deposits and stabilizing characteristics of riparian zones buffers the movement of water from upland areas into streams. Instead of allowing water to flow directly into streams following a rainstorm or snowmelt, healthy riparian areas hold and store water and are critical in sustaining the proper function and condition of stream channels and floodplains. Throughout the year, this water seeps slowly into adjacent streams, providing water for base flow in area streams. The indirect impacts described above would limit the ability of riparian areas to perform these beneficial functions.

The BLM would continue to manage 542,700 acres as unsuitable for forest harvest (refer to **Table 2-2**), and would continue to prohibit timber and woodland harvesting in riparian areas. This would protect vegetative cover, thereby limiting erosion and sedimentation during runoff events. Increased sedimentation can degrade water quality and result in increased width/depth ratios in stream channels. Increased width/depth ratios can cause increased lateral stream bank erosion and further sedimentation to streams (Rosgen 1996). These management actions would help maintain water resource conditions.

The BLM would continue to utilize prescribed fires in order to meet land and resource management objectives. Prescribed burn areas would be susceptible to erosion and increased sedimentation in water bodies because of the lack of vegetative cover and loss of woody debris and biologic soil crusts. Reduced fire

intensity associated with planned fire reduces the potential for post-fire erosion because not all soil-stabilizing characteristics are consumed. However, unlike unplanned wildfire, the BLM would avoid burning areas adjacent to surface water in order to limit impacts on water resources. Also, restoration of burned areas would include enhancing plant communities, which would help protect water resources in the long term. These indirect impacts would threaten water resource conditions in the short term and maintain or improve water resource conditions in the long term.

There would continue to be 48,600 acres closed to livestock grazing and 978,600 acres open to livestock grazing. Improper grazing has the potential to accelerate erosion rates and nutrient loads to surface water from trampled vegetation and soil compaction. As a result, contaminants such as nutrients and bacteria could wash directly into receiving waters from surface water runoff in grazed areas. These effects could occur in areas open to historic grazing. Stream banks would also continue to be sheared by livestock using these areas. This would result in changes to the natural stream morphology and its functions. The severity of these indirect impacts would vary, depending on season of use, type of livestock, intensity of livestock grazing, and climatic conditions. However, in lands closed to future livestock grazing, these types of water resource impacts would not occur.

The BLM would continue to implement BMPs, including periodic rest periods in areas open to grazing, to maintain plant vigor and health. This would minimize impacts on land and watershed health from overuse, reducing the impacts on water resources from grazing. Continuing to allow grazing use in limited precipitation zones would require more intensive management in these areas. Without proper management, this could reduce vegetative cover, resulting in accelerated sedimentation, nutrient loads, and bacteria into surface waters from increased erosion rates, alteration of timing of snow meltout due to increases in dust, increased evaporation, increased sublimination, increased evapotranspiration; and recharge impacts on local water-bearing units from decreased infiltration rates.

Under Alternative A, 35,300 acres would continue to be managed as closed to motorized use (and motorized and mechanized use would be limited to existing ways in WSAs), while the remainder of the decision area would be designated as Open (intensive: 12,500 acres; cross-country: 445,400 acres) or Limited (limited to designated routes: 225,500 acres; limited to existing routes: 342,700 acres; seasonal limitations: 106,200 acres). Within areas of open and limited use, potential impacts on water resources would continue from recreational use, and could increase due to increased motorized vehicle use of existing roads, trails, and cross-country travel. Foot and horse travel would continue to be limited to designated routes on 6,200 acres, limiting impacts in those areas.

In the 35,300 acres closed to motorized use, natural drainage patterns would be better preserved, and excessive erosion of uplands as well as stream channels and banks would be reduced. This would help preserve the natural stream morphologic conditions. Closed areas would experience less soil structure disturbance and disruption/removal of vegetation. This would limit erosion, sedimentation, and contamination of water bodies.

The effects of recreational activities on water quality can include sedimentation (deposited solids), turbidity (suspended solids), disrupted soil crusts, and reduced vegetation cover. Removal of vegetation can lead to increased amounts and velocities of runoff, accelerating the rates at which sediments and other debris are eroded from cross country or intensive use areas and flushed to downslope aquatic systems. Pollutants associated with deposition of motorized vehicle emissions and spills of petroleum products may be absorbed by sediments and plant material, or dissolved in runoff. Once mobilized, these contaminants may enter aquatic systems (Ouren et al. 2007). The severity of these impacts would vary, depending on the different types (e.g., dirt motorcycles, dune buggies, sand rails, jeeps, four-wheel drive vehicles, snowmobiles, and ATVs) and intensity of motorized use.

There would continue to be 300,700 acres acceptable for further coal leasing and development, and 36,700 acres in the coal resource development potential area identified as unacceptable for further consideration of leasing and development. Coal mining activities capable of affecting water resources would not occur in those areas identified as unacceptable. In acceptable areas, as described at the beginning of this section, coal mining activities and developments could impact water resources, including sedimentation, contamination, and alteration of water quality, stream morphology, and aquifer characteristics. The severity of these indirect impacts would vary, depending on the different types and intensities of coal activities and development.

By managing lands as closed to locatable, salable, and leasable minerals, impacts on water resources from associated mineral activities and developments would not occur in those areas. However, as described at the beginning of this section, by managing lands as open to locatable, salable, and leasable minerals, there is the potential for these impacts to occur in areas with mineral activities, including sedimentation, contamination, and alteration of surface and subsurface water bodies. The severity of these indirect impacts would vary, depending on the different types of locatable, salable, and leasable activities and intensity of development. Impacts from non-energy leasable minerals would be limited to the only part of the decision area known to have potential for non-energy leasable minerals, the 2,800-acre potash potential area in Sinbad Valley.

There would continue to be 23,300 acres withdrawn from mineral entry and 0 acres with petition to withdraw from locatable mineral exploration or development. By withdrawing land, impacts on water resources from associated

mineral activities and developments would not occur in those areas. However, by not withdrawing land, there is the potential for impacts on water resources to occur in these areas from mineral activities. The severity of these indirect impacts would vary, depending on the different types of locatable mineral activities and intensity of development.

There would be 14 stream segments along 99.5 miles of river segments crossing BLM-administered land identified as eligible for inclusion in the NWSRS (see **Appendix C**, Wild and Scenic River Suitability Report). The BLM would continue to manage the eligible segments according to interim protective management guidelines. The guidelines specify that BLM cannot take any actions that would degrade the outstandingly remarkable values, degrade the free-flowing nature of the segment, degrade water quality that is necessary to support the outstandingly remarkable values, or change the classification of the segment (level of development). These guidelines would contribute to maintaining water resource conditions in these 14 segments only. Identifying streams as eligible for WSR designations could attract recreation which has potential to degrade water quality when river-based recreation results in removal of streamside vegetation.

The lack of interpretation and environmental education activities in the decision area could result in user actions that could degrade water resources.

Alternative B

Under Alternative B, the BLM would implement specific actions related to protecting and monitoring water quality and quantity. These actions would maintain or improve water quality, natural stream morphologic conditions, sustainability of water resources (water quantity) (refer to **Table 2-2**), groundwater aquifer properties, and natural stream hydrographs.

Similar to Alternative A, the BLM would implement LN-1: Source Water Protection Areas, requiring the lessee to implement special protective measures for water resources and to collaborate with municipalities to comply with applicable municipal watershed plans. In addition, the Grand Junction and Palisade municipal watersheds would be closed to fluid mineral leasing. Compared to Alternative A, these special protective measures under Alternative B would result in fewer impacts on water resources in municipal watersheds from fluid minerals activities.

Under Alternative B, there would be 210,000 acres managed as ROW exclusion areas (11 percent fewer acres than under Alternative A) and 789,400 acres managed as ROW avoidance areas (79 percent more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A. The intensity and severity of impacts would depend on the type of activity or development, and the type or condition of water resources occurring in these areas.

There would be 270,700 acres of BLM surface land closed to fluid mineral leasing (2.8 times more than under Alternative A) and 790,700 acres open to fluid mineral leasing (18 percent fewer acres than under Alternative A). The types of impacts from fluid mineral leasing would be the same as those described under Alternative A, but would occur over a smaller area. The intensity and severity of impacts would depend on the type of activity or development, and the type or condition of water resources occurring in these areas.

Oil and gas operations near domestic water supplies using a groundwater well or spring would be restricted and appropriate design features or conditions of approval would be developed in order to avoid contaminating water resources. Therefore, impacts from fluid mineral development on domestic drinking water supplies using a well or spring would not be expected.

Within Water Intake Zone 3, restricting the storage and use of hazardous chemicals, requiring green completions and green hydraulic fracturing fluids, and restricting oil and gas pits would protect water resources from the use of hazardous chemicals that could infiltrate or percolate into domestic and municipal water resources if a spill or other accident were to occur. Applying additional site-specific mitigation measures as appropriate to minimize risk of water quality degradation would have a similar effect.

Under Alternative B, NSO stipulations would be applied on 670,300 acres (55 percent more acres than under Alternative A, though Alternative A's acreage only includes NSO stipulations in areas open to leasing) of federal mineral estate. On BLM-administered land, these stipulations would apply to all surface-disturbing activities. The types of impacts would be the same as those described under Alternative A; however, NSO stipulations would be applied on more acres and activities under Alternative B.

Under Alternative B, CSU stipulations would be applied on 642,400 acres of federal mineral estate (note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate). The types of impacts would be the same as those described under Alternative A.

Unlike Alternative A, the BLM would implement specific management actions to restore plant communities and revegetate areas under Alternative B. By restoring more plant communities and revegetating more areas, a larger soil surface area would be covered and, consequently, would be less susceptible to erosion as sedimentation to water bodies would be reduced. This would provide greater opportunities to maintain and improve water resource conditions.

Under Alternative B, 13 ACECs on 123,000 acres (4.2 times more acres than under Alternative A) would be designated. The types of impacts would be the same as under Alternative A, but would occur over a larger area.

Compared to Alternative A, the BLM would implement more actions to protect and monitor riparian vegetation. The BLM would also give priority for riparian management to areas identified as special status species habitat and those riparian areas not meeting PFC and riparian communities rated as Functional at Risk (FAR). The types of impacts would be the same as under Alternative A, but the additional management actions under Alternative B would provide more opportunities to protect water resources from activities such as recreational travel, livestock grazing, and fluid mineral development.

Under Alternative B, the BLM would close approximately 239,400 acres (56 percent fewer acres than under Alternative A) to wood product sales and harvest (not including Christmas tree harvest), and would prohibit timber and woodland harvesting in riparian areas. In addition, specific forest/woodland management plans would be developed for eight forestry zones to accomplish resource objectives and prevent adverse impacts. Although more acres would be closed under Alternative A, Alternative B would provide more opportunities to protect water resources from forestry activities through implementing specific forest/woodland management plans.

The types of impacts from wildland fire management would be the same as under Alternative A, except that more acres would be potentially treated, moving vegetation communities toward desired conditions, which would better protect soil resources and increase water quality. Alternative B would have the broadest range of treatments for hazardous fuels, allowing for those treatments that would limit adverse impacts on water resources. In addition, the BLM would design ESR treatment actions based on the severity of the wildfire impacts, further increasing protection of water resources from impacts related to wildfires.

Under Alternative B, the BLM would manage 44,100 acres for wilderness characteristics. Management prescriptions would provide protection of the relevant and important values found in these areas and would include actions such as ROW exclusion and avoidance areas, travel restrictions (e.g., closed to motorized travel, limiting mechanized travel to designated routes), and closure to mineral development (subject to valid existing rights). These restrictions on surface-disturbing activities would provide protection for water resources in and adjacent to these areas.

Under Alternative B, 66,600 acres would be closed to livestock grazing (37 percent more acres than under Alternative A). The types of impacts from livestock grazing would be the same as those described under Alternative A, but would occur over a smaller area. Grazing would be permitted in the Grand Junction and Palisade municipal watersheds. Proper management of grazing in

these watersheds would mitigate erosion and loss of vegetative cover that would cause increased run-off, erosion, and contamination of municipal water resources.

Under Alternative B, the BLM would also limit grazing use in limited precipitation zones (176,800 acres) to manage the compatibility of grazing activities with environmental conditions. This change in the grazing use period could be phased in over a three-year period and would provide additional measures to reduce indirect impacts on water resources from grazing.

The types of impacts from motorized travel designations would be the same as those described under Alternative A. However, unlike Alternative A, there would be no areas open to cross-country for all modes of travel. In addition, there would be 10,200 acres open to intensive cross-country motorized use (18 percent fewer acres than under Alternative A), 126,200 acres closed to motorized vehicle use (3.6 times more acres than under Alternative A), and 925,200 acres where motorized travel is limited to designated routes (4.1 times more acres than under Alternative A). Furthermore, within 100 feet of perennial streams, there would be more acres designated as closed to motorized use and as limited to designated routes for motorized vehicles (refer to **Table 4-30**, Travel Management Impacts on Perennial Stream Habitat). Thus, motorized travel under Alternative B would have fewer impacts on water resources than under Alternative A due to fewer areas disturbed or contaminated (water quality) by motorized use. Impacts from travel management under Alternative B would be further reduced by implementing comprehensive route designations for mechanized travel (e.g., allowing intensive mechanized travel on only 10,200 acres and limiting mechanized travel to designated routes on 931,900 acres). Foot and horse travel would be limited to designated routes on 3,900 acres (27 percent fewer acres than under Alternative A) while cross-country use would be allowed in the remainder of the decision area (except for a prohibition on horse and foot travel in the 1,300-acre Pyramid Rock ACEC, and on horse travel on the Mica Mine and Rough Canyon trails). The types of impacts would be the same as described under Alternative A.

The mileages of routes are proposed to be designated administrative-only or closed based upon water resources planning criteria are shown in **Table 4-31**.

Within the coal resource development potential area there would be 252,100 acres identified as acceptable for further coal leasing and development (15 percent fewer acres than under Alternative A). Alternative B would also identify 57,400 acres as unacceptable for further consideration of leasing and development (35 percent more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A, but would occur over a smaller area.

Table 4-31
Route Designations and Water Resources Planning Criteria under Alternative B

Planning Criteria	Final Designation Administrative Use (miles)	Final Designation Closed (miles)	Total Miles Designated as Administrative Use or Closed
Route Within 100 Feet of Riparian Community	13.5	26.5	40
PFC Functioning at Risk or Not Functioning	0.1	5.1	5.2
Does Not Meet Hydrologic Land Health Standard	51.4	144.3	195.7
Municipal Watershed and Source Water Protection Area	10.3	15.3	25.6
Perennial Stream/Fishery	2.8	19.1	21.9
Drainage Crossings	145.5	253.4	398.9
Total	**223.6**	**463.7**	**687.3**

Source: BLM 2010a

The types of impacts from locatable and salable minerals would be the same as those described under Alternative A. However, Alternative B would petition to withdraw 20,600 acres from mineral entry (versus 0 acres under Alternative A). There would also be 783,800 acres open for consideration for mineral material (salables) disposal on a case-by-case basis (0.5 percent more acres than under Alternative A), and 277,700 acres closed to mineral material (salables) disposal (1 percent more acres than under Alternative A).

Under Alternative B, opportunities would be provided for non-energy leasable exploration and development on 518,600 acres (there is no similar action under Alternative A). Applying NSO stipulations would reduce the potential impacts on water resources by prohibiting surface-disturbing activities. Alternative B would also close 542,800 acres in sensitive areas to non-energy leasable mineral exploration and development, which would increase opportunities to reduce impacts on water resources in these areas (there is no similar action under Alternative A).

Under Alternative B, the BLM would determine that all eligible stream segments are not suitable for inclusion in the NWSRS, with the exception of a portion of the Dolores River determined to be suitable. Streams segments determined to be not suitable would be released from interim management protection afforded to eligible segments. The portion of the Dolores River determined to be suitable would continue to be managed under interim management guidelines, which provide standards for ongoing protection of river-related values. Designation, by Congress, of portions of the Dolores River as a WSR could result in increased recreational use that may lead to minor reductions in water quality.

Implementation of an interpretation and environmental education program under Alternative B would enhance awareness and appreciation of water resources within the decision area. This could result in increased protective efforts by the general public.

Master Leasing Plan

Alternative B would close approximately 37,600 acres of currently unleased federal mineral estate to oil and gas leasing and geophysical development within the Shale Ridges and Canyons MLP analysis area. Major constraints (i.e., NSO leasing stipulations) would be applied to approximately 328,700 acres of federal mineral estate that are open to fluid minerals leasing. This includes approximately 4,400 acres of the NSO CSO-HYDROLOGY RIVER (i.e., major river corridors; note that all stipulations would protect water resources regardless of the resource program under which the stipulation originates. Other stipulations focused on water resources are not mapped, but would still apply.). In addition, CSU stipulations would apply to approximately 362,500 acres of federal mineral estate that are open to fluid minerals leasing. Timing limitations would apply to approximately 237,500 acres of federal mineral estate that are open to fluid minerals leasing.

Surface-disturbing activities associated with mineral resource development would contribute to negative impacts on water resources from the loss of vegetation cover, soil compaction, and soil displacement associated with well pads, roads, and pipelines. The result would be an increase in erosion, and potential sediment and contaminant delivery to nearby waterways during runoff. Areas that would be closed to development or subject to NSO leasing stipulations would not experience surface disturbance from fluid minerals development. Water resources in areas subject to standard conditions, CSU stipulations, or TL stipulations, would experience short- and long-term impacts from surface disturbances associated with fluid minerals development. Short- and long-term negative impacts include physical changes in channel configuration associated with poorly aligned or improperly sized culverts; increased run-off from compacted surfaces with poorly designed run-off controls, such as from pads, pipelines, and roads; and sediment and contaminant delivery to nearby waterways from denuded or poorly vegetated surfaces that lack adequate erosion and run-off controls.

Groundwater impacts from oil and gas development could occur if a well is improperly developed. All drilling would be completed under state and federal rules and regulations in a manner that protects groundwater resources. All potential water bearing zones would be protected from contamination by casing and cementing requirements. Additional existing requirements for siting wells, pits, and produced water disposal would be designed to protect surface and groundwater quality. Under Alternative B, leasing stipulations would apply to help insure well pads, pits, and operations protect water quality. Overall, oil and

gas activities would result in minor impacts on water resources, with moderate impacts possible in high potential oil and gas areas and developed fields.

Alternative C

Compared to Alternative A, the BLM would implement more actions related to protecting and monitoring water quality and quantity. These actions would maintain or improve water quality, natural stream morphologic conditions, sustainability of water resources (water quantity), groundwater aquifer properties, and natural stream hydrographs. Overall, compared to Alternative A, there would be more proactive actions to maintain or improve surface water and groundwater resources under Alternative C.

Unlike Alternative A, the BLM would not implement an LN pertaining to municipal watersheds and source water protection areas for the Palisade and Grand Junction municipal watersheds. However, the Palisade and Grand Junction municipal watersheds would be closed to future fluid mineral leasing; LNs applicable to fluid mineral leasing would not be necessary. The types and severity of impacts on water resources from fluid minerals activities and development in municipal watersheds would be similar to Alternative A, but would occur over a smaller area.

Under Alternative C, there would be 365,800 acres managed as ROW exclusion areas (39 percent more acres than under Alternative A) and 627,000 acres managed as ROW avoidance areas (42 percent more acres than under Alternative A). As a result, the types of impacts from ROW actions would be the same as those described under Alternative A, but would occur over fewer acres.

There would be 554,700 acres closed to fluid mineral leasing (5.7 times more acres than under Alternative A) and 506,700 acres open to fluid mineral leasing (48 percent fewer acres than under Alternative A). The types of impacts would be the same as under Alternative A, but would occur over a smaller area.

Developing appropriate design features or conditions of approval for oil and gas operations near domestic water supplies using a groundwater well or spring would result in the same impacts on domestic water supplies as described under Alternative B.

Under Alternative C, NSO stipulations would be applied on 858,000 acres of federal mineral estate (98 percent more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A, but would apply to more activities and occur over 248,300 fewer acres.

Under Alternative C, CSU stipulations would be applied on 664,400 acres of federal mineral estate (note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not

considered accurate). The types of impacts would be the same as those described under Alternative A.

Unlike Alternative A, the BLM would implement specific management actions to restore plant communities and revegetate areas under Alternative C. By restoring more plant communities and revegetating more areas, a larger soil surface area would be covered and, consequently, would be less susceptible to erosion and sedimentation than under Alternative A. This would provide greater opportunities to maintain and improve water resource conditions.

Under Alternative C, the BLM would designate 23 ACECs on 168,000 acres (4.8 times more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A. However, by protecting over 139,300 more acres of ACECs compared to Alternative A, Alternative C would provide more opportunities to protect water resources from surface-disturbing activities.

The BLM would close approximately 435,300 acres (20 percent fewer acres than under Alternative A) to wood product sales and harvest (not including Christmas tree harvest), and prohibit timber and woodland harvesting in riparian areas. As under Alternative B, specific forest/woodland management plans would be developed for eight forestry zones to accomplish resource objectives and prevent adverse impacts. Although more acres would be closed under Alternative A, Alternative C would provide more opportunities to protect water resources from forestry activities by implementing specific forest/woodland management plans.

The types of impacts from wildland fire management would be the same as described under Alternative A, except that more acres would be potentially treated, moving vegetation communities more in line with the historic range of variability, which would better protect soil resources and increase water quality. As under Alternative B, the BLM would design ESR treatment actions based on the severity of the wildfire impacts, further increasing protection of water resources from impacts related to wildfires. Unlike under Alternative B, there would be restrictions on some treatment types, limiting the choices for selecting a treatment type that would most limit impact to water resources.

Under Alternative C, the BLM would manage 171,200 acres for wilderness characteristics (7 times more acres than under Alternative B; there is no similar action under Alternative A). The types of impacts would be the same as under Alternative B, but over an additional 146,800 acres.

Under Alternative C, the BLM would close 440,400 acres to livestock grazing (84 percent more acres than under Alternative A). As a result, the types of impacts from livestock grazing would be the same as described under Alternative A, but would occur over a smaller area. Grazing would not be permitted in the Grand Junction and Palisade municipal watersheds. This would

prevent erosion and loss of vegetative cover that could cause increased run-off, erosion, and contamination of municipal water resources.

Similar to Alternative A, the BLM would implement rest periods on disturbed areas in order to protect land and watershed health. However, under Alternative C the BLM would also limit grazing use in limited precipitation zones (344,300 acres) to manage the compatibility of grazing activities with environmental conditions. These actions would provide additional measures to reduce indirect impacts on water resources from grazing. The impacts would be the same as those described under Alternative B, but would occur in limited precipitation zones across the entire decision area, not just in the Grand Valley and Kannah Creek management zones.

The types of impacts from comprehensive travel designations would be the same as those described under Alternative A but would occur over a smaller area because cross-country motorized and mechanized travel would be prohibited; 379,500 acres would be closed to motorized use (10.8 times more acres than under Alternative A); and motorized use would be limited to designated routes on 681,900 acres (3 times more acres than under Alternative A). This alternative would also be the most restrictive for mechanized travel, closing 367,000 acres (2.3 times more acres than under Alternative B; Alternative A does not include decision area-wide designations for mechanized travel). Furthermore, within 100 feet of perennial streams, there would be more acres designated as closed to motorized use and as limited to designated routes for motorized vehicles (refer to **Table 4-30**, Travel Management Impacts on Perennial Stream Habitat). Thus, Alternative C would have fewer impacts on water resources than Alternative A due to fewer areas disturbed or contaminated (water quality) by recreational travel.

Within the coal resource development potential area there would be 251,200 acres identified as acceptable for further coal leasing and development (26 percent fewer acres than under Alternative A). Alternative C would also identify 58,200 acres as unacceptable for further consideration of leasing and development (37 percent more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A, but would occur over a smaller area.

The types of impacts from locatable and salable minerals would be the same as those described under Alternative A, but additional restrictions mean the impacts would occur over a smaller area. Alternative C would petition to withdraw 45,100 acres from mineral entry (2.2 times more acres than under Alternative B). There would also be 609,400 acres open for consideration for mineral material (salables) disposal on a case-by-case basis (20 percent fewer acres than under Alternative A), and 452,000 acres closed to mineral material (salables) disposal (57 percent more acres than under Alternative A).

Under Alternative C, opportunities would be provided for non-energy leasable exploration and development on 298,600 acres (the fewest acres of any action alternative; there is no similar action under Alternative A). Applying NSO stipulations would reduce the potential impacts on water resources by prohibiting surface-disturbing activities. Alternative C would also close 762,900 acres in sensitive areas to non-energy leasable mineral exploration and development, which would increase opportunities to reduce impacts on water resources in these areas (the most acres of any action alternative; there is no similar action under Alternative A).

The BLM would determine that 14 stream segments (99.5 miles of stream segments crossing BLM-administered land) as suitable for inclusion in the NWSRS (see **Appendix C**). Segments determined to be suitable would continue to be managed under interim management guidelines, which provide standards for ongoing protection of river-related values. The stream segments would receive the same level of management protection as under Alternative A, but BLM's land use plan would contain a specific recommendation that the segments be designated into the NWSRS. Designation of these stream segments as WSRs could result in increased recreational use that may lead to minor reductions in water quality.

Under Alternative C, the types of impacts from interpretation and environmental education would be the same as those described under Alternative B.

Alternative D

Alternative D would result in greater buffer widths for disturbance near hydrologic features and include an NSO stipulation within major river corridors. These protections would be greater than under Alternative A. However, Alternative D does less to protect upland watershed conditions as no stipulations for "slumping soils" or slump areas exist. As a result, the function and condition of upland watersheds as well as water quality would be more vulnerable to degradation under Alternative D than under Alternative A. Similar to Alternative A, the BLM would implement LN-2: Municipal Watersheds and Source Water Protection Areas, requiring the lessee to implement special protective measures for water resources and to collaborate with municipalities to comply with applicable municipal watershed plans. Compared to Alternative A, there would be more special protective measures under Alternative D, resulting in fewer impacts on water resources from fluid minerals activities in municipal watersheds.

Under Alternative D, there would be 104,100 acres managed as ROW exclusion areas (56 percent fewer acres than under Alternative A) and 80,500 acres managed as ROW avoidance areas (82 percent fewer acres than under Alternative A). As a result, the types of impacts from ROW actions would be

the same as those described under Alternative A, but would occur over more acres.

There would be 100,500 acres of federal mineral estate closed to fluid mineral leasing (4 percent more acres than under Alternative A) and 1,130,700 acres open to fluid mineral leasing (1 percent fewer acres than under Alternative A). The types of impacts would be the same as under Alternative A.

The type of impacts on drinking water supplies using water wells would be similar to those described under Alternative A.

Under Alternative D, there would be one percent fewer acres where NSO stipulations would be applied than under Alternative A. The types of impacts would be the same as those described under Alternative A, but would apply to more activities and occur over 7,000 more acres.

CSU stipulations would be applied on 471,500 acres of federal mineral estate under Alternative D (note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison with Alternative A is not considered accurate). The types of impacts would be the same as those described under Alternative A.

Under Alternative D, the BLM would manage 5 ACECs on 33,200 acres (13 percent more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A, but would occur over an additional 4,400 acres.

The BLM would close approximately 108,600 acres (80 percent less than Alternative A) to wood product sales and/or harvest (not including Christmas tree harvest), and prohibit timber and woodland harvesting in riparian areas. Similar to Alternative B, specific forest/woodland management plans would be developed for eight forestry zones to accomplish resource objectives and prevent adverse impacts. Although more acres would be closed under Alternative A, Alternative D would provide more opportunities to protect water resources from forestry activities by implementing specific forest/woodland management plans.

Compared to Alternative A, the BLM would implement more actions to protect and monitor riparian vegetation. The BLM would also give priority for riparian management to areas identified as special status species habitat and those riparian areas not meeting PFC and FAR. By protecting more riparian areas from surface-disturbing activities, Alternative D would provide more opportunities than Alternative A to protect water resources from activities such as recreational travel, livestock grazing, and fluid mineral development.

The types of impacts from wildland fire management would be the same as Alternative A, except that more acres would be potentially treated, moving

vegetation communities toward ecological site potential, which would better protect soil resources and increase water quality. Unplanned ignitions for resource benefit would be allowed in fewer areas, which could lead to larger, more severe wildfires. Similar to Alternative B, the BLM would design ESR treatment actions based on the severity of the wildfire impacts, further increasing protection of water resources from impacts related to wildfires.

The types of impacts from livestock grazing would be the same as those described under Alternative A; however, there would be 49,900 acres closed to livestock grazing under Alternative D (3 percent more acres than under Alternative A). The minimal decrease in areas available to livestock grazing would result in a slight decrease in the potential for impacts on water resources. As under Alternative B, grazing would be permitted in the Grand Junction and Palisade municipal watersheds. Proper management of grazing in these watersheds would mitigate erosion and loss of vegetative cover that would cause increased run-off and contamination of municipal water resources.

As under Alternative A, the BLM would implement rest periods on disturbed areas in order to protect land and watershed health. Also, the BLM would limit grazing use in limited precipitation zones on a case-by-case basis to manage the compatibility of grazing activities with environmental conditions. The types of impacts from this limitation would be the same as those described under Alternative B, but Alternative D would consider limitations on a case-by-case basis, rather than in a defined geographic area.

The types of impacts from comprehensive travel designations would be the same as those described under Alternative A. However, unlike Alternative A, there would be no areas open to cross-country motorized use and there would be 10,200 acres open to cross-country motorized and mechanized use (18 percent fewer acres than under Alternative A). In addition, motorized travel would be limited to designated routes on 939,900 acres (4.2 times more acres than under Alternative A) and there would be 111,300 acres closed to motorized vehicle use (3.2 times more acres than under Alternative A). This alternative would prohibit mechanized travel on 98,000 acres (38 percent fewer acres than under Alternative B; Alternative A does not include decision area-wide designations for mechanized travel). Furthermore, within 100 feet of perennial streams, there would be more acres designated as closed to motorized use and as limited to designated routes for motorized vehicles (refer to **Table 4-30**, Travel Management Impacts on Perennial Stream Habitat). Thus, Alternative D would have fewer impacts on water resources than Alternative A due to fewer areas disturbed or contaminated (water quality) by recreational travel.

Within the coal resource development potential area there would be 265,600 acres identified as acceptable for further coal leasing and development (12 percent fewer acres than under Alternative A). Alternative D would also

identify 43,800 acres as unacceptable for further consideration of leasing and development (19 percent more acres than under Alternative A). The types of impacts would be the same as those described under Alternative A, but would occur over a smaller area.

Under Alternative D, there would be 906,100 acres open for consideration for mineral material (salables) disposal on a case-by-case basis (14 percent more acres than under Alternative A), and 155,300 acres closed to mineral material (salables) disposal (40 percent fewer acres than under Alternative A). The types of impacts from salable minerals would be the same as those described under Alternative A, but would occur over a larger area.

Under Alternative D, opportunities would be provided for non-energy leasable exploration and development on 925,400 acres (the most acres of any action alternative; there is no similar action under Alternative A). Applying NSO stipulations would reduce the potential impacts on water resources by prohibiting surface-disturbing activities. Alternative D would also close 136,000 acres in sensitive areas to non-energy leasable mineral exploration and development, which would increase opportunities to reduce impacts on water resources in these areas (the least acres of any action alternative; there is no similar action under Alternative A). However, the only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area.

Under Alternative D, the BLM would determine that 14 streams segments are not suitable for designation into the NWSRS. This decision would release the 14 segments from interim management protection that is afforded to eligible stream segments. This action would result in reduced direct protection for river-related values. However, certain values may be directly or indirectly protected by land use prescriptions in this plan, such as prescription related to water resources, riparian resources, recreation resources, and wildlife resources.

Under Alternative D, the types of impacts from interpretation and environmental education would be the same as those described under Alternative B.

Cumulative

The CIAA used to analyze cumulative impacts on water quality and watershed resources extends outside of the planning area, following fourth-order watershed boundaries. The CIAA also includes the Colorado River downstream to the US/Mexico border because BLM manages the resource to limit salinity delivery into the river based on the Colorado River Basin Salinity Control Act. Fourth-order watersheds were used as the basic unit of analysis because impacts from most management actions proposed under the RMP and other existing activity plans are not expected to have cumulative, hydrologic influence

beyond this scale. Given that the hydrologic influence of the surrounding area is primarily focused in the stream channels and that delineation of the CIAA was based on watershed boundaries, the area of analysis is sufficient. The hydrologic influence of the planning area on areas outside the planning area is primarily the result of hydrograph alteration and quality of the water flowing from the area.

Potential cumulative impacts on water resources in the planning area would result from alteration of functional vegetative communities and could lead to increased runoff and sediment/contaminant delivery. Activities with impacts on water resources include management actions attributed to the alteration of natural vegetative communities (e.g., pinyon-juniper invasion and cheatgrass), historic grazing practices, surface-disturbing actions in areas of low reclamation potential, conversion of native rangelands to irrigated agricultural lands (on non-BLM-administered lands), improper maintenance of transportation facilities, spills/leaks of substances used to develop mineral resources, and recreational use. These activities cause surface disturbances by removing vegetation cover, displacing and compacting soils, and altering soil structure and chemistry. The result is exposed surfaces that increase the potential for runoff and erosion, which delivers sediment and contaminants to nearby waterways. Sedimentation in waterways can cause changes in water chemistry as well as geomorphic adjustments that could have negative effects on stream function.

Urban growth and development is anticipated to have impacts on water quantity and water quality. The demand for water is anticipated to increase with urban expansion. Water right applications for waters flowing from or through BLM-administered lands are also expected to rise, along with the demand. Additionally, demand and use of water flowing to BLM-administered lands is expected to continue to rise. This includes water used on National Forest System and private lands upstream of BLM-administered lands in the West and East Creek, Roan Creek, Granite Creek, and Gunnison and Dolores River drainages. Impacts on quantity could affect wildlife habitat (e.g., riparian areas and wetlands, aquatic habitat, wildlife, water quality, and fisheries. Major water projects being initiated by counties and cities could have impacts on the Colorado River and other tributaries. Dust accumulating on snow is also estimated to cost the river an additional 800,000 acre-feet of water lost annually, or five percent of its annual flow (Painter 2007). Cumulatively, the overall water diversions would be anticipated to have impacts on the Colorado River Compact. Loss of vegetation and disturbed soils associated with construction and development projects would leave denuded surfaces susceptible to soil detachment and transport during runoff. Increased runoff and erosion following runoff events and mass wasting could further deliver sediment and contaminants to nearby waterways. In addition, agricultural runoff would introduce nutrients, pesticides, and herbicides to shallow groundwater and adjacent hydrologic features.

The development of solar energy resources may result in indirect impacts on water supply in the CIAA. While photovoltaic technologies require little-to-no water for operation, solar thermal technologies require large amounts of cooling water to condense vapor back into liquid. Identifying solar energy emphasis areas within the decision area does not limit development projects to one type of technology over another, and so the potential for such water impacts does exist. If photovoltaic projects are developed and electricity is produced that replaces other highly-water-consumptive power generation technologies such as coal-fired and natural gas-fired power plants, then there would be a net decrease in regional water consumption. While the development of solar resources would require water within the CIAA to be used, particularly during the construction phase, overall, the implementation of these technologies would reduce water consumption on a per-megawatt basis at the regional level.

Unavoidable water quality impacts would include temporary increases in suspended load in flowing streams as a result of culvert installation, vehicle use of low-water crossings, and livestock, wildlife, and wild horse use of stream banks and wetlands; permitted channel fills resulting from construction of oil and gas pads, roads, and pipelines; and the introduction of nutrients from irrigation practices occurring on private lands. Water quantity impacts would include water withdrawals for livestock use, oil and gas and other mineral resource exploration, development and production, and watering of roads for dust mitigation. Dust on snow resulting from fugitive dust production outside of the planning area would continue to impact the timing of meltout and the quantity of water available for downstream users.

Reasonably foreseeable future actions (**Table 4-1**) on federal, state, private, and other lands within and adjacent to the planning area that could have an effect on water resources include energy and minerals development, vegetation management, livestock grazing, recreation and visitor use, lands and realty, roadway development, water diversions, spread of noxious/invasive weeds, wildland fires, spread of forest insects and diseases, drought, and climate change. Without proper mitigation, BMPs, and comprehensive planning, these activities could have similar impacts, as described above.

Under all alternatives, water resources would be protected due to management in accordance with the Clean Water Act, the Colorado River Salinity Control Act, the Fundamentals of Rangeland Health and Standards and Guidelines for Grazing Administration, and other applicable state and federal water quality standards. Site-specific mitigation and BMPs for surface-disturbing activities would further reduce impacts on water resources. Adherence to these standards would reduce many of the impacts from future actions. In addition, existing and proposed stipulations designed to protect water resources would minimize sediment and contaminant delivery potential by preventing or limiting surface-disturbing activities in proximity to sensitive areas such as hydrologic features, designated municipal watersheds and source water protection areas,

and domestic wells. Stipulations and limitations for other resources (e.g., fisheries, riparian) that prevent or limit surface-disturbing activities would provide additional protection for water resources. Furthermore, TLs could protect water resources by limiting or preventing surface-disturbing activities during times of the year when saturated soil conditions exist or when precipitation and runoff are frequent (e.g., winter, spring).

Stipulations designed to protect water resources vary by alternative, as do stipulations for other resources that provide additional protection for water resources. Under all alternatives, the BLM would continue to oppose water right applications that could affect water quantity on BLM-administered lands or that could injure existing water rights for maintenance of habitat, wildlife, water quality, and fisheries.

Alternative actions that allow the least amount of soil disturbance, loss of vegetation, energy and minerals development, recreational use, and roadway/transportation facilities development would be the least impactful on water resources. Also, alternative actions that have the most restoration of plant communities, revegetation, and protected areas (such as ACECs or WSRs) would have the most beneficial cumulative impacts on water resources.

4.3.4 Vegetation

This section discusses impacts on vegetation, forests and woodlands, rangelands, riparian areas, and weeds from proposed management actions of other resources and resource uses. Existing conditions concerning vegetation are described in **Section 3.2.6**, Vegetation.

Methods of Analysis

This analysis focuses on those management alternatives or actions that have the potential for physical disturbance of vegetation and rangelands, loss of habitat, and loss or disturbance of riparian/wetland areas or their functioning condition in the planning area. The BLM has incorporated management actions, when necessary, to reduce otherwise significant impacts on vegetation, forests and woodlands, and riparian areas.

The effects of management actions on vegetation, forests and woodlands, rangelands, and riparian/wetland areas may vary widely, depending on a variety of factors such as the type of soils, aspect, precipitation, soil moisture, topography, and plant reproductive characteristics. Surface disturbance removes existing vegetation and can increase opportunities for noxious weeds and invasive species establishment, reducing vegetation diversity, production, and desirable plant cover. Indirectly, this could reduce the ecological health of rangelands and forest and woodland areas. Increasing surface disturbance could also increase erosion rates and decrease riparian/wetland functioning conditions. Concentrating surface disturbance can isolate associated impacts on the area of concentration while effectively reducing those impacts over a larger geographic area. Reducing the size of surface disturbance would reduce associated impacts.

Impacts on vegetation resources also vary depending on the seral stage and composition of vegetation communities, which are classified as rangelands, forests and woodlands, or riparian/wetland areas. These classifications are based on the major species found in the vegetation types listed in **Chapter 3**. The composition of a plant community changes over time as a result of interactions with factors such as climate, resource uses, and disturbance. In many cases, the potential composition of these units differs from the existing composition. Consequences to vegetation diversity, which include structure, productivity, vigor, percent cover, density, and species composition, were based on likely changes relative to movement toward desired vegetation conditions. In the absence of quantitative data, best professional judgment was used, and impacts are sometimes described using ranges of potential impacts or in qualitative terms, if appropriate. This section is organized by broad categories of vegetation communities: general vegetation and desired plant communities; riparian and wetland vegetation; forest and woodland vegetation; and weeds. As such, the section reflects the organization of the vegetation management actions in **Chapter 2**.

Indicators of impacts on vegetation, rangelands, forests and woodlands, and riparian/wetland areas include the following:

- Any action or event that would remove a vegetation community's unique attributes or ability to support other resource values
- Any unmitigated loss of wetlands or wetland function
- PFC cannot be attained or maintained as a minimum physical state, or the Colorado BLM Standard 2 for Public Land Health cannot be obtained as a result of the management actions
- Management actions or activities that accelerate erosion and runoff and thereby alter the physical characteristics of wetland and riparian vegetation
- Replacement or substantial invasion of native communities with noxious and invasive weeds to the degree that such invasions cannot be successfully controlled or change the character of the native communities

The analysis includes the following assumptions:

- Vegetation management actions are aimed at achieving or trending towards achieving BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado.
- Adequate forage will be available for current wildlife, livestock, and wild horse population objectives.
- All plant communities will be managed toward achieving a mix of species composition, cover, and age classes across the landscape.

- Woodland communities not available for commercial harvest will increase in age and cover with reduced composition and cover of understory species.
- The degree of impact attributed to any one disturbance or series of disturbances would be influenced by several factors, including location in the watershed; the type, time, and degree of disturbance; existing vegetation; precipitation; and mitigating actions applied to the disturbance.
- Noxious and invasive weeds will continue to be introduced and spread as a result of ongoing vehicle traffic in and out of the planning area, recreational activities, wildland fire, wildlife and livestock grazing and movements, and surface-disturbing activities.
- Weed and pest control will be carried out in coordination with the appropriate county weed and pest control district and owners of adjacent property.
- Activities that will disturb soils could cause erosion, loss of topsoil, and soil compaction, which could affect the ability of vegetation to regenerate. Further, surface-disturbing activities could increase dust, which could cover existing vegetation and impair plant photosynthesis and respiration. Resulting impacts could include lowered plant vigor and growth rate, altered or disrupted pollination, and increased susceptibility to disease.
- NSO stipulations will provide the greatest protection to vegetation communities by prohibiting surface-disturbing activities in these areas. This will prevent disturbance to vegetation caused by fluid mineral development. CSU stipulations will provide slightly less protection to vegetation communities, since surface-disturbing activities will be allowed and vegetation could be disturbed or removed. However, CSU stipulations could protect vegetation in certain instances by requiring special operational constraints or by moving the surface-disturbing activity to protect a certain resource.
- Ecological health and ecosystem functioning depend on a number of factors, including vegetative cover, species diversity, nutrient cycling and availability, water infiltration and availability, and percent cover of weeds.
- Climatic fluctuation will continue to influence the health and productivity of plant communities on an annual basis.
- Short-term effects will occur over a timeframe of two years or less and long-term effects will occur over longer than two years.
- The BLM will comply with the Colorado Statewide Strategic Plan for Control and Eradication of Noxious and Invasive Weeds.

Effects Common to All Alternatives

General Vegetation and Desired Plant Communities

The type, abundance, and distribution of vegetation communities within the decision area would be affected under all alternatives. However, implementation of any alternative would not completely eliminate a plant species, plant community, or seral stage. As described below, changes to vegetation would be caused by the following three types of disturbances: 1) disturbance from casual use; 2) disturbance from permitted activities; and 3) changes to vegetation condition.

Disturbance from casual use. Substantial analysis and planning is used to determine the locations and types of casual use activities that would occur, such as recreation, motorized vehicle use, and use of authorized and unauthorized routes. However, these uses are not subject to site-specific environmental review and monitoring requirements, and vegetation impacts would not be apparent until after damage has occurred. Examples of impacts on vegetation and desired plant communities from casual use include trampling from humans and animals, vegetation removal, fragmentation of vegetation communities, increased dust, soil compaction, and increased likelihood for weed introduction or spread. Increased soil compaction damages the soil structure and decreases the pore size in smaller-particle soils, which would decrease infiltration rates and soil moisture and increase erosion or surface runoff. Impacts are more likely to occur in easily accessible areas, where visitation would be high, and in areas open to cross-country travel. Fewer impacts on vegetation would occur along designated routes because past and current use has already impacted these areas, although further impacts could still occur. Once discovered, the BLM would mitigate impacts to the extent practicable and feasible through such measures as closures or use restrictions.

Air resource management actions would require drill rigs to meet specific emission standards. Emission requirements for drill rigs vary by alternative. However, contributions to airborne pollutants would occur under all alternatives. Deposition of airborne pollutants could contaminate soils, impairing vegetation function and condition.

BLM on-site management of recreation, as well as designation and closure of travel routes, could prevent impacts. For example, where recreation is managed within an SRMA, and to a lesser extent ERMAs, rules and guidelines would limit or control activities through specialized management tools such as designated campsites, permits, area closures, and limitations on number of users and duration of use. Impacts would vary depending on the SRMA, as each SRMA would be managed for certain recreation outcomes and setting prescriptions. Impacts on vegetation would be concentrated in these areas but would limit more extensive, widespread impacts, and would reduce fragmentation of vegetative communities throughout the decision area.

The biggest potential impact of travel management on the weed management program would involve the number of roads designated as "closed and rehab" which were in proximity to a known weed infestation. Open roads and roads designated as administrative would still provide access to these infestations for treatment.

A GIS buffer of roads designated as admin by ¼ mile to capture nearby weed infestations, some of which were originally GPS-identified on the edge of a road, and some of which were offset (i.e., an infestation was seen across a drainage and the location was offset in the original GIS exercise. This was done for both Alternative A (existing situation) and the PRMP.

A total of 5,702 known infestations were captured within this buffer.

For alternative A, 5,191 of the 5,702 were within ¼ mile of an open road. For the PRMP, 4949 of the 5,702 infestations were accessible on a road open to the weed program. The difference (5191-4949) or 242 infestations would not be accessible in the PRMP due to the route being identified as closed. This is 4% of the known infestations of weeds. The species involved in those 242 infestations becomes important….whether they are a high priority weed or a widespread and common weed help determine the level of impact. The breakdown of the 242 species is:

For Alternative A:

- Bull thistle: 9
- Canada thistle: 10
- Chicory: 3
- Common burdock: 11
- Dalmation toadflax: 6
- Diffuse knapweed: 1
- Houndstongue: 95
- Lambsquarter: 13
- Musk thistle: 27
- Other: 156
- Russian knapweed: 72
- Scotch thistle: 1
- Spotted knapweed: 1
- Tall whitetop: 1
- Tamarisk: 10

- Whorled milkweed: 9
- Whitetop: 85
- Yellow toadflax: 1 (BLM 2010a)

Species counts under Alternative (Proposed RMP) are as follows:

- Bull thistle: 27
- Canada thistle: 34
- Chicory: 7
- Common burdock: 22
- Dalmation toadflax: 6
- Diffuse knapweed: 1
- Houndstongue: 134
- Lambsquarter: 13
- Musk thistle: 38
- Other: 192
- Plumeless thistle:20
- Russian knapweed: 115
- Scotch thistle: 3
- Spotted knapweed: 1
- Tall whitetop: 1
- Tamarisk: 11
- Whorled milkweed: 20
- Whitetop: 99
- Yellow starthistle: 8
- Yellow toadflax: 1 (BLM 2010a)

The highest priority weeds from this list where there is a difference between the existing situation under Alternative A and the Proposed RMP (Alternative B) are: Russian knapweed, plumeless thistle, and yellow starthistle. 43 infestations of Russian knapweed would not be accessible by motorized equipment, 20 infestations of plumeless thistle, and 8 infestations of yellow starthistle.

Note that the yellow starthistle occurrence is on private lands; the closed route is likely located in proximity to the private lands where this weed occurs.

Disturbance from permitted activities. Permitted, surface-disturbing activities (e.g., mineral exploration and development, ROWs) could result in removal of

desired plant communities, fragmentation of vegetation communities, loss of habitat for pollinators, and conversion of areas to an earlier seral stage, which could change vegetation community succession and reduce desired plant communities. The remaining vegetation could have reduced vigor or productivity due to mechanical damage, soil compaction, and dust. Soil compaction would inhibit natural revegetation in areas without active reclamation efforts and would reduce plant vigor, which would make plants more susceptible to disease, drought, or insect attack. In most cases soils in reclaimed areas would be ripped and seeded during interim or final reclamation. Vegetation loss is caused by road construction and use, facility construction and placement, construction of well pads and pipelines, and construction within ROWs. Placement of subsurface or temporary facilities in highly degraded areas may benefit vegetation if more desirable species become established following reclamation. These species can introduce a native seed source back into areas where noxious and invasive species dominate the landscape. Some desired vegetation communities such as salt desert shrub, lower elevation sagebrush, and black brush take longer to recover from disturbance; impacts on these communities would be greater than for other desired vegetation communities such as mountain shrub or high elevation sagebrush, which generally respond more favorably to disturbance. ROW avoidance and exclusion areas would be identified to reduce or avoid impacts on vegetation. ROW corridors would be delineated to concentrate placement of large linear facilities and other ROW development in less sensitive areas and reduce the total acreage of vegetation disturbance.

The amount of land that is open to fluid mineral leasing or other mineral use is not necessarily indicative of the number of acres that would be directly disturbed. Where NSO, CSU, and TL stipulations are applied, surface disturbance would be limited. Stipulations that would be applied under each alternative are presented in **Table 2-2**. The reasonably foreseeable development scenario predicts that over 13,000 acres of short-term disturbance would occur from drilling, roads, and pipelines, and over 4,000 acres of long-term disturbance would occur from operation of new wells by 2028.

Federal oil and gas regulations prevent the BLM from applying new or additional lease stipulations that would be developed through this planning effort to existing leases. However, federal regulations do allow the BLM to apply other protection measures in conjunction with planning and implementing oil and gas projects. For example, the BLM has the discretion to require additional restrictions on surface operations when supported by scientific analysis. All mitigation and/or conservation measures not already required as stipulations would be analyzed in a site-specific NEPA document, and incorporated, as appropriate, into COAs of the permit, plan of development, and/or other use authorizations.

Changes to vegetation condition. Changes to vegetation condition could occur from vegetation and weed treatments; riparian restoration; forest and woodland treatments and harvest; wildlife, wild horse, and livestock browsing and grazing; special status species and wildlife habitat enhancements; fire; fuels treatments; and range improvements. Overall, the BLM would aim to achieve or trend toward achieving Public Land Health Standard 3, Healthy Productive Plant and Animal Communities, which would improve ecosystem function, vegetation diversity, and soil stability. Over the long term, vegetation and habitat treatments would increase productivity and vigor in most plant communities by removing decadent and thick stands of vegetation, increasing the percent cover of desirable plant species, improving ecological health, and reducing erosion.

Overutilization of vegetation and desired plant communities via wild horses, wildlife, or livestock could occur, leading to reduced plant vigor, which would change vegetation structure and species composition. Impacts from wild horses would be localized within the LBCWHR. Impacts would vary depending on the extent of removal, type of vegetation impacted, and length of the grazing period. In general, the more acres that are open to grazing under a given alternative, the greater the risk for negative impacts. Under all alternatives, if overutilization were to occur, the BLM would adjust AUMs and/or use for livestock or the AML for wild horses and implement additional measures such as range improvements or wild horse gathers as necessary and feasible, to reduce impacts. With proper utilization, wild horses and livestock also have the potential to positively impact vegetation by mitigating or reversing the impacts listed above.

Unplanned fire ignitions could cause short- or long-term damage to vegetation depending on the seral stage and vegetative community affected, extent, and severity of the fire. In the short term, fire and fuels treatments remove vegetation and cause bare areas to be more susceptible to soil loss or weed invasion. In the long term, wildland and prescribed fires and fuels treatments reduce dense vegetation, create vegetation mosaics and promote vertical stratification, improve herbaceous understory, and return nutrients to the soil. Often, fire and fuels treatments result in improved vegetation diversity and ecosystem function and lower the risk for an uncharacteristically large or severe wildfire. Emergency stabilization and rehabilitation efforts can help stabilize soils and reestablish desirable plant communities.

Management actions that restrict surface-disturbing activities would help retain existing vegetation diversity and seral succession. Such management actions include stipulations to protect water, soil, wildlife, special status species, visual resources, and cultural resources; closure of areas to fluid mineral leasing; restrictions within special designation areas; and route closures or restrictions. In general, VRM Classes I and II, which preserve or retain the existing character of the landscape, would restrict surface-disturbing activities and retain vegetation. Areas managed as VRM Class III or IV would be subject to actions

that allow for greater landscape modification and therefore greater surface disturbance. LNs and COAs would be applied where necessary to protect resources. However, certain areas such as WSAs would prohibit certain types of vegetation manipulation, which could prevent desired plant communities from expanding within these areas. Under all alternatives, four WSAs would be managed on 96,500 acres.

Land exchanges, disposals, and acquisitions could reduce the fragmentation of BLM-administered land in the planning area. This could improve BLM's ability to implement management actions that would result in increased vegetation diversity, ecological health, and attainment of BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado.

Climate change would impact vegetation under all alternatives, but vegetation may be more vulnerable to the impacts of climate change under certain alternatives. Resource uses in the planning area (e.g., livestock grazing, forestry, recreation, travel, lands and realty, and energy and minerals leasing and development) are stressors that may generally impact vegetation's ability to adapt to climate change. These impacts would likely be more harmful to vegetation under Alternatives A and D where there are fewer restrictions on resource uses. Under Alternative C, more stringent restrictions would limit the impact of these stressors (as described in the analysis under Alternative C, below). Vegetation's ability to adapt to climate change under Alternative B would likely fall between the other alternatives because resource use restrictions are generally more stringent than under Alternatives A and D, but less stringent than under Alternative C.

Riparian and Wetland Vegetation

In addition to the impacts described under *General Vegetation and Desired Plant Communities*, livestock often use riparian and wetland areas in the summer for water and shade, which may cause greater impacts on these areas by concentrating livestock use. Over the long term, vegetation treatments would help improve or maintain riparian functioning condition by removing invasive plants (e.g., Russian olive *[Elaeagnus angustifolia]* and tamarisk *[Tamarix* spp.*]*). Range improvements that attract livestock away from riparian and wetland areas would also be beneficial by reducing livestock use of these areas. Under all alternatives, the BLM would focus on compliance with Public Land Health Standard 2, Riparian Systems. The primary goal of the management actions would be to maintain proper function and to improve riparian and wetland areas that are functioning at risk or not functioning.

Land exchanges, disposals, and acquisitions could improve BLM's ability to improve riparian and wetland functioning condition by reducing fragmentation of land ownership in riparian areas throughout the planning area. Land acquisitions would also place riparian areas under BLM management. This would allow for

potential vegetation treatments and other land management actions aimed at repairing and/or maintaining riparian function and condition.

Forest and Woodland Vegetation

In addition to the impacts described under *General Vegetation and Desired Plant Communities*, fuels projects and firewood collection would likely improve the health and structure of pinyon-juniper communities by removing dead and dying wood. In addition, unplanned ignitions, depending on the fire's extent and severity, could have long-term positive or negative effects on old-growth forest by altering age class and seral stage. The definition of old-growth pinyon-juniper woodlands is described in **Section 3.2.6**, Vegetation.

Significant Plant Communities

Direct and indirect impacts on significant plant communities from management actions would be similar to those described above for vegetation. However, because significant plant communities tend be rare, and smaller in size, impacts would be greater. Surface disturbing activities would have adverse, direct, and long term impacts. Due to the small and often pristine nature of these communities, adverse impacts would occur if surface disturbing activities resulted in plant loss, weed invasion, or a change in species composition or diversity.

Weeds

In general, management actions that restrict surface-disturbing activities would reduce the likelihood of weed invasion throughout the decision area.

In addition to the impacts described under *General Vegetation and Desired Plant Communities*, impacts from casual use include increased likelihood for weed introduction and spread by transport of weed seeds from recreation users, equipment, and vehicles. In general, the more acres with designated routes in the decision area, the greater the likelihood of weed introduction or spread.

Surface disturbance caused by permitted activities could increase the likelihood for weed introduction and spread. In particular, ROWs are linear and may extend for many miles, increasing the potential for weeds to be introduced or spread over large distances. Reclamation and weed management requirements as part of stipulations and/or COAs would reduce this impact.

Some activities such as vegetation treatments and planned and unplanned fire would result in a short-term increase in the likelihood for weed introduction or spread by disturbing soil and removing vegetation. In addition, the increase in soil nutrients following fire may favor some invasive plant species. By stabilizing soils and reestablishing native vegetation, ESR efforts can help prevent weed spread and invasion. In some instances, unplanned fire in lower-elevation sagebrush and salt desert shrub communities could have long-term effects by causing conversion of these fire-intolerant areas to cheatgrass or other invasive

annuals. These invasive species can change the fire regime, potentially affecting adjacent desired vegetation communities.

Weed control and prevention measures would help to reduce the cover of weeds in the planning area and prevent the introduction and spread of weeds over the long term. The herbicide use protocols and standard operating procedures as described in the Programmatic EIS for Vegetation Treatments Using Herbicides would be followed to reduce impacts on non-target vegetation from herbicide treatments.

Livestock can contribute to the spread of weeds by transporting weed seeds in their coat or manure. In general, the more acres that are open to grazing under a given alternative, the greater the risk for impacts. If impacts from grazing were discovered, the BLM would modify grazing practices by changing AUMs or by using livestock exclosures. Furthermore, the construction and maintenance of range improvements could lead to an increase in weeds from surface disturbance as well as from contaminated equipment used for construction and maintenance. In some cases, livestock can be used to control certain weed species.

Land exchanges, disposals, and acquisitions could improve BLM's ability to treat and prevent weed invasion by reducing fragmentation of land ownership throughout the planning area. Conversely, acquisition of parcels impacted by noxious and invasive species would affect BLM's capacity to restore and maintain land health standards.

In WSAs, weed treatments may be limited to non-motorized methods, which could limit the BLM's ability to treat weeds if a large weed infestation were discovered in a WSA.

Implementing management for the following resources would have negligible or no impact on vegetation and are therefore not discussed in detail: paleontology; national trails; national, state, and BLM byways; Native American tribal uses; public health and safety; socioeconomics; and environmental justice.

Alternative A

General Vegetation and Desired Plant Communities

In general, Alternative A would rely on management guidance that would not reflect current conditions and issues and would lack a landscape-level approach to land planning. Inadvertent impacts on vegetation may result from implementing this alternative.

Soil and water protections through the use of NSO and CSU stipulations would protect vegetation from surface-disturbing activities associated with fluid mineral development. Determining soil suitability for surface-disturbing activities would

help maintain adequate vegetative cover where vegetation would be sensitive to removal.

The lack of comprehensive planning for vegetation, fish and wildlife, and special status species would result in vegetation and habitat management that is applied on a case-by-case basis and which would not give the BLM the authority to implement or enforce certain management actions. Protection for vegetation and habitats would occur, and management flexibility would allow BLM to adaptively manage resources. Vegetation and weed treatments and range improvements would be carried out, which would improve vegetation conditions and trend toward achieving land health standards.

Fire management under Alternative A would utilize mechanical treatments and prescribed fire for resource benefit, but would be limited in the use of unplanned fire. Treatments and fire would allow for some short-term disturbance to vegetation and long-term improvement in vegetation health and productivity.

Areas managed as VRM Class I and II on 159,200 acres, as well as stipulations to protect visual resources, would indirectly protect vegetation by limiting or prohibiting development and other surface-disturbing activities in these areas, as described under Effects Common to All Alternatives.

Sale and harvest of forestry products would not be permitted in areas managed as unsuitable for forest product harvest. In addition, clear cuts would be discouraged, reducing impacts on vegetation; however, impacts could still occur, as these areas could still support sale of forestry products.

The types of impacts from grazing would be the same as those described under Effects Common to All Alternatives. Range improvements would be used to improve vegetative conditions, and BLM would manage 978,600 acres as open and 48,600 acres as closed to grazing under this alternative.

The types of impacts from recreation under Alternative A would be the same as those described under Effects Common to All Alternatives. Under Alternative A, BLM management of SRMAs and ERMAs would continue to struggle to accommodate current and future levels of recreation, which could lead to an increase in impacts on vegetation as population and recreation use increase. Four SRMAs and IRMAs would be managed on 358,300 acres, and one ERMA would be managed on 703,100 acres under this alternative. Note that planning guidance and definitions of recreation management areas in Alternative A are different than those in Alternatives B, C and D (see **Section 3.3.4**).

The types of impacts from motorized use under Alternative A would be the same as those described under Effects Common to All Alternatives; cross-country travel motorized use would be allowed on 445,400 acres, and 12,500 acres would be open to intensive motorized use. The likelihood of impacts

would be reduced on 35,300 acres that would be closed to motorized use (and in the WSAs, where motorized and mechanized use would be limited to existing ways).

BLM would continue to manage 441,400 acres as sensitive to public utility development and 234,900 acres as unsuitable for public utilities, which would protect vegetation and minimize impacts from lands and realty disturbances in these areas.

Under Alternative A, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would continue to manage 300,700 acres as acceptable for coal leasing. Areas unacceptable for coal leasing on 36,700 acres, as well as stipulations on open lands, would reduce vegetation impacts from coal mining on these lands.

Under Alternative A, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would continue to manage 1,134,600 acres of federal mineral estate as open to fluid mineral leasing. Areas closed to fluid mineral leasing on 96,500 acres, as well as stipulations on open lands, would reduce vegetation impacts from fluid mineral leasing on these lands. NSO stipulations would be applied on 433,000 acres and CSU stipulations would be applied on 74,100 acres, which would reduce the impact of fluid mineral development on vegetation.

Five ACECs would be managed on 28,900 acres; within these areas vegetation would be protected through such measures as limiting travel to designated routes, closing areas to motorized use, managing areas as unsuitable for or sensitive to ROWs, and applying NSO stipulations.

The lack of interpretation and environmental education activities in the decision area could result in user actions that could degrade vegetation resources and desired plant communities.

Riparian and Wetland Vegetation

In addition to the impacts described previously for *General Vegetation and Desired Plant Communities*, timber and woodland harvest would be discouraged in riparian and wetland areas, which would maintain or improve functioning condition throughout the decision area. However, lack of firewood gathering in specific areas could allow fuel loads to accumulate and increase susceptibility to wildfire.

Under Alternative A, an NSO stipulation would be applied to new fluid mineral leases on 6,145 acres of riparian vegetation, and 3,000 acres would be managed for aquatic riparian vegetation. In these areas, riparian vegetation would be improved or protected.

Over time, recreation would have increasing impacts on riparian and wetland areas, as regional population and subsequent recreation use increases. Under Alternative A, 3,500 acres of riparian vegetation would be open to all modes of travel, 5,400 acres would be either limited to existing or limited to designated routes for motorized travel, and 700 acres would be seasonally closed to motorized travel.

Under Alternative A, 14 river segments would be managed as eligible for the NWSRS. Interim protective management guidelines would help to prevent or reduce impacts on riparian and wetland vegetation in these areas.

Forest and Woodland Vegetation
Under Alternative A, as described previously, there would be no forest and woodland management plans to guide BLM forestry practices in specific areas.

Weeds
In addition to the impacts described previously for *General Vegetation and Desired Plant Communities*, over time, recreation would have increasing impacts on weed spread. This is because users and vehicles would introduce and spread weeds throughout the decision area, and population and recreation use would increase.

Lands and realty management actions, as described previously for *General Vegetation and Desired Plant Communities,* would reduce the likelihood of weed spread throughout the decision area.

The lack of interpretation and environmental education activities in the decision area could result in user actions that could introduce or spread weeds.

Alternative B

General Vegetation and Desired Plant Communities
Under Alternative B, the BLM would implement protective management measures for vegetation and stipulations and restrictions to reduce impacts from resource uses. Furthermore, the BLM would prioritize desired plant communities as a focus of vegetation management.

Protections such as BMPs and COAs described in **Appendix H** would be applied for soil and water resources. These measures could include requiring detailed engineering and reclamation plans, protecting biological soil crusts and municipal watersheds, applying stipulations, and reducing salt, sediment, and selenium. These actions would reduce impacts from surface-disturbing activities by maintaining topsoil and native seed banks and reducing erosion.

Vegetation management under Alternative B would emphasize improving and restoring vegetation. Seasonal limitations on grazing in the salt desert shrub community would allow native perennials a chance to recover. In addition, fires

would be suppressed in salt desert shrub communities to protect communities that are not adapted to fire and to reduce cheatgrass invasion. Sagebrush communities would be managed to restore habitat connectivity and function by reducing pinyon-juniper encroachment, achieving multiple sagebrush age classes, reducing the total area of disturbance of new roads, upgrading existing roads to reduce the need for new roads, and encouraging utility development in existing corridors. Mountain shrub communities would be improved by using fire and vegetation treatments to create openings within dense stands. Post-treatment, in all vegetation communities, grazing would be deferred or excluded, where necessary, for a minimum of two growing seasons. This would affect vegetation in the long term through improved biodiversity, increased cover of desired plant species, reduced fragmentation, and restrictions on associated activities that could degrade desired plant communities. In the short term, vegetation treatments would often remove dense, decadent, and woody vegetation as well as weeds, which would cause impacts until desired vegetation were to establish. Adaptive drought management actions, such as restrictions on surface disturbance, travel, and recreation, plus changes in grazing management, would improve vegetative health by reducing impacts from dust, erosion, desertification, and topsoil loss.

Similarly, fish and wildlife and special status species management under Alternative B would improve and protect vegetation and increase cover of desired plant communities. This would be achieved through applying stipulations, identifying ROW avoidance and exclusion areas, identifying travel and recreation restrictions and closures, identifying habitat improvements and wildlife emphasis areas, and designating ACECs. Proper management of wildlife, particularly big game (in coordination with CPW), would prevent over-browsing and damage to vegetation and desired plant communities. Measures would be implemented to avoid habitat fragmentation, which would result in more contiguous vegetation and maintenance or improvement of ecosystem functions.

Management of vegetative communities within the LBCWHR would emphasize seral stages that would provide optimum forage for wild horses while meeting land health standards.

Under Alternative B, the BLM would have increased opportunities to use naturally ignited, unplanned fire as a natural disturbance regime to meet resource objectives. Using a variety of fuel treatment methods would have short-term effects on vegetation through vegetation manipulation or removal. In the long term, these activities may prevent uncharacteristically large or intense wildfires that could damage large expanses of vegetation. ESR treatments would help to reestablish vegetation and reduce topsoil loss from erosion.

The types of impacts from visual resources management would be the same as those described under Alternative A. However, under Alternative B, 491,100

acres (3.1 times more acres than under Alternative A) would be managed as VRM Class I and II.

The types of impacts from grazing would be the same as those described under Effects Common to All Alternatives. The BLM would manage 960,500 acres (2 percent fewer acres than under Alternative A) as open and 66,600 acres (37 percent more acres than under Alternative A) as closed to grazing under this alternative. In addition, the BLM would require periodic rest and limited grazing in lower elevation communities, as well as a minimum of two growing seasons of rest following vegetation treatments. This would prevent overgrazing and would provide undisturbed growth and development of forage plants during critical or sensitive growth periods, resulting in increased vegetative production, vigor, seed production, litter accumulation, and seedling establishment. Improved vigor and reproduction capabilities would allow desired vegetation to compete more favorably with weedy species.

The types of impacts from recreation would be the same as those described under Effects Common to All Alternatives. The BLM would manage 5 SRMAs on 87,200 acres (75 percent fewer acres than under Alternative A) and 6 ERMAs on 217,400 acres (69 percent fewer acres than under Alternative A). Certain SRMAs or portions of SRMAs would be closed to fluid mineral leasing or would have stipulations on surface-disturbing activities applied, which would protect vegetation.

Intensive cross-country motorized use would be allowed on 10,200 acres (18 percent fewer acres than under Alternative A) within the decision area, which could cause the types of impacts described above for casual use under Effects Common to All Alternatives. Areas closed to motorized use on 126,200 acres (3.6 times more acres than under Alternative A) and limited to designated routes on 925,200 acres (4.1 times more acres than under Alternative A) would reduce the likelihood of these impacts. Measures would be implemented to reduce fugitive dust, which would minimize impacts on vegetation and desired plant communities.

The mileages of routes are proposed to be designated administrative-only or closed based upon vegetation planning criteria are shown in **Table 4-32**.

Identifying 789,400 acres (79 percent more acres than under Alternative A) of ROW avoidance and 210,000 acres (11 percent fewer acres than under Alternative A) of ROW exclusion areas would reduce impacts on vegetation as described under Effects Common to All Alternatives. Furthermore, encouraging the use of designated utility corridors, managing five corridors for utilities and facilities, and managing solar and wind emphasis areas on 11,100 acres would concentrate impacts on vegetation and reduce widespread impacts and fragmentation. Development of solar and wind projects would remove vegetation in the short term, and solar projects would likely have long-term effects on vegetation. For all projects, revegetation planning would be required.

Table 4-32
Route Designations and Vegetation Planning Criteria under Alternative B

Planning Criteria	Final Designation Administrative Use (miles)	Final Designation Closed (miles)	Total Miles Designated as Administrative Use or Closed
Communities Susceptible to Cheatgrass Invasion	119.6	288.6	408.2
Relic Vegetation	2.5	5	7.5
Total	**122.1**	**293.6**	**415.7**

Source: BLM 2010a

Under Alternative B, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 252,100 acres (16 percent fewer acres than under Alternative A) within the coal potential development area as acceptable for coal leasing. Areas within the coal potential development area unacceptable for coal leasing on 57,400 acres (52 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce vegetation impacts from coal mining on these lands.

Under Alternative B, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 790,700 acres of BLM-administered surface lands (18 percent fewer acres than under Alternative A) as open to fluid mineral leasing. BLM surface lands closed to fluid mineral leasing on 270,700 acres (2.8 times more acres than under Alternative A), as well as stipulations on open lands, would reduce vegetation impacts from fluid mineral leasing on these lands. Of the acres open to fluid mineral leasing, NSO stipulations would be applied on 371,500 acres (12 percent fewer acres than under Alternative A) and CSU stipulations would be applied on 481,800 acres of BLM surface lands that are open to fluid mineral leasing (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate).

Under Alternative B, 20,600 acres would be petitioned for withdrawal from locatable mineral exploration or development (0 acres would be petitioned under Alternative A). If withdrawn, these areas would provide additional protection to vegetation from surface-disturbing activities.

Thirteen ACECs would be managed on 123,000 acres (4.2 times more acres than under Alternative A), and these would be closed to wood harvest, mineral material sales, and non-energy leasable mineral exploration and development. Other restrictions include travel route closures or limitations, identification of ROW avoidance or exclusion areas, recreation restrictions, stipulations, and managing areas as closed to fluid mineral leasing. As such, vegetation would generally be protected from surface disturbance within these areas.

Implementation of an interpretation and environmental education program under Alternative B would enhance awareness and appreciation of vegetation resources within the decision area. This could result in increased protective efforts by the general public.

Riparian and Wetland Vegetation

In addition to the impacts described under *General Vegetation and Desired Plant Communities*, applying NSO stipulations around major river corridors and managing riparian areas and major river corridors as ROW avoidance areas with special stipulations would protect riparian vegetation and reduce impacts from surface-disturbing activities. Actions such as modifying recreation use and prohibiting firewood harvest would be taken to reduce impacts on riparian areas. The BLM would also try to reduce fragmentation of riparian areas by acquiring properties, if necessary, and would subject these areas to BLM protection measures. While there would be no CSU stipulation applied along major river corridors, the BLM would apply NSO stipulations that would provide greater protection by prohibiting surface-disturbing activities.

Riparian areas within the Dolores River Canyons SRMA could be impacted by increased visitation and designated camping. Other recreation uses would likely remain limited in the riparian corridor. East Creek may also be impacted by increased visitation and use due to its proximity to Grand Junction and the surrounding bouldering and rock climbing opportunities in the area. Where recreation causes impacts on riparian areas such that land health standards are not met, management would modify recreation use accordingly.

Comprehensive route designations under Alternative B would help reduce impacts on riparian vegetation. There would be 1,400 acres of riparian areas closed to motorized vehicles (0 acres would be closed under Alternative A) and 8,400 acres where motorized vehicles would be limited to designated routes (1.3 times more acres than under Alternative A). Restrictions to mitigate riparian impacts would be applied on routes in riparian areas if monitoring reveals that impacts are occurring, per the Travel and Transportation Management Plan (**Appendix M**).

Under Alternative B, several ACECs would be maintained or designated to protect riparian and wetland vegetation, including the Dolores River Riparian, Roan and Carr Creeks, and Unaweep Seep ACECs. The types of impacts would be the same as those described under *General Vegetation and Desired Plant Communities*. Interim protective management guidelines for the portions of the Dolores River determined suitable for inclusion in the NWSRS would provide similar protections to riparian vegetation in this area.

Master Leasing Plan

Approximately 183,400 acres of federal mineral estate in the Shale Ridges and Canyons MLP analysis area that are currently unleased would be open to oil and gas leasing and development in Alternative B. Approximately 37,600 currently

unleased acres would be closed to leasing, providing direct protection to riparian vegetation. NSO stipulations would be applied to about 328,700 acres of federal mineral estate that are open to fluid minerals leasing (including areas along major river corridors; lands adjacent to perennial, intermittent and ephemeral streams; riparian areas, fens and/or wetlands; and water impoundments; and groundwater public water supply wells). Additional protection of riparian areas in the MLP analysis area would be provided by applying CSU use stipulations on about 362,500 acres of federal mineral estate that would be open to fluid minerals leasing. Major and moderate land use restrictions (i.e., NSO and CSU stipulations) applied to other resources, such as an NSO stipulation for big game critical habitat, may also help protect riparian vegetation from the impacts of fluid mineral development. The number of acres of riparian vegetation that would be indirectly protected by various fluid mineral development restrictions is not additive. For instance, an NSO stipulation for big game critical habitat may entirely, or partially, overlap a municipal watershed boundary, and the same riparian acreage could be protected by each NSO stipulation.

Direct impacts on riparian vegetation from fluid mineral development would be constrained by the leasing stipulations proposed to protect water resources and other resources. Impacts on riparian vegetation would also be reduced by stipulations proposed to protect riparian areas. Depending upon the actual amount of development, there could be direct disturbance due to the impracticality of avoidance, such as a road crossing or pipeline requiring large open cuts in a riparian area. Indirect impacts on riparian vegetation could occur due to increased erosion from surrounding areas, dust deposition on vegetation, increased non-native species invasion, and concentrating animal use in areas of undisturbed vegetation. Impacts are also likely and common from soil compaction associated with pads, roads, and other ground disturbance adjacent to or through riparian areas which may affect the ability of the soil to hold water along with surface run-off. BMPs to revegetate disturbances quickly with native vegetation can help reduce indirect impacts on riparian vegetation. BMPs and SOPs can be used to reduce the size of a well pad from the larger drilling size to a smaller production size, which helps limit the unvegetated acreage to that disturbed by roads and smaller well pads. Fluid mineral management would have minor impacts on riparian vegetation, overall, although there could be moderate impacts in site-specific areas of development.

Forest and Woodland Vegetation

In addition to the impacts described under *General Vegetation and Desired Plant Communities*, the BLM would aim to maintain the current acreage of old-growth pinyon and juniper. In addition, old-growth woodlands would be managed as ROW avoidance areas, and a CSU stipulation would be applied, which would protect these areas from surface-disturbing activities.

Under Alternative B, using planned and unplanned fire, as well as a variety of fuel treatments, would assist in managing for multiple age classes in non-old-growth forest and woodland areas.

Under Alternative B, activity level plans would be developed for certain areas to ensure that forestry actions meet vegetation objectives. Forestry management areas would cover the entire decision area. Aspen (*Populus tremuloides*) treatments would be focused on stimulating regeneration. Impacts would include improved forest health, diversity, and achievement of multiple age classes for species such as pinyon-juniper and aspen. Douglas fir (*Pseudotsuga menziesii*), spruce (*Picea engelmannii*), and ponderosa pine (*Pinus ponderosa*) would be managed to improve stand health and resilience to natural disturbance.

Significant Plant Communities

Applying CSU stipulations on significant plant communities would be implemented to protect such plant communities. These stipulations would allow for relocation of proposed surface disturbing activities by more than 200 meters, thereby avoiding, and protecting, occupied habitat and habitat necessary for the maintenance or recovery of the communities. In addition to CSU stipulations, most significant plant communities would indirectly benefit from the implementation of NSO stipulations for other resources.

Weeds

In addition to the impacts described under *General Vegetation and Desired Plant Communities*, soil and water protections would decrease the likelihood of weed spread by maintaining topsoil and native seed banks and reducing vegetation disturbance and clearing.

Recreation management under Alternative B would emphasize management of SRMAs and ERMAs, which would concentrate recreation facilities and visitor use. As such, while visitor use is expected to increase, thus increasing weed vectors, weeds may be easier to manage since use would be concentrated in discrete areas.

Alternative C

General Vegetation and Desired Plant Communities

The types of impacts on general vegetation and desired plant communities from management for soil resources, water resources, biological resources, fire, alternative energy development, and interpretation and environmental education would be the same as those described previously under Alternative B. Alternative C would focus management on improving vegetation for special status species habitat, which would improve and protect desired plant communities throughout the decision area. In addition, Alternative C emphasizes the use of fire over mechanical treatments.

The types of impacts from visual resources management would be the same as those described under Alternative A. However, under Alternative C, the BLM would manage 654,000 acres (4.1 times more acres than under Alternative A) as VRM Class I and II.

The types of impacts from grazing management would be the same as those described under Alternative B. However, under Alternative C, the BLM would manage 586,600 acres (40 percent fewer acres than under Alternative A) as open and 440,400 acres (84 percent more acres than under Alternative A) as closed to grazing. In addition, the BLM would require periodic rest and limited grazing on more areas, which would allow plants to recover and prevent overgrazing, as described under Alternative B.

The types of impacts from recreation management would be the same as those described under Alternative B, but under Alternative C the BLM would manage two SRMAs on 60,000 acres (84 percent fewer acres than under Alternative A) and zero ERMAs. Although Alternative C has less emphasis on marketing recreation within the planning area, use would likely increase proportionate to population growth, and the BLM would have a reduced capacity to concentrate use in areas managed for recreation. As such, more dispersed impacts on vegetation may result from equestrian, mechanized, or foot-based travel.

Areas open to cross-country motorized use would be eliminated under Alternative C, which would prevent the types of impacts described under Effects Common to All Alternatives. Areas closed to motorized use on 379,500 acres (10.8 times more acres than under Alternative A) and limited to designated routes on 681,900 acres (3 times more acres than under Alternative A) would reduce the likelihood of impacts on vegetation and desired plant communities. Measures would be implemented to reduce fugitive dust, which would benefit vegetation communities.

Managing 627,000 acres as ROW avoidance (42 percent more acres than under Alternative A) and 365,800 acres as ROW exclusion areas (39 percent more acres than under Alternative A) would reduce impacts on vegetation as described under Effects Common to All Alternatives. Furthermore, the types of impacts from management for utility corridors would be similar to those described under Alternative B. However, under Alternative C, the BLM would require, as practical, the use of delineated utility corridors for large linear facilities, manage six corridors for utilities and facilities, and manage solar and wind emphasis areas on 7,900 acres (47 percent fewer acres than under Alternative B).

Under Alternative C, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and the BLM would manage 251,200 acres (16 percent fewer acres than under Alternative A) as acceptable for coal leasing. Areas unacceptable for coal leasing on 58,200 acres (58 percent more acres than under Alternative A),

as well as stipulations on open lands, would reduce vegetation impacts from coal mining on these lands.

Under Alternative C, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 506,700 acres (48 percent fewer acres than under Alternative A) as open to fluid mineral leasing. Areas closed to fluid mineral leasing on 554,700 acres (5.7 times more acres than under Alternative A), as well as stipulations on open lands, would reduce vegetation impacts from fluid mineral leasing on these lands. NSO stipulations would be applied on 302,900 acres (30 percent fewer acres than under Alternative A) and CSU stipulations would be applied on 326,800 acres (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate).

The types of impacts from withdrawal from locatable mineral exploration or development would be the same as those described under Alternative B. However, under Alternative C, 45,100 acres (2.2 times more acres than under Alternative B) would be petitioned for withdrawal.

The types of impacts from ACEC management would be the same as those described under Alternative B. However, under Alternative C, the BLM would manage 23 ACECs on 168,000 acres (5.8 times more acres than under Alternative A).

Riparian and Wetland Vegetation

The types of impacts on riparian and wetland vegetation from casual use, permitted activities, and changes to vegetation conditions would be the same as those described under Alternative B, but would occur over a smaller area. Under Alternative C, motorized and mechanized travel would be limited to designated routes on 5,300 acres (2.4 times more acres than under Alternative A) of riparian vegetation, closed on 4,100 acres (0 acres would be closed under Alternative A), and 400 acres (43 percent fewer acres than under Alternative A) would be seasonally closed to motorized travel. If monitoring indicates that impacts are occurring, the BLM would alter management to mitigate impacts.

Under Alternative C, several ACECs would be designated to protect riparian and wetland vegetation, such as the Colorado River Riparian, Coon Creek, Dolores River Riparian, Hawxhurst Creek, Roan and Carr Creeks, and Unaweep Seep ACECs (**Table 2-2**). Furthermore, 14 WSR segments covering 99.5 miles would be suitable for inclusion in the NWSRS (**Table 2-2**). ACEC management and interim protective guidelines for WSRs would protect riparian and wetland vegetation from disturbance in these areas through the use of stipulations and ROW exclusion and avoidance areas.

Forest and Woodland Vegetation

The types of impacts on forest and woodland vegetation from casual use, permitted activities, and changes to vegetation conditions would be the same as those described previously under Alternative B. However, under Alternative C, the BLM would place a greater emphasis on increasing the acreage of old-growth pinyon-juniper woodlands. Furthermore, the BLM would close the greatest acreage to wood harvest. These actions would help to maintain late seral forest vegetation over the long term.

Significant Plant Communities

Applying CSU stipulations on significant plant communities would be implemented to protect significant plant communities. These stipulations would allow for relocation of proposed surface disturbing activities by more than 200 meters, thereby avoiding, and protecting, occupied habitat and habitat necessary for the maintenance or recovery of the communities. In addition to CSU stipulations, most significant plant communities would indirectly benefit from the implementation of NSO stipulations for other resources.

Weeds

The types of impacts from casual use, permitted activities, and changes to vegetation conditions on weeds would be the same as those described previously under Alternative B. With its greater conservation emphasis and potentially reduced amount of surface-disturbing activities, there would likely be less potential for weed introduction or spread under Alternative C.

Alternative D

General Vegetation and Desired Plant Communities

The types of impacts on general vegetation and desired plant communities from management for soil resources, water resources, biological resources, alternative energy development, and interpretation and environmental education would be the same as those described previously under Alternative B. However, Alternative D would emphasize vegetation management for commodities and resource uses, as well as maintenance of vegetation conditions. While BLM would comply with all laws and regulations, there would be less focus on resource protection and improvement or restoration of vegetation under Alternative D. There would also be fewer measures to reduce or limit surface-disturbing activities, such as fewer NSO, CSU, and TL stipulations, as well as ROW avoidance and exclusion areas.

Alternative D allows less flexibility in the management of unplanned ignitions because more suppression would be required as a result of allowing increased resource extraction under this alternative than under Alternatives B and C. As a result, the BLM would have fewer opportunities to use fire as a natural disturbance regime to meet resource objectives. This could lower biodiversity and vegetative health and vigor, increase cover of decadent plants, and prevent

achieving land health standards. Limiting the use of fire would also lead to hazardous fuels buildup that creates conditions for larger, more severe wildfires.

The types of impacts from visual resources management would be the same as those described under Alternative A. However, under Alternative D, 291,300 acres would be managed as VRM Class I and II (2.1 times more acres than under Alternative A).

The types of impacts from grazing would be the same as those described under Alternative B, but under Alternative D the BLM would manage 977,200 acres (less than 1 percent fewer acres than under Alternative A) as open and 49,900 acres (3 percent more acres than under Alternative A) as closed to livestock grazing. The primary focus of range improvements would be to improve livestock forage and not necessarily desired plant communities. As such, the desired plant community could shift to include more forage species and less diversity of native plant species. Further, limitations on grazing, such as requiring periodic rest or seasonal restrictions, would be applied on a case-by-case basis, which could allow for impacts on vegetation and desired plant communities in certain locations.

The types of impacts from recreation would be similar to those described under Alternative B, but under Alternative D the BLM would manage six SRMAs on 79,000 acres (78 percent fewer acres than under Alternative A) and six ERMAs on 61,900 acres (91 percent fewer acres than under Alternative A). Alternative D would place the greatest emphasis on recreation and visitation within the planning area. Since use would likely increase at a rate greater than local population growth (as a result of increased marketing), the BLM would have a reduced capacity to concentrate use in areas managed for recreation. As such, more dispersed impacts on vegetation may result.

A total of 10,200 acres (18 percent fewer acres than under Alternative A) would be open to cross-country motorized use, which could cause the types of impacts described above for casual use under Effects Common to All Alternatives. Areas closed to motorized use on 111,300 acres (3.2 times more acres than under Alternative A) and limited to designated routes on 939,900 acres (4.2 times more acres than under Alternative A) would reduce the likelihood of these impacts. Measures would be implemented to reduce fugitive dust, which would benefit vegetation and desired plant communities.

Managing 80,500 acres (82 percent fewer acres than under Alternative A) as ROW avoidance and 104,100 acres (56 percent fewer acres than under Alternative A) as ROW exclusion areas would limit impacts on vegetation as described under Effects Common to All Alternatives. Alternative D would manage eight corridors for facilities and utilities and 40,000 acres (2.7 times more acres than under Alternative B) as solar and wind emphasis areas. These actions could result in more habitat fragmentation and vegetation removal.

Under Alternative D, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 265,600 acres (12 percent fewer acres than under Alternative A) as acceptable for coal leasing. Areas unacceptable for coal leasing on 43,800 acres (19 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce vegetation impacts from coal mining on these lands.

Under Alternative D, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and the BLM would manage 1,130,700 acres of federal mineral estate (1 percent fewer acres than under Alternative A) as open to fluid mineral leasing. Federal mineral estate closed to fluid mineral leasing on 100,500 acres (4 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce vegetation impacts from fluid mineral leasing on these lands. NSO stipulations would be applied on 400,900 acres (seven percent fewer acres than under Alternative A), and CSU stipulations would be applied on 455,800 acres (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate).

The types of impacts from withdrawal from locatable mineral exploration or development would be the same as those described under Alternative B. However, under Alternative D, 1,300 acres (94 percent fewer acres than under Alternative B) would be petitioned for withdrawal.

Five ACECs would be managed on 33,200 acres (15 percent more acres than under Alternative A), and these would be managed as described under Alternative B, providing protections to vegetation.

Riparian and Wetland Vegetation

The types of impacts on riparian and wetland vegetation from casual use, permitted activities, and changes to vegetation conditions would be the same as those described previously under Alternative B. Alternative D would provide the same protection to riparian areas around major river corridors via an NSO stipulation, require less stringent design, construction, maintenance, and reclamation plans, and apply ROW avoidance and CSU stipulations around riparian and wetland areas. Timber and woodland harvest would be allowed on a case-by-case basis, which could introduce surface disturbance and vegetation removal in riparian areas. Riparian areas would not benefit from WSR protections under Alternative D, as no segments would be managed as eligible or suitable for inclusion in the NWSRS.

Under Alternative D, motorized and mechanized travel would be limited to designated routes on 8,600 acres (3.9 times more acres than under Alternative A) of riparian areas, closed on 600 acres (0 acres would be closed under Alternative A), and 600 acres (14 percent fewer acres than under Alternative A)

would be seasonally closed to motorized travel. If monitoring indicates that impacts are occurring, the BLM would alter management to mitigate impacts.

Forest and Woodland Vegetation

The types of impacts on forest and woodland vegetation from casual use, permitted activities, and changes to vegetation conditions would be the same as those described previously under Alternative B. Alternative D would emphasize mid-seral pinyon-juniper forest and woodlands for harvest and treatment. This would likely prevent the expansion of old-growth forest communities.

Significant Plant Communities

Applying CSU stipulations on significant plant communities would be implemented to protect significant plant communities. In addition to CSU stipulations, most significant plant communities would indirectly benefit from the implementation of NSO stipulations for other resources.

Weeds

The types of impacts on weeds from casual use, permitted activities, and changes to vegetation conditions would be the same as those described previously under Alternative B. In general, the increased disturbance associated with Alternative D would result in the greatest potential for weed introduction and spread.

Cumulative

The CIAA used to analyze cumulative impacts on vegetation extends outside the planning area, following fourth-order watershed boundaries that completely or partially overlap the planning area. The fourth-order watersheds were used as the basic unit of analysis because the scope of cumulative influence would be at the watershed scale and is not expected to extend beyond this scale. Noxious weeds can also be dispersed into the planning area by upstream waterways and carried downstream from the planning area.

Past, present, and reasonably foreseeable future actions and conditions within the CIAA that have affected and will likely continue to affect vegetation include mineral exploration and development, forestry, grazing, recreation, road construction, ROWs (including large transmission lines or pipelines), weed invasion and spread, prescribed and wildland fires, land planning efforts, vegetation treatments, habitat improvement projects, insects and disease, and drought. Many of these activities create conditions that cause or favor other vegetation changes. For example, wildland fire causes vegetation removal, which makes affected areas more susceptible to weed invasion and soil erosion. Drought conditions reduce vegetative health, which makes vegetation prone to insect infestation or disease. In general, resource use activities have cumulatively caused vegetation removal, fragmentation, weed spread, soil compaction, and erosion, whereas land planning efforts and vegetation and weed treatments have countered these effects by improving vegetative connectivity, productivity, diversity, and health.

Climate change within the CIAA could cause an increase or decrease in temperatures and precipitation, which would affect soil conditions, vegetative health, and water availability. Such changes would alter the conditions to which vegetative communities are adapted, potentially creating conditions that could favor certain species or communities, weeds, or pests.

Under the Proposed RMP (Alternative B) and alternatives, impacts on vegetation would be minimized to the extent practical and feasible through restrictions; stipulations; closures to mineral exploration and development, recreation, and motorized travel; COAs; and by concentrating development in previously disturbed areas. Vegetative conditions would be improved through treatments, weed prevention and control, habitat improvements, use of prescribed and wildland fire, forestry management, and proper grazing practices. In general, all alternatives would work toward achieving land health but would differ in the time and methods used to reach that goal. Since Alternative D would emphasize more resource use and development, impacts on vegetation would be more likely to occur under this alternative. As a result, Alternative D could significantly contribute to cumulative impacts on vegetation. In contrast, the incremental contribution of Alternatives A, B, and C to cumulative impacts on vegetation is expected to be less than significant.

4.3.5 Fish and Wildlife

This section discusses impacts on fish and wildlife habitat from proposed management actions of other resources and resource uses. Habitat types are described in **Section 3.2.6**, Vegetation. Existing conditions concerning fish and wildlife and descriptions of habitat requirements for various species are described in **Section 3.2.7**, Fish and Wildlife.

Methods of Analysis

Impacts on fish and wildlife and their habitats include the following:

- Disturbance and/or loss of plant communities, food supplies, cover, breeding sites, and other habitat components necessary for population maintenance used by any species to a degree that would lead to substantial population declines
- Disturbance and/or loss of seasonally important habitat (e.g., critical for overwintering or successful breeding) to a degree that would lead to substantial population declines
- Interference with a species movement pattern that decreases the ability of a species to breed or overwinter successfully to a degree that would lead to substantial population declines

Impacts specific to aquatic species and their habitats include the following:

- Sediment and Turbidity—Increased sediment loading in waters containing sediment-intolerant fish species, loss of recruitment, stress, habitat alteration, and habitat loss
- Habitat Alteration—Changes in habitat that make it nonfunctional for select species or more conducive to competitive species
- Loss or Reduction of Streamside Vegetation/Cover—Increased temperatures, stress, reduced productivity, and impacts on food webs
- Water Quality Alteration—Actions that alter important water quality parameters, including pH, dissolved oxygen, temperature, hardness, alkalinity/salinity, and turbidity
- Water Depletions—Loss of physical habitat, changes in water quality, sediment accumulation, habitat alteration, loss of habitat complexity, or food source reduction
- Potential direct mortalities to aquatic wildlife from motorized travel

The analysis includes the following assumptions:

- If monitoring reveals that mitigation is unsuccessful in precluding significant impacts, immediate measures to prevent further impacts will be implemented as appropriate to the species affected prior to the accumulation of impacts to a level of significance.
- Disturbance of a key or critical component of a species habitat will be detrimental, with the degree of detriment dependent on the importance of the habitat component to the maintenance of the population.
- Wildlife habitat needs vary substantially by species. It is generally true, however, that healthy and sustainable wildlife populations can be supported where there is a diverse mix of plant communities with multiple seral stages to supply structure, forage, cover, and other specific habitat requirements. Managing for a diverse mix of plant communities is thus an important component of managing for a diversity of species.
- Habitat conditions and quality are directly linked to the health, vigor, and cover of vegetative communities, particularly desired plant communities that fish and wildlife species depend on, as well as soil conditions and water quality and quantity.
- Impacts on populations that exceed the current carrying capacity that will not reduce those populations below the carrying capacity would not be considered significant.
- Impacts on terrestrial wildlife from displacement depend on the location, extent, timing, or intensity of the disruptive activity.

Furthermore, impacts from displacement will be greater for wildlife species that have limited habitat or a low tolerance for disturbance.

- NSO stipulations will provide the greatest protection to fish and wildlife and their habitats by prohibiting surface-disturbing activities in these areas. This will prevent disturbance to species and habitats caused by fluid mineral development and will prevent direct impacts on species as described below. CSU stipulations will provide slightly less protection to fish and wildlife and their habitats, since surface-disturbing activities will be allowed and species and habitats could be disturbed. However, CSU stipulations could protect fish and wildlife and their habitats in certain instances by requiring special operational constraints or by moving the surface-disturbing activity to protect fish and wildlife. TLs will protect certain fish and wildlife species during time periods when species would be most sensitive to disturbance, such as during nesting, spawning, and wintering periods.
- Habitat will be managed in coordination with CPW herd objectives and species-specific plans.
- Currently, sufficient habitat exists to maintain CPW data analysis unit objectives for game species across the GJFO.
- Human disturbance will displace wildlife beyond the actual disturbance footprint, although some wildlife may adapt over time depending on the nature of the disturbance and the species being impacted.
- Short-term effects will occur over a timeframe of two years or less and long-term effects will occur over longer than two years.
- In the context of this analysis, the term "avoidance" means reduced use and does not imply a complete absence of use by wildlife.

Management actions with potentially significant impacts on fish and wildlife habitat include resource uses that result in surface disturbance and disruptive activities, such as energy and minerals, lands and realty, and travel management. Management actions with potential to enhance fish and wildlife habitat include special management areas and management of soils, water, vegetation, and fish and wildlife for preservation, maintenance, and enhancement of current ecosystem values.

Effects Common to All Alternatives

Types of Impacts

Many activities could impact species or habitats through disturbance, direct habitat loss and reduced habitat effectiveness, habitat modification and degradation, habitat fragmentation, direct mortality, habitat avoidance, and

interference with movement patterns. Impacts associated with certain activities are discussed below in greater detail under each habitat type and alternative.

Disturbance. Disturbances are events that disrupt ecological systems; they may occur naturally or be human-induced. The effects of disturbances are determined in large part by their intensity, duration, frequency, timing, and the size and shape of the area affected, as well as the species that are affected. For example, human disturbance near raptor nests can result in the abandonment of the nest, high nestling mortality from overheating, chilling, or dehydration when adults are flushed from the nest and young are exposed, premature fledging, and reduced access to resources (Gutzwiller et al. 1998).

Direct habitat loss. Direct habitat loss occurs when life-sustaining conditions are lost. For example, removing vegetation affects wildlife by reducing the extent or quality of habitat in terms of food cover and reducing structure for nesting and other uses. While closure and reclamation of disturbed areas can eventually restore lost habitat values, it may require years or decades for recovery to pre-disturbance structure and function.

Reduced habitat effectiveness. Habitat effectiveness is the comparison of the habitat and disturbance components that reflects an area's actual ability to support certain species of wildlife. The amount of habitat actually available to wildlife is called "effective habitat," and reductions in the amount of effective habitat can greatly exceed any direct habitat loss. Increasingly, there is a need to understand and predict the consequences of habitat alterations. Several studies have found that habitat effectiveness is reduced near roads and developed areas (Reed et al. 1996, Ruediger et al. 2006).

Habitat modification and degradation. Changes in habitat are generally less obvious and less severe than losses of habitat but can be substantial, especially if small impacts accumulate across large areas. Examples include removal of too much forage by domestic livestock, invasions of weeds, degradation of water quality, and removal of tree cover during harvesting. A habitat treatment changes habitat and can be beneficial; it is an important tool in wildlife habitat management. Examples include use of prescribed fires to stimulate new growth on older woody vegetation and thinning of overly dense shrubs to enhance forage production.

Habitat fragmentation. Habitat fragmentation is the disruption of large, continuous blocks of habitat into less continuous habitat by, for example, clearing land and converting vegetation from one type to another. These effects generally have more of an impact on wide-ranging species such as pronghorn (*Antilocapra americana*) than on species with a small geographic home range such as ground squirrels. Tracts of fragmented habitat could separate wildlife into smaller populations, potentially making them more vulnerable to predation, drought, or disease, and potentially limiting genetic diversity. Furthermore, fragmentation would create more edge habitat, which increases predation and

the likelihood of invasive, nonnative species invasion, lowering the habitat value of the area.

Direct mortality. Direct mortality can result in areas of increasing human use due to collisions with vehicles, electrocution of raptors on utility lines, or inadvertent trampling of reptiles. In the case of oil and gas development, wildlife mortality associated with petroleum pollution has also been reported. Human activities can cause the direct mortality of animals and over the long term can affect the population numbers, sex ratios, area densities, and population structure.

Habitat avoidance. Direct disturbance to a species and possibly its habitat can affect its use of BLM-administered lands. Avoidance or displacement occurs when wildlife make proportionately less use of particular areas despite the presence of the physical habitat. The result is a de facto loss of habitat because avoided areas meet no survival needs.

Some species are more tolerant of human activity than others. Species such as big game must adapt to human-related disturbances to some degree, especially on winter ranges that have been altered by human uses. However, virtually all species have some threshold of disturbance above which they would avoid or abandon utilization of an area.

Interference with movement patterns. Human-induced impacts can also affect wildlife by altering important daily or seasonal movement patterns. These patterns may be altered through shifts to avoid human activity, to avoid crossing open areas that provide inadequate cover, or to circumvent some physical barrier (e.g., fences and steep road cuts). This type of impact is not as much of an issue for small mammals or reptiles that do not move across large areas or for some birds that easily avoid them. Even without the need for these regular movements, most terrestrial wildlife tend toward some population dispersal as young seek new habitats to occupy. This is important to the species to ensure that suitable habitat is occupied and to facilitate gene exchange between distinct populations.

All Fish and Wildlife Habitats

Fish and wildlife habitats on BLM-administered lands within the decision area would be affected under all alternatives, and the condition of habitats is directly linked to vegetation conditions, water quality and quantity, and progression towards land health standards (**Section 4.3.4**, Vegetation, and **Section 4.3.3**, Water Resources).

Changes to fish and wildlife habitats would be caused by the following three types of disturbances: 1) disturbance from casual use; 2) disturbance from permitted activities; and 3) changes to habitat condition.

Substantial analysis and planning is used to determine the locations and types of casual use activities that would occur, such as recreation, motorized vehicle use, and use of authorized and unauthorized routes. However, these uses are not subject to site-specific environmental review and monitoring requirements, and impacts on habitats or species would not be apparent until after damage has occurred. Examples of impacts on fish and wildlife from casual use include habitat loss, fragmentation, or degradation; mortality or injury of animals; sedimentation of waterways; increased turbidity; decreased water quality; disturbance to species during sensitive or critical periods in their life cycle such as spawning, nesting, or denning; short-term displacement; and long-term habitat avoidance by species that are sensitive to noise or human presence such as raptors. Some species may adapt to disturbances over time and could recolonize disturbed habitats. Impacts are more likely to occur in easily accessible areas, where visitation would be high, and in areas open to intensive motorized use. Impacts would still occur in areas limited to designated routes due to noise disturbance, human presence, potential for weed spread and habitat degradation, and the potential for injury or mortality to wildlife from vehicle collisions. In general, the more acres of routes that are designated in the planning area, the greater the likelihood of habitat fragmentation and disturbance to species and habitats.

The risk of bighorn sheep exposure to domestic sheep is analyzed using WAFWA (2010) bighorn sheep recommendations, which states that buffer zones between domestic sheep or goats and wild sheep to minimize association have frequently been cited as a minimum of 9 airline miles. It also states that this applies to herds or populations of wild sheep rather than to individual wandering wild sheep. The Desert Bighorn Council (1990) recommends a 13.5-kilometer (8.5-mile) buffer. Alternatives that place greater restrictions on domestic sheep grazing in and near bighorn sheep habitat would be assumed to have fewer adverse impacts on bighorn sheep.

Both short-term, loud noise (such as from vehicles or construction) and long-term, low-level noise (such as from industrial uses such as oil and gas development) has been documented to cause physiological effects, including increased heart rate, altered metabolism, and a change in hormone balance (Radle 2007). Determining the effect of noise is complicated because different species and individuals have varying responses, and certain species rely more heavily on acoustical cues than others (Radle 2007; Barber et al. 2009). Impacts would be both short and long term, depending on the type and source of noise.

On-site management of recreation and mechanized and motorized activity and designation and closure of travel routes could prevent or reduce impacts. For example, where recreation is managed within an SRMA, and to a lesser extent ERMAs, rules and guidelines would limit or control activities through specialized management tools such as designated campsites, permits, area closures, and limitations on duration of use. Seasonal closure of routes would prevent impacts

on species during sensitive or critical times of the year, such as during winter or birthing. Impacts would vary depending on the SRMA, as each SRMA would be managed for certain recreation outcomes and setting prescriptions. Impacts on fish and wildlife habitats would be concentrated in these areas but are expected to reduce impacts in other areas.

Closing areas to recreational target shooting would result in reduced risk of lead poisoning and elevated lead concentrations in tissues of bird species that utilize these areas (USGS 2009).

Permitted, surface-disturbing activities (e.g., mineral exploration and development, ROWs) would result in short-term direct impacts through mortality, injury, displacement, and noise or human disturbance caused by increased vehicle traffic and use of heavy machinery. Displacement of species could increase competition for resources in adjacent habitats. Over the long term, these activities would remove and fragment habitats due to road development and use, facility construction and placement, creation of well pads and pipelines, and construction within ROWs. Species could avoid developed areas over the long-term, or may adapt and recolonize sites after construction. ROW avoidance and exclusion areas would be identified to reduce or avoid habitat impacts, and utility corridors would be used to concentrate utility and facility development and reduce the total acreage of habitat disturbance and fragmentation.

Roads, mineral development, and off-road recreation have been shown to affect terrestrial wildlife, particularly big game species (Wisdom et al. 2004; Rowland et al. 2004; Trombulak and Frissell 2000). Impacts include those stated previously, such as weed spread, sedimentation, reduced water quality, habitat degradation, injury or mortality, and noise. Other impacts include increased movement rates and probabilities of flight response (Wisdom et al. 2004) and increased daily movements and home range (Rowland et al. 2004). Such increases in movement and stress levels would cause individuals to expend more energy, which could impact reproductive success or susceptibility to mortality, predation, or disease. Species have also been shown to avoid habitat adjacent to disturbance extending to distances of over a mile (Wyoming Game and Fish Department 2010). Mule deer (*Odocoileus hemionus*) were less likely to occupy areas in close proximity to well pads than those farther away, and no evidence of well pad acclimation occurred over time (Sawyer et al. 2006). Mule deer were less likely to use habitat within 1.7 to 2.3 miles of well pads, suggesting that indirect habitat loss may be substantially greater than direct habitat losses (Sawyer et al. 2006). Other studies have found the average distances from well pads and roads to areas of high winter use by mule deer were 0.44 to 2.3 miles and 0.27 to 0.6 mile, respectively (Sawyer et al. 2006). Hebblewhite (2008) conducted a meta-analysis of over 160 studies and found an average 0.6-mile avoidance response from human disturbance, with the greatest avoidance in summer. Powell (2003) found that elk (*Cervus canadensis*) avoided

areas less than 0.3-mile from human development in the fall, winter, and spring. It is important to note that average avoidance distances do not correspond to total habitat loss, as some deer and elk will use habitats closer to disturbances depending on individual responses. Impacts are greater in areas with high densities of well pads, roads, and facilities and areas of high traffic (Wyoming Game and Fish Department 2010).

A multi-year study on the Pinedale Anticline suggests that not only do mule deer avoid mineral activities, but the deer have not become accustomed to the disturbance after three years of drilling activity (Madson 2005). Big game animals are expected to return to the project area following construction; however, populations would likely be lower than prior to project implementation as the human activities associated with operation and maintenance continue to displace big game. Mule deer are more sensitive to operation and maintenance activities than pronghorn, and, as the Pinedale Anticline study suggests, mule deer do not readily habituate. A study in North Dakota stated, "Although the population (mule deer) had over seven years to habituate to oil and gas activities, avoidance of roads and facilities was determined to be long term and chronic" (Lustig 2003). Deer have even been documented as avoiding dirt roads that were used only by 4-wheel drive vehicles, trail bikes, and hikers (Jalkotzy et al. 1997).

Studies of elk suggest that road closures may benefit wildlife by reducing energy expenditure, increasing the amount of effective habitat, improving diet quality, and decreasing vulnerability of elk during the hunting season (Rowland et al. 2004).

Numerous studies have shown that routes include a zone of influence that extends beyond the actual running surface of the route (Foreman et al. 2003; Hebblewhite 2008; Nietvelt 2002; Sawyer et al. 2006, 2009). This zone of influence includes impacts on wildlife species such as avoidance the area or higher stress levels in individuals near routes. Zones of influence and associated route densities (i.e., the overlap of the zones of influence) are becoming increasingly useful measurement of human impact on the natural world because they are tangible, can be visualized, and relatively easy to quantify with supporting GIS data (Forman 2000). Every mile of route is not equal in its effect due to variables such as route widths, location, traffic type, speed, and volume. While many studies quantify the effects of routes and route densities on wildlife and habitat quality, few distinguish between route classifications, use volumes, or specific route types and their corresponding effects on wildlife. Avoidance of routes appears to be the most studied parameter related to routes and their effects on wildlife (Foreman et al. 2003; Hebblewhite 2008; Nietvelt 2002). It is important to note that these zones of influence do vary by study and are not areas of 100 percent avoidance.

As route densities increase, zones of influence overlap; in other words, greater route density results in a higher level of wildlife avoidance. For this reason, we

chose to use route density to characterize impacts of routes on wildlife habitat. Route density is more than an index of the effect of humans on the landscape (Forman and Hersperger 1996). Routes and route traffic are the cause of, or are involved in, most of the impacts that humans make on the landscape (Hann et al. 1997; Lyon 1984). The impacts routes have on wildlife stem from habitat fragmentation, direct habitat destruction, habitat edge effects, weed invasion along the edges, access for adjacent habitat altering projects, pollution, wildfires, source of stream sedimentation, collisions, disturbances that change wildlife movement and habitat use. Route densities in the United States are usually expressed as miles of route per square mile. An Oregon study found that a route density of 1 mile of route per square mile reduced elk use by 25 percent of what it would be with no routes (Wisdom et al. 1986). At two miles of route per square mile routes can cut elk presence by half. At six miles of route per square mile, routes eliminated elk from an area

As summarized in a literature review of ungulate response to route and well development, research has shown significant impacts on ungulate populations begin to manifest themselves when route densities reach 0.6 mile of route per square mile (0.4 to 1 mile of route per square mile, Table 6, p. 88, Hebblewhite 2008). Based on documented displacement distance and avoidance buffers for ungulates (Hebblewhite 2008; Sawyer 2006, 2009), residual unavoidable adverse impacts on ungulates increase dramatically with a route density over 0.5 mile of route per square mile.

The need to offset impacts from additional development corresponds to the rate of change in habitat quality and route densities. The greatest rate of change in both habitat quality (distance to nearest route) and route densities is between approximately 0.6 and 2 miles of route per square mile; this is where efforts to offset impacts would be most effective in maintaining habitat quality. Habitat quality continues to decline when route densities are between 2 to 4 miles of route per square mile. When route densities exceed 4 miles of route per square mile, the impacts on habitat condition are expected to be widespread (Hebblewhite 2008; Wilbert et al. 2008).

To analyze the potential impact of routes on wildlife in the decision area, we analyzed density of routes per 0.6 miles (this falls within the 0.4 to 1 mile range suggested in the literature). Specific wildlife objectives (outlined in Chapter 2, for Alternatives B, C, and D) include minimizing habitat fragmentation and restoring habitat connectivity within travel management to reduce route density within high value wildlife habitat. Where route densities were high within critical areas for wildlife (such as near sage-grouse leks, in critical or severe winter range for big game, or in production areas for big game) a seasonal closure was considered as a possible minimization measure.

The following assumptions were used in this analysis:

- Administrative, private, linear disturbances, BOR, and closed routes were not included.
- Routes mapped on private land were only buffered if they were mapped as county routes.
- For the portion of Zone L (North Desert area) outside of the OHV open area, mileages were calculated based on route designations for Alternatives A, C, and D. For Alternative B (Proposed RMP) route designations in this area are being deferred; therefore, the acres in Zone L outside of the proposed OHV open area were not included in the analysis.
- The open area was lumped into the highest disturbance category for each alternative.

As shown in **Table 4-33**, Route Density by Alternative – Decision Area, and **Table 4-34**, Route Density by Alternative – Proposed RMP's Wildlife Emphasis Areas, there would be fewer areas within wildlife emphasis areas with a route density of greater than 2.0 miles per square mile. In addition, several wildlife emphasis areas would have winter seasonal travel limitations that would seasonally restrict motorized and mechanized travel. This would, in effect, further reduce route density within these wildlife emphasis areas to minimize impacts on wintering habitat and big game production areas.

Table 4-33
Route Density by Alternative – Decision Area

Route Density	Alternative A	Alternative B (Proposed RMP)	Alternative C	Alternative D
0-0.5 miles /sq. mile	49 %	64 %	73 %	55 %
0.6- 2 miles /sq. mile	42 %	33 %	24 %	39 %
2.1 -4 miles /sq. mile	6 %	2 %	2 %	4 %
More than 4 miles /sq. mile	3 %	1 %	less than 1%	2 %

Table 4-34
Route Density by Alternative – Proposed RMP's Wildlife Emphasis Areas

Route Density	Alternative A*	Alternative B (PRMP)	Alternative C*	Alternative D*
0-0.5 miles /sq. mile	41 %	62 %	75 %	54 %
0.6- 2 miles /sq. mile	53 %	37 %	25 %	43 %
2.1 -4 miles /sq. mile	6 %	1 %	less than 1%	3 %
More than 4 miles /sq. mile	less than 1%	0	0	0

* To provide a consistent area by which to compare the four alternatives, route density was analyzed within the wildlife emphasis areas proposed under Alternative B.

Bird mortality and/or injury could occur from collision or electrocution with transmission lines and other ROW structures. ROW development in areas where there are existing ROWs would reduce impacts, since resident birds may have adapted to the existing ROWs. COAs such as requiring flight diverters or following Avian Power Line Interaction Committee guidelines would be applied to new ROW applications to reduce impacts. Wind energy may also cause direct impacts on birds and bats, including blade strikes, barotrauma (injury or mortality caused by rapid or excessive pressure changes), habitat loss, and displacement. Indirect impacts may include introduction of invasive vegetation that results in alteration of fire cycles; increase in predators or predation pressure; decreased survival or reproduction of the species; and decreased habitat effectiveness. The amount of land that is open to fluid mineral leasing or other mineral use is not necessarily indicative of the number of acres of habitat that would be directly disturbed. Areas managed under NSO, CSU, and TL stipulations would limit surface disturbance and associated impacts in certain areas. The reasonably foreseeable development scenario predicts that over 13,000 acres of short-term disturbance would occur from drilling, roads, and pipelines, and over 4,000 acres of long-term disturbance from operation of new wells. Under all alternatives, 1,038,100 surface acres would be open to locatable mineral exploration or development, and 23,300 acres would be withdrawn from mineral entry.

Federal oil and gas regulations prevent the BLM from applying new or additional lease stipulations that would be developed through this planning effort to existing leases. However, federal regulations do allow the BLM to apply other protection measures in conjunction with planning and implementing oil and gas projects. For example, the BLM has the discretion to require additional restrictions on surface operations when supported by scientific analysis. All mitigation/conservation measures not already required as stipulations would be analyzed in a site-specific NEPA document, and incorporated, as appropriate, into COAs of the permit, plan of development, and/or other use authorizations.

Birds and other wildlife species may be impacted by oil field waste pits, as they are attracted to oil-covered ponds. Potential impacts include the following:

- Entrapment in oil, causing wildlife to drown
- Mortality or illness from preening feathers or cleaning fur that is covered with oil
- Cold stress and potential resulting mortality if oil damages the insulating properties of feathers or fur
- Increased susceptibility to disease or predation
- Reduced hatching success of eggs (USFWS 2000)

Changes to habitat conditions could occur from vegetation and weed treatments; forest and woodland treatments and harvest; wildlife, wild horse,

and livestock browsing and grazing; special status species and wildlife habitat enhancements; fire; fuels treatments; and range improvements. Overall, the BLM would aim to achieve or trend toward achieving Public Land Health Standards 2: Riparian Systems, and 3: Healthy Productive Plant and Animal Communities, which would improve habitat values for fish and wildlife. Over the short term, vegetation, fire, and weed treatments would remove habitat, and impacts would occur until the desired habitat was established. Over the long term, vegetation and habitat treatments would increase habitat structural and compositional diversity, increase cover and nesting habitat, prevent sedimentation of waterways, and retain riparian and wetland habitats. Depending on the extent and severity, fire can improve habitat for some species in the long term.

Under all alternatives, measures to reduce the introduction and spread of invasive fish and wildlife species and disease transmission within the planning area would improve fish and wildlife habitat quality. It is anticipated that as the population and associated recreation increase, management of invasive fish and wildlife species and disease would need to be more aggressive to halt their spread.

If managed improperly, overutilization of forage by wild horses or livestock could occur, leading to increased competition with wildlife for forage, and potentially reduced cover and nesting habitat for other species. Livestock could also spread weeds, which would degrade habitats. Wildlife could be displaced from their habitats, which could increase competition for resources in adjacent habitats. Impacts from wild horses would be localized within the LBCWHR. Impacts would vary depending on the extent of removal, type of vegetation impacted, and length of the grazing period. In general, the more acres that are open to grazing under a given alternative, the greater the risk for impacts. Livestock may degrade riparian areas, which could impact riparian-dependent, aquatic, and fish species. Under all alternatives, if overutilization were to occur, the BLM would adjust AUMs and/or use for livestock or the AML for wild horses and implement additional measures such as range improvements or wild horse gathers, as necessary and feasible, to reduce impacts. Some range improvement projects provide forage, water sources, and habitat for a variety of wildlife species.

Unplanned fire ignitions could cause short- or long-term damage to habitats depending on the seral stage affected, extent, and severity of the fire. In the short term, fire removes nesting and cover habitat and leaves bare areas that provide little habitat value and could erode to cause sedimentation of waterways. Fire could displace species from suitable habitat, which could increase competition for resources in adjacent habitats. In the long term, wildland and prescribed fires, as well as fuels treatments, improve habitat by increasing structural diversity. In some portions of the field office the fire return interval has been altered due to invasive species (e.g., cheatgrass) and in these areas vegetation diversity and wildlife habitat suitability has been decreased due

to the frequent fire return interval which appears to support a monoculture of cheatgrass. Often, fire and fuels treatments lower the risk for an uncharacteristically large or severe wildfire that would destroy a large acreage of wildlife habitats.

Management actions that restrict surface-disturbing activities would reduce impacts such as habitat removal, fragmentation, and human disturbance. Management action would include stipulations to protect water, soil, wildlife, special status species, lands with wilderness characteristics, and cultural resources; visual resources management; closure of areas to fluid mineral leasing; restrictions within special designation areas (WSAs and ACECs); and route closure or restrictions. In general, VRM Classes I and II, which preserve or retain the existing character of the landscape, would restrict surface-disturbing activities, reduce direct impacts on fish and wildlife, and retain habitats. Areas managed as VRM Class III or IV would be subject to actions that allow for greater landscape modification and therefore greater surface disturbance. LNs and COAs would be applied where necessary to protect resources.

ACECs provide protection to fish and wildlife species and habitats in several ways. They are typically withdrawn from locatable mineral entry, managed as ROW exclusion or avoidance areas, and restricted from a net increase in travel routes. These special management prescriptions provide broad protection from habitat fragmentation and loss of potential habitat.

Criteria would be used to guide land exchanges, disposals, and acquisitions, which could reduce the fragmentation of BLM-administered land in the planning area. This could improve BLM's ability to implement management actions that would result in improved habitats, undisturbed fish and wildlife populations, and attainment of land health standards.

Climate change would impact fish and wildlife under all alternatives, but fish and wildlife may be more vulnerable to the impacts of climate change under certain alternatives. Resource uses in the planning area (e.g., livestock grazing, forestry, recreation, travel, lands and realty, and energy and minerals leasing and development) are stressors that may generally impact fish and wildlife's ability to adapt to climate change. These impacts would likely be more harmful to fish and wildlife under Alternatives A and D where there are fewer restrictions on resource uses. Under Alternative C, more stringent restrictions would limit the impact of these stressors (as described in the analysis under Alternative C, below). Fish and wildlife's ability to adapt to climate change under Alternative B would likely fall between the other alternatives because resource use restrictions are generally more stringent than under Alternatives A and D, but less stringent than under Alternative C.

Sagebrush Habitats

The types of impacts on sagebrush habitats from casual use, permitted activities, and changes to habitat condition common to all alternatives would be similar to those described for *All Fish and Wildlife Habitats*. Wildlife dependent on this vegetation type for all or part of their life cycle are often highly susceptible to fragmentation as described above.

Salt Desert Shrub Habitats

The types of impacts on salt desert shrub habitats from casual use, permitted activities, and changes to habitat condition common to all alternatives would be similar to those described for *All Fish and Wildlife Habitats*. These vegetation types are more susceptible to invasion and dominance by weedy species than high-elevation sagebrush or forested habitat types.

Forest and Woodland Habitats

The types of impacts on forest and woodland habitats from casual use, permitted activities, and changes to habitat condition common to all alternatives would be similar to those described for *All Fish and Wildlife Habitats*.

River and Stream Habitats

Sediment and Turbidity. Actions that increase sediment loading into streams can impact sediment-intolerant aquatic species in many ways. Increased sediments in the stream environment reduce dissolved oxygen, raise stream temperature, and can cover spawning/rearing areas, thereby reducing the survival of fish embryos and juveniles (US Forest Service 2000). Excessive sedimentation can also fill in important pool habitats, reducing their depth and making them less usable by fish and other aquatic organisms. Impacts would be greater on sediment-intolerant species.

A number of sublethal effects on resident trout may also occur as a result of sedimentation, including avoidance behavior, reduced feeding and growth, and physiological stress (Waters 1995). Over the long term, increased sediment loading reduces primary production in streams (US Forest Service 2000). Reduced macroinvertebrate productivity and diversity results when excessive sediment fills in the spaces between stream substrates needed by these aquatic invertebrates. Food webs can be altered as sediment-intolerant macroinvertebrates are replaced by sediment-tolerant species. Reduction in stream productivity can disrupt the food chain and result in reduced food sources for resident fish species. Suspended sediment causes turbidity within streams, which can impact species that need clear water in which to successfully capture prey, such as trout.

Where actions or activities include roads or pipelines, there is high risk of sediment impacts. Roads increase surface runoff and sedimentation and, where they cross water bodies, often require in-channel structures such as culverts

and bridges that remove aquatic habitat and may be barriers to fish passage (Bryant 1981; Barrett et al. 1992).

Amphibians that require clear ponds in which to breed can be impacted by increased sediment and turbidity. Egg masses can be covered by sediment, which impacts productivity, and tadpoles can have reduced feeding efficiency caused by prolonged turbidity.

Habitat Alteration. Stream channel and stream bank alterations can affect aquatic species in many ways. Mechanisms for impact on stream channels include channel relocation, diking, riprapping, and fine sediment input at levels greater than the stream can efficiently or effectively move. Actions that affect stream banks can result in soil compaction, increased erosion, and subsequent widening of stream channels. Stream widening results in a loss of habitat complexity and diversity and reduced water depths, which can reduce available habitat and cause increased stream temperatures. Increased temperatures can affect fish by increasing physiological stress, reducing feeding, and increasing susceptibility to disease. Stream bank alteration also exposes bare soils, which provides for points of invasion by weedy species and increases the risk of further erosion of the stream bank. Actions that increase the amount of soil exposed to the erosive effects of water would increase sediment loading and turbidity. This can alter feeding by fish that require water clarity to forage and capture prey. Actions that cause soil compaction result in decreased vegetation cover, less vigorous root systems, and more exposure of the soil surface to erosion (Burton et al. 2008). Reduced flows can result in buildup of sediment and alter channels by narrowing them and reducing habitat complexity for some species.

Amphibians can be impacted by alteration of limited breeding pond habitats and overwinter habitats. Many species aestivate (burrow into stream bank, pond, or soil substrates during summer). Activities that disturb ground have the potential to disrupt amphibians and result in direct mortality. Breeding ponds can be drained or lowered in volume or have shorelines altered that can impact breeding sites and limit productivity.

Loss or Reduction of Streamside Vegetation Cover. Loss or reduction of streamside riparian vegetation can alter the nutrient dynamics of the aquatic ecosystem. In areas where riparian vegetation has been depleted or lost, a shift in energy inputs from riparian organic matter to primary production by algae and vascular plants has been predicted (Minshall et al. 1989) and observed (Spencer et al. 2003). The increased solar radiation that results from the loss of streamside (or poolside) vegetation causes temperatures, light levels, and autotrophic production (i.e., plants and algae) to increase. This change in a stream's food web can alter the composition of food and thus energy sources that are available to resident fishes and aquatic invertebrates. Terrestrial insect diversity and productivity also decreases with reductions in streamside

vegetation, which also affects food availability for resident fish. Increased stream temperatures affect trout by reducing their growth efficiency and increasing their likelihood of succumbing to disease.

Prolonged and excessive utilization of streamside/riparian vegetation can also result in increased peak flows as vegetation is not sufficient in root mass, size, or abundance to sufficiently slow stream velocities. In addition, the loss of streamside vegetation reduces water percolation and infiltration, leading to unnaturally high and frequent runoff. This can result in accelerated bank erosion and sloughing, increased siltation, elevated stream temperatures, widened and braided stream channels, and loss of overhanging banks, all of which are important factors affecting trout productivity in a given stream (Gardner 1950; Armour 1977; Behnke 1980; Claire and Storch 1977; Glinski 1977; Kauffman et al. 1983).

Loss of shoreline vegetation at amphibian breeding sites can reduce shade and increase water temperature. Reduced food sources can also result with the loss or reduction of riparian vegetation. Reduced vegetation can allow for more sediment to enter breeding sites as the filtering properties are reduced. Reduced cover can also increase predation, as amphibians occupy areas with less hiding cover and are more exposed to predators.

Water Depletions. Stream and river flows and reservoir and pond volumes are generally climate dependent, but water diversions and impoundments play a large role with regard to localized flow regimes and water volumes of streams, rivers, and ponds. The primary actions and activities that result in water depletions include construction of water impoundments (stock ponds, reservoirs), water diversions for agricultural and domestic uses, water use associated with natural gas development, and fire suppression. Reduced water flow or volume directly correlates to a loss of wetted habitat for fish and amphibians.

Reduced flow can result in increased water temperatures, reduced food supplies, reduced habitat complexity and diversity, and a loss of carrying capacity. Important microhabitats such us spawning bars and pools can be lost or altered. Reduced flows can result in habitat fragmentation and limit movement of cutthroat between preferred habitats. Holding habitats (pools) can be reduced in size and become less useable by fish or amphibians. Fish that congregate in limited pool habitats for long periods can incur increased stress and susceptibility to disease.

Breeding ponds that lose water volume can become unusable by amphibian species. Increased predation can result due to less wetted habitat available for evading predators. Reduced pond volumes can cause increased risk of anoxia (severe oxygen depletion) for northern leopard frogs (*Rana pipiens*).

Water Quality Alteration. The effects of changes in water quality are well documented on aquatic species. For example, trout prefer cold water, neutral pH, and high dissolved oxygen levels in which to thrive. With increased nutrient input and limited summer and fall stream flows, eutrophication can result. This is the condition in which the increase of mineral and organic nutrients has reduced the dissolved oxygen levels within the stream, producing an environment that favors plant life over animal life. In other words, the mineral and organic nutrient levels being inputted into these streams are greater than the streams can dilute or carry through the system. The symptoms of this are often large algae blooms. This further depletes oxygen levels and reduces habitat quality for resident fish.

Such activities as natural gas development, road use, and other construction can alter water quality through spills, leaks, or vehicular accidents. Where these could occur near occupied fish and amphibian habitat, impacts would be acute and could result in direct mortality. Use of chemicals for weed treatments, fire suppression, or other vegetation management could impact aquatic species and their habitats by overspray and drift to nontarget areas and habitats. This can result in direct mortality, reduced feeding, loss of prey species, and habitat avoidance. Grazing by cattle has also been reported to affect water quality (Buckhouse and Gifford 1976), water chemistry (Jefferies and Klopatek 1987), and water temperature (Van Velson 1979). The changes are subtle over time (Elmore and Beschta 1987) but tend to have a profound effect on aquatic ecosystems (Kauffman and Krueger 1984).

Chemicals and pollutants have the potential to impact the four endangered fishes (Colorado pikeminnow *[Ptychocheilus lucius]*, razorback sucker *[Xyrauchen texanus]*, humpback chub *[Gila cypha]*, bonytail *[Gila elegans]*) as well as the three BLM sensitive fishes (flannelmouth sucker *[Catostomus latipinnis]*, bluehead sucker *[Catostomus discobolus]*, and roundtail chub *[Gila robusta]*). All of these fish are long-lived species. Roundtail chub can live up to eight years, bluehead sucker and flannelmouth sucker up to and beyond 20 years, humpback chub and Colorado pikeminnow up to 30 years, and bonytail and razorback sucker up to 50 years. Thus the exposure time is long and potential for bioaccumulation (e.g., accumulation of harmful substance) of certain constituents is high for these fish.

Impacts from chemicals and pollutants include accidental spills of petroleum products and hazardous materials, and high selenium concentration in the water and food chain. Accidental spills of hazardous material into critical habitat can cause immediate mortality when lethal toxicity levels are exceeded. In addition, hazardous materials can cause fish to become sick, induce stress, impact reproductive success, and impact important food resources.

BLM authorized actions at the highest risk of larger scale accidental spills of hazardous materials include ROW authorizations for pipeline construction and subsequent use, ROWs that allow for the transport of hazardous substances,

and natural gas development (e.g., drilling, hydraulic fracturing, production, and transport). Standard measures are in place in ROW grants/authorizations and via onshore regulations to limit the potential for these accidents. To further limit risk and to reduce potential negative impacts, spill prevention and contingency plans would be required for large scale operations.

Selenium is a natural trace element that is a component of certain sedimentary deposited soils, primarily Mancos shale a common formation in parts of western, Colorado. This compound presents a problem when soils containing it become saturated. Upon saturation, selenium is leached into nearby waterways. In the larger rivers, it becomes concentrated and accumulates in low to zero velocity habitats such as backwaters and enters the food chain. Historic agricultural practices in particular have resulted in both the Gunnison and Colorado rivers having higher than desired levels of selenium. Selenium concentrations of 4.9-7.0 µg/g dry weight in whole body fish from the Colorado River basin have been among the highest in the nation (Hamilton et al. 2002). Selenium bioaccumulates in fish tissue primarily via the consumption of food resources that contain elevated levels of the compound. Colorado pikeminnow are especially at risk given their piscivorous (fish eating) nature. High selenium levels can affect reproduction and recruitment. Research has shown that selenium from the female's diet is incorporated into eggs, and high concentrations may result in reduced production of viable eggs, and/or post-hatch mortality due to metabolism of egg selenium by developing larval fish (deformities and altered physiology) (Lemly 2002; Sorensen 1991). Tissue samples taken from Colorado pikeminnow in the Colorado River near Grand Junction, CO showed selenium levels to be above the recommended toxicity threshold of 4 parts per million (ppm) dry weight (DW) in the majority of fish (Osmundson et al. 2000). Non endangered fish collected in the Gunnison River basin in the early 1990's had a mean selenium concentration of 7.1 ppm DW. Other studies have documented selenium levels and effects and assessed risk from contamination on these endangered fish (Hamilton and Waddell 1994; Stephens and Waddell 1998; Hamilton 1999; Hamilton et al. 2005 I; Hamilton et al. 2005 II; Hamilton et al. 2005 III).

Associated with BLM management, any activities that would disturb identified Mancos shale soils and make them available for transport via erosion or sedimentation into water would likely increase selenium levels in nearby streams and rivers. In addition, irrigation practices, stock ponds, produced water pits, or other water related developments in Mancos shale soils associated with water storage or transport, could result in selenium leaching and increased selenium levels in waters containing these fish. The Controlled Surface Use stipulation (GEOLOGY SOIL CSU CO in Alternative B and CSU-6 in Alternatives C and D) proposed under all the action alternatives, as well as select SOPs and BMPs in **Appendix H** would substantially reduce the risks of increasing selenium levels in the Gunnison and Colorado rivers and reduce exposure risk of this compound to resident special status fishes.

In areas where the BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado are not currently being met, and livestock grazing is causing direct negative impacts at specific locations on select streams containing sediment-intolerant aquatic species, the BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado ensure that sufficient residual vegetation in upland and riparian areas remains to protect soils and stream banks from wind and water erosion and to maintain stream stability.

Under all alternatives, improved water quality would benefit fish and aquatic species. Stipulations and meeting Public Land Health Standards 1 and 2 could minimize impacts on runoff timing or other hydrograph changes and enhance recharge of alluvial aquifers that provide base flows. This would improve water quantity and quality for fish and promote healthy riparian communities, an important source of stream shade and fish habitat.

Unmitigated or unplanned impacts on fisheries and aquatic wildlife under all alternatives would be most likely to occur from casual use activities. While permitted activities could cause removal of riparian or overhanging vegetation, erosion, and sedimentation, impacts would be mitigated through restrictions within riparian areas, wetlands, and waterways.

Riparian and Wetland Habitats

Stipulations and meeting Public Land Health Standards 1 and 2 would promote healthy riparian communities.

Unmitigated or unplanned impacts on riparian habitats under all alternatives would be most likely to occur from casual use activities. While permitted activities could cause removal of riparian or overhanging vegetation, impacts would be mitigated through restrictions within riparian areas and wetlands. Furthermore, since riparian areas and waterways are popular recreation spots, increased demand for access to these areas is expected as the population increases.

Barren Habitats

The types of impacts on barren habitats from casual use, permitted activities, and changes to habitat condition common to all alternatives would be similar to those described for *All Fish and Wildlife Habitats*.

Implementing management for the following resources would have negligible or no impact on fish and wildlife and are therefore not discussed in detail: air quality; paleontology; national trails; national, state, and BLM byways; Native American tribal uses; public health and safety; socioeconomics; or environmental justice.

Alternative A

All Fish and Wildlife Habitats

In general, Alternative A would rely on management guidance that would not reflect current conditions and issues, and would lack a landscape-level approach to land planning. For example, wildlife emphasis areas would not be managed under Alternative A, which would make it harder to effectively and efficiently manage for wildlife, as species are dispersed throughout the planning area and wildlife emphasis areas would not be prioritized for protection.

Soil and water protections through the use of NSO and CSU stipulations on fluid mineral leases in areas with saturated or frozen soils would protect fish and wildlife and their habitats from the effects of surface-disturbing activities associated with fluid mineral development. Determining soil suitability for surface-disturbing activities would help maintain habitat where vegetation would be sensitive to removal and would reduce the likelihood of erosion and sedimentation of waterways.

The lack of comprehensive planning for vegetation, fish and wildlife, and special status species would result in habitat management that is applied on a case-by-case basis and which would not give BLM the authority to implement or enforce certain management actions. Protection for vegetation and fish and wildlife habitats would occur, and management flexibility would allow BLM to adaptively manage resources. NSO, CSU, and TL stipulations for fluid mineral leasing are presented in **Appendix B**, and these would help protect fish, wildlife, and their habitats from the effects of surface-disturbing activities associated with fluid mineral development. Vegetation and weed treatments and range improvements would be implemented, which would improve habitat conditions and trend toward achieving BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado.

The types of impacts from invasive species and disease transmission under Alternative A would be the same as those described under Effects Common to All Alternatives.

Fire management under Alternative A would rely on prescribed fire for resource benefit and would be limited in the use of unplanned fire. This would allow for some short-term disturbance to habitats and species and long-term improvement in habitat health and productivity, as described under Effects Common to All Alternatives.

Areas managed as VRM Class I and II on 159,200 acres, as well as stipulations to protect visual resources, would indirectly protect fish and wildlife and their habitats by limiting or prohibiting surface-disturbing activities in these areas.

The types of impacts from grazing would be the same as those described under Effects Common to All Alternatives. Range improvements would be used to

improve habitat conditions, which would reduce potential impacts on habitats and fish and wildlife populations over the long term. The BLM would manage 978,600 acres as open and 48,600 acres as closed to grazing under this alternative.

The types of impacts from recreation, such as from displacement, would be the same as those described under Effects Common to All Alternatives. Under Alternative A, BLM management of SRMAs and ERMAs would continue to be insufficient to accommodate current and future levels of recreation, which could lead to an increase in impacts on fish and wildlife and their habitats as population and recreation use increase. Recreation would not be focused away from wildlife areas, so there would be a greater likelihood of impacts on wildlife. Four SRMAs and IRMAs would be managed on 358,300 acres, and one ERMA would be managed on 703,100 acres under this alternative.

Large portions of the decision area would be open to motorized use under this alternative, with many important fish and wildlife areas not avoided. Furthermore, cross-country travel would be allowed on 445,400 acres and intensive motorized use on 12,500 acres within the decision area, which could cause the types of impacts described above for casual use under Effects Common to All Alternatives. Areas limited to existing routes and designated routes on 568,200 acres would have fewer impacts but could still disturb fish and wildlife from noise and human presence. Areas closed to motorized use on 35,300 acres (and in WSAs, where motorized and mechanized use would be limited to existing ways) would reduce the likelihood of these impacts. Leaving large areas open to cross-country travel is likely to result in more habitat fragmentation and greater impacts on wildlife than any of the following 3 alternatives.

Lands and realty management actions would identify 441,400 acres as sensitive to public utility development and 234,900 acres as unsuitable for public utility development. This would protect habitats or minimize impacts from disturbance in these areas. The BLM would manage seven corridors for utility and facility development.

Under Alternative A, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 300,700 acres as acceptable for coal leasing. Areas unacceptable for coal leasing on 36,700 acres, as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from coal mining on these lands.

Under Alternative A, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would continue to manage 1,134,600 acres of federal mineral estate as open to fluid mineral leasing. Areas closed to fluid mineral leasing on 96,500 acres, as well as stipulations on open lands, would reduce

impacts on fish and wildlife and their habitats from fluid mineral leasing on these lands. NSO stipulations would be applied on 433,000 acres and CSU stipulations would be applied on 74,100 acres, which would reduce the impact of fluid mineral development on fish and wildlife and their habitats.

Five ACECs (Badger Wash, The Palisade, Pyramid Rock, Rough Canyon, and Unaweep Seep) would be managed on 28,900 acres, which would protect fish and wildlife and their habitats through such measures as limiting travel to designated routes, closing areas to motorized use, managing areas as unsuitable for ROWs, and applying NSO stipulations.

The lack of interpretation and environmental education activities in the planning area could result in user actions that could degrade fish and wildlife habitats.

Master Leasing Plan

Leasing stipulations identified in **Table 2-2** would either directly or indirectly protect fisheries in the Shale Ridges and Canyons MLP analysis area. In addition, an extensive list of COA-level mitigation measures may be applied. Where oil and gas development is occurring, or would occur, in or near occupied habitats of trout and sculpin species, there is increased risk of identified impacts to occur, because these species require cold, clear, well-oxygenated water in which to thrive.

The primary potential impacts on fish and other aquatic species include water quality alteration, water depletions, and increased sediment loading and turbidity. Specifically, the primary concern is activities that result in ground disturbance and the removal of native vegetation due to the construction of well pads, roads, pipelines, compressor and relay stations, settling ponds, geophysical seismic exploration, and various assorted infrastructure. Collectively, activities to construct or install these features have the potential to provide for the offsite movement of soils, thereby increasing sediment loading and turbidity into nearby water bodies. In addition, they serve as niches in which invasive, weedy vegetation can take hold. This reduces watershed health and results in poor soil retention, increased run-off, and poor water infiltration and absorption. Increased numbers and densities of roads are a concern because they are chronic, long-term, point sources of sediment input, and because they serve as water collection and conveyance corridors to live streams and ephemeral drainages that ultimately feed live streams. Impacts are amplified and more acute in areas where oil and gas is being developed in small discrete watersheds containing these species. Fish and other aquatic species would benefit directly from stipulations for rivers and other riparian habitats. Within the MLP analysis area, several stipulations would directly protect fish and other aquatic species by reducing disturbance to their habitat. These include HYDROLOGY RIVER NSO CO; NSO-2, Streams/Springs Possessing Lotic Riparian Characteristics; and NSO-4, Lentic Riparian Areas (including springs, seeps, and fens).

Where proper and timely reclamation is occurring at well pad and pipeline sites, and where roads are properly constructed and maintained, impacts resulting from offsite soil movement and sediment and turbidity generally are minimized. Where reclamation and road maintenance practices have been poor or neglected, the sediment loading and turbidity impacts discussed in detail are occurring. Increased road density and use can impact amphibians by direct vehicular mortality and by the fragmentation of habitats that limit accessibility to seasonal breeding habitats.

Approximately 183,400 acres of currently unleased federal mineral estate in the MLP analysis area would be open to leasing under the Proposed RMP (Alternative B). Protection of terrestrial wildlife would be provided by leasing stipulations and closures to leasing in certain areas. COAs may be applied mitigate impacts of development. For example, the Proposed RMP (Alternative B) would provide protection of wildlife habitat by prohibiting surface occupancy in core wildlife areas. In addition, energy companies would be required to implement specific measures designed to reduce the impacts of oil and gas operations within high-value wildlife habitat.

The primary potential impacts on terrestrial wildlife from fluid mineral development include direct habitat loss, habitat modification, habitat fragmentation, reduced habitat effectiveness, disturbance, displacement, and direct mortality. Specifically, activities that result in ground disturbance, and in the removal of native vegetation, associated with the construction of well pads, roads, pipelines, compressor and relay stations, settling ponds, geophysical exploration, and other various assorted infrastructure are the primary concern. Collectively, or individually, these activities have the potential to substantially impact wildlife habitat, and to influence whether big game would maintain some reasonable existence in the developed area, or whether they would abandon it altogether. In addition, these areas serve as niches in which invasive weedy vegetation can take hold. Increased numbers and densities of roads are a concern, as they are long-term sources of habitat fragmentation and reduced habitat effectiveness. Each phase of oil and gas development, from exploration and construction through operation and abandonment, has a specific combination of impact type, intensity, and duration.

Exploration and construction. Typically, the initial phase of development lasts for 25 days to 40 days, depending upon the depth of a well, and is very equipment-intensive. Associated activities include blading an access road and pad and nearly continuous operation of a drill rig and other specialized heavy equipment. Resultant impacts are likely greatest when the first well is drilled in an area. This is because wildlife would not have had an opportunity to adjust to low-level disturbance or to adjust their movement patterns in order to avoid high-level disturbance.

Energy development often leads to the improvement of existing roads, and an increase in the number of roads. These changes would increase public access to areas that have previously been inaccessible and would increase wildlife disturbance. New roads constructed for energy development would normally be gated and would not offer new public access.

As densities of wells, roads, and facilities increase, habitats within, and near, oil and gas development become progressively less effective until most animals no longer use these areas. While vegetation and other natural features would remain physically unaltered, wildlife would make proportionately less use of areas near oil and gas facilities. Animals that remain within the areas affected by oil and gas development are subjected to increased physiological stress resulting from the presence of infrastructure related to mineral development. This avoidance-and-stress response impairs habitat function by reducing the capability of wildlife to use the habitat effectively. In addition, physical or psychological barriers lead to fragmentation of habitats, further limiting the availability of effective habitat. An area of intensive activity or construction becomes a barrier when animals cannot, or will not, cross it to access otherwise suitable habitat. These impacts are especially problematic when they occur within limiting habitat components such as within crucial winter ranges and reproductive habitats. There is no information that supports the idea that any big game herd will stay in these areas if oil and gas activities were to increase over time. Past research has shown that elk displaced from high-quality winter ranges during drilling and construction did not return until those activities were completed. Continued development in these areas likely would lead to native winter range abandonment, and to a loss of high-quality forage, until reclamation had successfully returned these ranges to elk habitat.

The construction of roads, pipelines, and transmission corridors directly removes habitat. They also have the potential to contaminate groundwater and surface water. Noxious weeds would infiltrate roadside impact zones and result in indirect adverse impacts, such as non-native bacteria, viruses, insect pests, and chemical defense compounds with toxic or allergenic properties (NMDGF 2004).

Operation and production. This phase typically involves minimal personnel in the field except at compressor stations and water disposal facilities, with periodic traffic to each well for monitoring and maintenance. Reclamation of temporarily disturbed areas begins upon completion of construction. Successful reclamation for weed and erosion control is expected to occur within 3 years to 5 years after disturbance, but restoration to productive wildlife habitat could take up to 20 years. The remainder of a disturbed area is occupied by surface facilities and ongoing human activity throughout the life of a well.

Abandonment. The final phase of oil or gas wells occurs at the end of their productive lives, typically 20 years to 40 years. During abandonment, surface

facilities are removed, wells are plugged, and access roads are reclaimed, unless deemed necessary for resource management or if requested by the landowner. These activities involve a short-term increase in workers, and in vehicles, within the project areas. Abandonment and reclamation require approximately 3 days per well, and 4 days per mile of access road, for a crew of 4 people.

Reclamation. Restoration of temporarily disturbed areas at a well pad, and along an access road, begins on completion of construction. Attaining reclamation standards in terms of erosion control, weed control, and establishment of vegetation cover, typically requires at least 3 years to 5 years following planting. Actual recovery of reclaimed areas to conditions that represent productive wildlife habitat may take 20 years or longer, especially in drier sites. Areas of long-term disturbance, which are occupied by surface facilities and ongoing human activity throughout the life of the well, are reclaimed following abandonment.

BMPs, SOPs, COAs, and leasing stipulations may help minimize impacts on terrestrial wildlife from development associated with new leases. For lease-related actions, the BLM may apply COAs to augment whatever protections already exist as stipulations on the lease. For example, requiring that a proposed project component be moved to avoid or minimize impacts on a sensitive resource. Regulations allow a delay in activity for up to 60 days and relocation of a facility by up to 200 meters, in order to protect a sensitive resource. Examples of other protections applied to existing leases include requirements for adequate reclamation, weed control, erosion control, and dust abatement. These actions are in addition to the process followed when working with operators during the project planning and review process in order to ensure that oil and gas activities comply with applicable laws, rules, regulations, policies, standards, and guidelines (e.g., ESA, the Bald and Golden Eagle Protection Act, the MBTA, and the CWA); to ensure that facilities are sited, designed, and conducted in an appropriately protective manner; and to ensure that suitable mitigation is implemented.

In addition to those effects discussed under *All Fish and Wildlife Habitats*, the following habitat-specific effects would occur with implementation of Alternative A.

Sagebrush Habitats

The types of impacts on sagebrush habitats from casual use, permitted activities, and changes to habitat condition under Alternative A would be the same as those described under *All Fish and Wildlife Habitats*.

Salt Desert Shrub Habitats

The types of impacts on salt desert shrub habitats from casual use, permitted activities, and changes to habitat condition under Alternative A would be the same as those described under *All Fish and Wildlife Habitats*.

Forest and Woodland Habitats
The types of impacts on forest and woodland habitats from casual use, permitted activities, and changes in habitat condition under Alternative A would be the same as those described under *All Fish and Wildlife Habitats*. While wildlife areas would be excluded from commercial forestry under Alternative A, impacts on habitat would occur in other areas due to habitat removal, human presence and disturbance, use of vehicles and heavy machinery, noise, and increased likelihood for soil erosion.

In addition, cavity-rich portions of aspen stands would not be cut under this alternative. This action would help maintain habitat for species that nest in or otherwise use tree cavities.

Riparian and Wetland Habitats
In addition to the impacts described under *All Fish and Wildlife Habitats*, 14 river segments would be managed as eligible for inclusion in the NWSRS. Interim protective management guidelines would help to protect or reduce impacts on riparian habitats and riparian-dependent species in these areas.

River and Stream Habitats
The types of impacts on river and stream habitats from casual use, permitted activities, and changes to habitat condition under Alternative A would be the same as those described under *All Fish and Wildlife Habitats*. WSR impacts would be similar to those described under *Riparian and Wetland Habitats*. In addition, direct protection to fish and aquatic species would occur where fish are an ORV for a WSR-eligible segment.

While wildlife areas would be excluded from commercial forestry under Alternative A, impacts on rivers and streams would occur in other areas due surface-disturbing activities, which would increase the likelihood for soil erosion and sedimentation of waterways as well as degradation of water quality.

Barren Habitats
In addition to the impacts described under *All Fish and Wildlife Habitats*, grazing management under Alternative A could cause impacts on bighorn sheep (*Ovis canadensis*) by allowing domestic sheep grazing in allotments on a case-by-case basis. Where allotments occur in occupied bighorn sheep habitat, there would be the potential for disease transmission between domestic and bighorn sheep.

Alternative B

All Fish and Wildlife Habitats
Under Alternative B, the BLM would establish 10 wildlife emphasis areas on 149,700 acres (no wildlife emphasis areas are identified under Alternative A) to protect areas with high wildlife value and significance. This strategy would allow BLM to focus their wildlife management efforts in the areas that would be most effective to preserve and protect fish and wildlife. While the emphasis in these

areas is largely on protecting habitat for big game, cutthroat trout, and Sage-Grouse, other species would benefit from the protections and restrictions that would be implemented. Examples of management actions that would be applied in wildlife emphasis areas include stipulations on surface-disturbing activities and recreation restrictions, as well as ROW avoidance and exclusion areas and travel closures and seasonal restrictions to maintain existing unfragmented habitat and meet wildlife objectives. When a wildlife emphasis area is neither a ROW avoidance nor exclusion area, BMPs would be applied to minimize habitat fragmentation.

Vegetation management under Alternative B would emphasize improving and restoring vegetation and would thus improve habitats. Actions would be implemented to reduce fragmentation, and treatments that would provide for the natural range of variation and seral stages within each vegetation type would support a higher diversity of wildlife species over the long term. Fencing modifications would help enhance pronghorn movement throughout the decision area. In addition, adaptive drought management actions would prevent surface-disturbing activities and associated impacts. Adaptive drought management actions would also require BLM to coordinate with CPW for big game herd control to maintain sustainable levels of big game and prevent overbrowsing.

Similarly, fish and wildlife and special status species management under Alternative B would improve and maintain habitat throughout the decision area, and stipulations to reduce surface-disturbing activities would reduce the likelihood of impacts on fish and wildlife. Fish and wildlife stipulations and restrictions include a CSU in high value and essential wildlife habitat, managing the Ant Research Site as a ROW exclusion area, managing the Owl Banding Station as a ROW avoidance area, and applying a CSU on deer and elk migration and movement corridors. Stipulations and ACECs to protect special status species would indirectly protect other fish and wildlife species as well. Thirteen ACECs (totaling 123,000 acres) would be designated under this alternative: Atwell Gulch, Badger Wash, Dolores River Riparian, Juanita Arch, The Palisade, Pyramid Rock, Roan and Carr Creeks, Rough Canyon, Sinbad Valley, South Shale Ridge, and Unaweep Seep. An NSO would be applied to these areas. Supporting USFWS and CPW efforts to remove predatory nonnative fishes (such as smallmouth bass, largemouth bass, and northern pike) from critical habitat for listed and non-listed native fishes of the Colorado/Gunnison Rivers would improve the health and habitat of native fish species in those locations.

Under Alternative B, the BLM would have increased opportunities to use planned and unplanned fire as a natural disturbance regime to meet resource objectives. Using a variety of fuel treatments would have short-term effects on wildlife and habitats through vegetation removal, increased likelihood of erosion and sedimentation, human presence, and the potential for habitat avoidance. In the long term, these activities would reduce the likelihood of

uncharacteristically large or intense wildfires that could damage large expanses of habitat or kill or displace wildlife. In addition, the condition of upland vegetation would be improved, which would benefit both terrestrial and aquatic wildlife. Over the short and long terms, fuel treatments could increase forage quality and quantity for some species. ESR treatments would help to reestablish vegetation and restore habitat for wildlife.

The types of impacts from visual resources management would be the same as those described under Alternative A, but under Alternative B, 491,100 acres (3.1 times more acres than under Alternative A) would be managed as VRM Class I and II.

There would be three units managed for wilderness characteristics covering 44,100 acres under Alternative B. Since fish and wildlife resources are a feature that contributes to an area's wilderness character, fish and wildlife within these units would be managed to maintain that character. Examples of management within lands managed for wilderness characteristics include closure to motorized and mechanized travel (with an exception for mechanized travel on the Pickett Trail within the Maverick Unit), and wood cutting; identification of ROW exclusion areas; closure to mineral materials and non-energy leasables; no fluid mineral leasing; and applying NSO stipulations.

The types of impacts from grazing would be the same as those described under Effects Common to All Alternatives. The BLM would manage 960,500 acres (2 percent fewer acres than under Alternative A) as open to grazing and 66,600 acres (37 percent more acres than under Alternative A) as closed to grazing. If properly managed, grazing would not conflict with the fish and wildlife and habitat resource objectives in these areas. Increases in forage availability would be allocated to meet the greatest need; depending on the circumstances, these allocations could include wildlife. In addition, the BLM would require periodic rest and limited grazing in lower elevation communities, as well as a minimum of two growing seasons of rest following vegetation treatments. This would prevent overgrazing and would allow for habitats to recover.

The types of impacts from recreation, such as from roads and displacement, would be the same as those described under Effects Common to All Alternatives. Under Alternative B, the BLM would manage 5 SRMAs on 87,200 acres (75 percent fewer acres than under Alternative A) and 6 ERMAs on 217,400 acres (69 percent fewer acres than under Alternative A). Planning within SRMAs under Alternative B would consider wildlife concerns. Certain SRMAs or portions of SRMAs would be closed to fluid mineral leasing or would have stipulations on surface-disturbing activities applied, which would protect fish and wildlife and their habitats from disturbance.

Cross-country motorized use would be allowed on 10,200 acres (18 percent fewer acres than under Alternative A), which would allow the types of impacts on wildlife habitat that are described under Effects Common to All Alternatives,

but over a smaller area. Areas closed to motorized use on 126,200 acres (3.6 times more acres than under Alternative A) and limited to designated routes on 925,200 acres (4.1 times more acres than under Alternative A) would reduce the likelihood of impacts compared to Alternative A. Impacts on wildlife would still occur from disruption caused by motorized vehicles (e.g., noise, human presence). Under Alternative B, motorized and mechanized travel would be restricted from December 1 to May 1 to protect big game species on 105,200 acres. This would reduce disturbance to big game species during winter when additional stressors could impact survival, and would reduce the likelihood of direct and indirect impacts to all wildlife.

The mileages of routes are proposed to be designated administrative-only or closed based upon fish and wildlife planning criteria are shown in **Table 4-35**.

Table 4-35
Route Designations and Fish and Wildlife Planning Criteria under Alternative B

Planning Criteria	Final Designation Administrative Use (miles)	Final Designation Closed (miles)	Total miles designated as Administrative Use or Closed
Perennial Stream/Fishery	2.8	19.1	21.9
Pronghorn Antelope - winter range	26.1	43.6	69.7
Mule Deer - winter range	129.2	439	568.2
Bighorn Sheep - production, winter range	14	20.7	34.7
Lands not meeting biotic Land health Standard	104.7	286	390.7
Total	**276.8**	**808.4**	**1,085.2**

Source: BLM 2010a

Managing 789,400 acres (79 percent more acres than under Alternative A) as ROW avoidance and 210,000 acres (11 percent fewer acres than under Alternative A) as ROW exclusion areas would reduce impacts on habitats and fish and wildlife as described under Effects Common to All Alternatives. (The remaining acres would be available for utilities development.) In addition, the Ant Research Site would be a ROW exclusion area, and the Owl Banding Station would be a ROW avoidance area. Furthermore, encouraging the use of delineated utility corridors, managing five corridors for utilities and facilities, and managing solar and wind emphasis areas on a total of 11,100 acres within the planning area would concentrate impacts on fish and wildlife and habitats and reduce widespread impacts and fragmentation. By concentrating development in corridors, the BLM would also reduce hazards to wildlife such as bird collision and electrocution that would be caused by having transmission lines spread throughout the decision area.

Development of solar and wind projects would remove habitat and potentially disturb, kill, injure, or displace species in the short term during construction.

Over the long term, wind facilities pose collision hazards for birds and bats, and solar projects would remove habitats. Solar projects would also be fenced, which would exclude some species, particularly larger mammals such as big game. As a result, species could avoid or be excluded from solar and wind energy areas over the long term.

Under Alternative B, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 252,100 acres (16 percent fewer acres than under Alternative A) as acceptable for coal leasing. Areas unacceptable for coal leasing on 57,400 acres (52 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from coal mining on these lands.

Under Alternative B, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 790,700 acres (18 percent fewer acres than under Alternative A) as open to fluid mineral leasing. BLM surface lands closed to fluid mineral leasing on 270,700 acres (2.8 times more acres than under Alternative A), as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from fluid minerals development on these lands. On BLM surface lands open to fluid mineral leasing, NSO stipulations would be applied on 371,500 acres (12 percent fewer acres than under Alternative A), and CSU stipulations would be applied on 481,800 acres of BLM surface lands (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate). Stipulations to protect big game, such as a CSU in deer and elk migration and movement corridors, NSO in elk calving sites, and TL in big game winter range, would reduce impacts from surface-disturbing activities and development such as those described under Effects Common to All Alternatives.

Under Alternative B, 20,600 acres would be petitioned for withdrawal from locatable mineral exploration or development (0 acres would be petitioned under Alternative A). If withdrawn, these areas would provide additional protection to fish and wildlife and habitats from surface-disturbing activities.

Thirteen ACECs would be managed on 123,000 acres (4.2 times more acres than under Alternative A), and these would be closed to wood harvest, mineral material sales, and non-energy leasable mineral exploration and development. Other restrictions include travel route closures or limitations, managing the areas as ROW avoidance or exclusion, recreation restrictions, surface disturbance stipulations, and managing areas as closed to fluid mineral leasing. As such, fish and wildlife and their habitats would generally be protected from surface disturbances and associated impacts within these areas.

Implementation of an interpretation and environmental education program under Alternative B would enhance awareness and appreciation of fish and wildlife resources within the planning area. This could result in increased protective efforts by the general public.

In addition to those effects discussed under *All Fish and Wildlife Habitats*, the following habitat-specific impacts would occur with implementation of Alternative B.

Sagebrush Habitats

Sagebrush communities would be improved and maintained through vegetation treatments, avoiding planned and unplanned wildland fire in low-elevation cheatgrass-infested communities, prioritizing winter Sage-Grouse (Greater and Gunnison) habitat for treatment and restoration, developing restoration plans in non-functioning habitat, reducing pinyon-juniper encroachments, increasing habitat connectivity, and managing for age class diversity. Wildlife that rely on these habitats would directly and indirectly be affected by these management actions in the short and long term. Stipulations to protect special status species that use sagebrush habitats (see **Section 4.3.6**, Special Status Species) would reduce surface disturbance in the areas where they are applied. In addition, a suite of management actions would be implemented to conserve Gunnison and Greater Sage-Grouse (*Centrocercus urophasianus*) (see **Section 4.3.6**, Special Status Species), which would directly benefit other sagebrush-dependent species.

Salt Desert Shrub Habitats

Salt desert shrub habitats would be improved and maintained through fire suppression, grazing management, erosion control in greasewood communities, and prioritization of cheatgrass treatments. The BLM would require periodic rest and limited grazing in lower elevation communities, as well as a minimum of two growing seasons of rest following vegetation treatments. This would prevent overgrazing and would allow forage to recover. Stipulations to protect special status species that use salt desert shrub habitats would reduce surface disturbance in the areas where they are applied.

Forest and Woodland Habitats

Old-growth pinyon-juniper woodlands would be managed to maintain their current acreage, and a CSU would be applied in all old-growth forests and woodlands and would reduce direct impacts from surface-disturbing activities. Other forest types such as ponderosa pine, Douglas fir, aspen, and spruce/fir would be managed to increase resilience to disease and diversity in age classes and species composition. These actions would help provide habitat for a diversity of forest and woodland-dependent species.

Under Alternative B, activity level plans would be developed for certain areas to manage for healthy forests and woodlands. Over the long term, this would maintain important wildlife habitat, provide habitat diversity and multiple age

classes, and prevent erosion and sedimentation of waterways. Short-term impacts could occur, depending on the timing of management actions and the species and habitats that are affected. Impacts would be greater on species that are sensitive to disturbance or human presence, such as nesting birds.

Riparian and Wetland Habitats

Mature riparian forest would be conserved and mitigation measures would be implemented to reduce impacts on riparian habitats, such as locate/relocate travel routes, recreation restrictions, and closure to mineral materials sales and non-energy mineral leasing and development. Management actions and stipulations would be applied to protect special status species. These measures would also reduce direct disturbance to riparian- and wetland-dependent wildlife. In addition, an NSO stipulation would be applied around riparian and wetland areas and around major river corridors, which would decrease the likelihood of effects on riparian and wetland habitat and associated species.

Fish and aquatic resources have been identified as an ORV for the Dolores River in the Wild and Scenic River Eligibility Report. Under Alternative B, a portion of the Dolores River is determined to be suitable for inclusion in the NWSRS. Interim management guidelines for suitable river segments would assist in protection of riparian and wetland habitats by preventing degradation of shorelines, water quality, and the free-flowing nature of the suitable stream segments. In addition, river and stream habitats along the Dolores River would be further protected under Alternative B by making it a ROW avoidance area and applying a CSU stipulation. As a result, impacts from surface-disturbing activities, including soil compaction, noise disturbance, and vegetation trampling would be reduced.

River and Stream Habitats

Water protective measures would have a greater impact on fish and aquatic wildlife compared to terrestrial wildlife. Actions to maintain water quantity, including securing water rights and acquiring parcels adjacent to waterways, would improve habitat for fish and aquatic wildlife by maintaining existing in-stream flows. Similarly, water quality protections and enhancements would improve habitat by reducing selenium, maintaining and/or restoring surface and groundwater quality, and meeting designated beneficial uses. Surface disturbance stipulations around wetland and riparian areas and major river corridors would reduce the likelihood of erosion and sedimentation of waterways, as well as maintain riparian vegetation that is an important element in stream and river habitats. Vegetation management would complement these actions by protecting and enhancing riparian areas, including mature riparian forest.

Fish and aquatic resources have been identified as an ORV for the Dolores River in the Wild and Scenic Rivers Eligibility Report. Under Alternative B, a portion of the Dolores River is determined to be suitable for inclusion in the NWSRS. Interim management guidelines for suitable river segments would assist

in protection of river and stream habitats by preventing degradation of shorelines, water quality, and the free-flowing nature of the suitable stream segments. In addition, river and stream habitats along the Dolores River would be further protected under Alternative B by making it a ROW avoidance area and applying a CSU stipulation.

In general, management actions under Alternative B would prevent the spread of nuisance aquatic organisms through such measures as treating equipment used within or near perennial water sources and removing aquatic competitors from active native aquatic breeding grounds. These measures would reduce impacts caused by these species, such as changes to the food web and water conditions. However, recreation in the Dolores River SRMA may increase the likelihood for the introduction or spread of nuisance aquatic organisms.

Barren Habitats

The types of impacts on barren habitats from casual use, permitted activities, and changes in habitat condition under Alternative B would be the same as those described under *All Fish and Wildlife Habitats*. Under Alternative B, domestic sheep grazing would be prohibited on allotments within occupied bighorn sheep habitat and permitted outside of occupied habitat on a case-by-case basis as long as detailed criteria were met. In addition, the BLM would consider closure of caves and other structures used by bats to prevent the spread of white nose syndrome. These actions would reduce the likelihood of disease transmission in the areas where they are applied. Stipulations to protect special status species would also benefit other wildlife species where these are applied.

Alternative C

All Fish and Wildlife Habitats

The types of impacts on fish and wildlife from management for soil resources, water resources, invasive species and disease transmission, wild horses, wildland fire management, forestry, and interpretation and environmental education would be the same as those described under Alternative B. In addition, Alternative C would focus management on improving vegetation for special status species habitat, which would benefit other wildlife in these desired plant communities. The BLM would manage 13 wildlife emphasis areas on 145,400 acres (3 percent fewer acres than under Alternative B), though other wildlife emphasis areas under Alternative B would be managed as ACECs under Alternative C, thereby protecting habitats in those areas.

Under Alternative C, a variety of stipulations would be applied and 20 ACECs would be designated to protect special status species habitats and populations (see **Section 4.3.6**, Special Status Species), which would also protect other fish and wildlife habitats and populations.

The types of impacts from visual resources management would be the same as those described under Alternative A, but under Alternative C, the BLM would manage 654,000 acres (4.1 times more acres than under Alternative A) as VRM Class I and II.

The types of impacts from lands with wilderness characteristics would be the same as those described under Alternative B, but under Alternative C, 12 units would be managed for wilderness characteristics on 171,200 acres (7 times more acres than under Alternative B). Direct protections would occur on 4,200 acres where the Maverick unit overlaps with the Casto wildlife emphasis area.

The types of impacts from grazing management would be the same as those described under Alternative B, but under Alternative C, the BLM would manage 586,600 acres (40 percent fewer acres than under Alternative A) as open to grazing and 440,400 acres (84 percent more acres than under Alternative A) as closed to grazing. The remainder would be unallotted. In addition, the BLM would require periodic rest and limit grazing on more areas, which would allow forage to recover and would limit the possibility of overgrazing. Grazing management would allocate increases in forage availability to wildlife species, which could allow for increases in carrying capacity for browsers in certain areas.

The types of impacts from recreation, such as from roads and displacement, would be the same as those described under Alternative B, but under Alternative C the BLM would manage two SRMAs on 60,000 acres (84 percent fewer acres than under Alternative A) and zero ERMAs. Although Alternative C provides fewer structured opportunities for recreation within the planning area, use would likely increase in proportion to population growth, and the BLM would have a reduced capacity to concentrate use in areas managed for recreation under this alternative.

No areas would be open to cross-country motorized use under Alternative C, which would prevent such impacts as those described under Effects Common to All Alternatives. Areas closed to motorized use on 379,500 acres (10.8 times more acres than under Alternative A) and limited to designated routes on 681,900 acres (3 times more acres than under Alternative A) would reduce the likelihood of direct impacts on habitats. Impacts on wildlife would still occur from disruption caused by motorized vehicles (e.g., noise, human presence).

Managing 627,000 acres (42 percent more acres than under Alternative A) as ROW avoidance and 365,800 acres (39 percent more acres than under Alternative A) as ROW exclusion areas would reduce impacts on fish and wildlife as described under Effects Common to All Alternatives. Furthermore, requiring the use of delineated utility corridors, managing 6 corridors for utilities and facilities, and managing solar and wind emphasis areas on a total of 7,900 acres (47 percent fewer acres than under Alternative B) within the decision area would have the types of impacts described under Alternative B;

however, there would be no SEZs, and pronghorn mitigation in the 2 Road solar emphasis area would apply to pronghorn migration and winter use, providing a higher level of protection for this species than Alternative B.

Under Alternative C, lands that contain big game critical and severe winter range would be retained, ensuring that habitat for these species is kept under BLM management.

Under Alternative C, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and the BLM would manage 251,200 acres (16 percent fewer acres than under Alternative A) as acceptable for coal leasing. Areas unacceptable for coal leasing on 58,200 acres (58 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from coal mining on these lands.

Under Alternative C, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 506,700 acres (48 percent fewer acres than under Alternative A) as open to fluid mineral leasing. Areas closed to fluid mineral leasing on 554,700 acres (5.7 times more acres than under Alternative A), as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from fluid mineral leasing on these lands. NSO stipulations would be applied on 858,000 acres of federal mineral estate (98 percent more acres than under Alternative A), and CSU stipulations would be applied on 664,400 acres of federal mineral estate (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate).

The types of impacts from withdrawal from locatable mineral exploration or development would be the same as those described under Alternative B, but under Alternative C, 45,100 acres (2.2 times more acres than under Alternative B) would be petitioned for withdrawal.

Twenty-three ACECs would be managed on 168,000 acres (5.8 times more acres than under Alternative A) under this alternative, providing protection to habitats and fish and wildlife as described under Alternative B.

In addition to those effects discussed under *All Fish and Wildlife Habitats*, the following habitat-specific effects would occur with implementation of Alternative C.

Sagebrush Habitats

Vegetation management in sagebrush habitats would be similar to those described under Alternative B. More cheatgrass treatments would be implemented under Alternative C, which would reduce infestations and restore native perennials over a greater area. Special status species management actions

that would affect sagebrush species would be similar to those described under Alternative B, but Alternative C would apply additional protections, such as NSO stipulations for the nest sites of many raptor species, which would give more protection to other fish and wildlife species and habitats (see **Section 4.3.6**, Special Status Species).

Salt Desert Shrub Habitats

The types of impacts on salt desert shrub habitats from casual use, permitted activities, and changes in habitat condition under Alternative C would be the same as those described under *All Fish and Wildlife Habitats*. More cheatgrass treatments would be implemented under Alternative C, which would reduce infestations and restore native perennials over a greater area.

Forest and Woodland Habitats

Forest and woodland management would emphasize maintaining and expanding old-growth pinyon-juniper, which would provide habitat for wildlife that depend on this late seral vegetation community, such as increased cavities for nesting birds.

Riparian and Wetland Habitats

Fourteen segments that are eligible under the WSR Act, covering 99.5 miles, would be determined suitable for inclusion in the NWSRS. The interim management guidelines for suitable stream segments would assist in the protection of riparian and wetland habitats by preventing degradation of any resource that is essential for supporting the fish and recreation values identified on the Dolores River. There would also be additional protective measures for special status species than under Alternative B, including those that are associated with riparian and wetland habitats.

River and Stream Habitats

Management for aquatic invasive species would be similar to that described under Alternative B. The types of impacts on river and stream habitats from casual use, permitted activities, and changes in habitat condition would be the same as those described under *All Fish and Wildlife Habitats*, but there would be additional protections for river and stream habitats under Alternative C. For example, 14 WSR segments, covering 99.5 miles, would be suitable for inclusion in the NWSRS. These would provide direct protection to fish and aquatic wildlife where they are an ORV. The interim protective guidelines as well as the use of stipulations and ROW exclusion and avoidance would protect waterways, riparian areas, and fish and aquatic wildlife from disturbance in these areas.

Barren Habitats

The types of impacts on barren habitats from casual use, permitted activities, and changes in habitat condition under Alternative C would be the same as those described under *All Fish and Wildlife Habitats*. The types of impacts from prohibiting domestic sheep grazing on allotments within both potential and occupied bighorn sheep habitat would be the same as described under

Alternative B, but would occur over a larger area because Alternative B allows domestic sheep grazing on allotments within potential bighorn sheep habitat.

Alternative D

All Fish and Wildlife Habitats

The types of impacts on fish and wildlife from management for soil resources, water resources, invasive species and disease transmission, wild horses, wildland fire management, forestry, and interpretation and environmental education would be the same as those described under Alternative B, but Alternative D would emphasize management for commodities and resource uses, as well as maintenance of habitat conditions. While the BLM would comply with all laws and regulations, there would be less focus on resource protection through wildlife emphasis areas and ACECs and improvement or habitat restoration under Alternative D. There would also be fewer measures to reduce or limit surface-disturbing activities, such as fewer NSO, CSU, and TL stipulations, as well as ROW avoidance and exclusion areas. Stipulations are presented in **Table 2-1**. Under Alternative D, the BLM would manage one wildlife emphasis area (Roan and Carr Creeks) on 33,400 acres (82 percent fewer acres than under Alternative B). Other sensitive fish and wildlife areas would not be protected by a core area and would be at risk for impacts from uses and activities. Impacts would likely be dispersed throughout the decision area.

With its focus on commodities, Alternative D would allow the BLM to have fewer opportunities to use wildfire as a natural disturbance regime to meet resource objectives. This could lower biodiversity and vegetative health and vigor, increase cover of decadent (old and overgrown) plants, and prevent achieving land health standards. This would degrade fish and wildlife habitat in some areas.

The types of impacts from visual resources management would be the same as those described under Alternative A, but under Alternative D, 291,300 acres would be managed as VRM Class I and II 2.1 times more acres than under Alternative A).

No lands with wilderness characteristics would be managed for wilderness characteristics under Alternative D. Protections such as those described under Alternative B would not be applied in these areas.

The types of impacts from grazing would be the same as those described under Alternative B, but under Alternative D, the BLM would manage 977,200 acres (less than 1 percent fewer acres than under Alternative A) as open to grazing and would close 49,900 acres (3 percent more acres than under Alternative A). Limitations on grazing such as requiring periodic rest or seasonal restrictions would be applied on a case-by-case basis, which could allow for impacts on habitats and fish and wildlife in certain locations. In addition, increases in forage

availability would be allocated to livestock, which would not allow for the expansion of carrying capacity for wildlife that utilize the same forage.

The types of impacts from recreation, such as from roads and displacement, would be the same as those described under Alternative B, but under Alternative D the BLM would manage six SRMAs on 79,000 acres (78 percent fewer acres than under Alternative A) and six ERMAs on 61,900 acres (91 percent fewer acres than under Alternative A). Alternative D would manage the fewest acres as SRMAs, while emphasizing recreation and visitation within the planning area. Since use would likely increase at a rate greater than local population growth (because of increased marketing), the BLM would have a reduced capacity to concentrate use in areas managed for recreation. As such, more dispersed impacts on habitats and fish and wildlife may result.

Cross-country motorized use would be allowed on 10,200 acres (18 percent fewer acres than under Alternative A) under Alternative D, which would allow impacts on wildlife habitat that are described under Effects Common to All Alternatives. Areas closed to motorized use on 111,300 acres (3.2 percent more acres than under Alternative A) and limited to designated routes on 939,900 acres (4.2 times more acres than under Alternative A) would reduce the likelihood of impacts. Impacts on fish and wildlife would still occur from disruption caused by motorized vehicles (e.g., erosion, sedimentation, noise, human presence).

Managing 80,500 acres (82 percent fewer acres than under Alternative A) as ROW avoidance and 104,100 acres (56 percent fewer acres than under Alternative A) as ROW exclusion areas would reduce impacts on fish and wildlife as described under Effects Common to All Alternatives. The Ant Research Site would be a ROW avoidance area, which would reduce the likelihood for impacts in this area. Alternative D would put less emphasis on using utility corridors, and would manage eight corridors for utilities and facilities and 40,000 acres (1.7 times more acres than under Alternative B) as solar and wind emphasis areas. These actions could result in habitat fragmentation, degradation, and hazards to wildlife from transmission lines in previously undisturbed areas.

Under Alternative D, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and the BLM would manage 265,600 acres (12 percent fewer acres than under Alternative A) as acceptable for coal leasing. Areas unacceptable for coal leasing on 43,800 acres (19 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from coal mining on these lands.

Under Alternative D, the types of impacts from fluid mineral leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and the BLM would manage 1,130,700 acres of federal mineral

estate (1 percent fewer acres than under Alternative A) as open to fluid mineral leasing. Federal mineral estate closed to fluid mineral leasing on 100,500 acres (4 percent more acres than under Alternative A), as well as stipulations on open lands, would reduce impacts on fish and wildlife and their habitats from fluid mineral leasing on these lands. NSO stipulations would be applied on 497,800 acres of federal mineral estate (15 percent more acres than under Alternative A) and CSU stipulations would be applied on 471,500 acres of federal mineral estate (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate).

The types of impacts from withdrawal from locatable mineral exploration or development would be the same as those described under Alternative B, but under Alternative D, 1,300 acres (94 percent fewer acres than under Alternative B) would be petitioned for withdrawal.

Five ACECs would be managed on 33,200 acres (15 percent more acres than under Alternative A), and these would be managed similar to Alternative B, although they would provide fewer protections to habitat and fish and wildlife.

In addition to those effects discussed under *All Fish and Wildlife Habitats*, the following habitat-specific effects would occur with implementation of Alternative D.

Sagebrush Habitats

Sagebrush communities would be maintained through vegetation treatments, prioritizing winter Sage-Grouse (Greater and Gunnison) habitat for treatment and restoration, reducing pinyon-juniper encroachments, increasing habitat connectivity, and managing for age class diversity. Fire would be allowed in low-elevation sagebrush with reseeding, which would help to reduce the likelihood of cheatgrass infestation. Less stringent stipulations would be applied under Alternative D compared with Alternatives B and C. Therefore, Alternative D could allow for greater fragmentation and general habitat loss.

Salt Desert Shrub Habitats

Salt desert shrub habitats would be maintained through fire suppression, grazing management, and erosion control in greasewood communities. Less stringent special status species stipulations would be applied under Alternative D compared with Alternatives B and C, which could allow for impacts on wildlife species within this habitat type.

Forest and Woodland Habitats

Forest and woodland management would focus on management for mid seral pinyon-juniper. As a result, there could be more disturbance in this habitat type from harvest and treatment, which would impact pinyon-juniper-dependent species.

Riparian and Wetland Habitats

The types of impacts on riparian and wetland habitats from casual use, permitted activities, and changes in habitat condition under Alternative D would be the same as those described under *All Fish and Wildlife Habitats*. Vegetation management would be similar to that described under Alternative B, although firewood harvest would be allowed in riparian areas. Stipulations for special status species would be less stringent compared with Alternatives B and C, which could allow for some impacts on other fish and wildlife species within this habitat type.

Under Alternative D, no segments would be managed as eligible or suitable under the WSR Act. Impacts on river-related values, including riparian and wetland habitats, may occur because there would be no standard for protection of those values. The BLM may protect those values through other land use prescriptions and stipulations in this RMP.

River and Stream Habitats

The types of impacts on river and stream habitats from casual use, permitted activities, and changes in habitat condition under Alternative D would be the same as those described under *All Fish and Wildlife Habitats*. The BLM would prioritize and implement management actions to achieve desired future conditions of rivers and streams. Management for aquatic invasive species would be similar to that described under Alternative B.

Under Alternative D, no segments would be managed as eligible or suitable under the WSR Act. Impacts on river-related values, including river and stream habitats, may occur because there would be no standard for protection of those values. The BLM may protect those values through other land use prescriptions and stipulations in this RMP.

Barren Habitats

Domestic sheep grazing would be avoided on allotments within occupied bighorn sheep habitat, which would reduce the likelihood of disease transmission in these areas. Domestic sheep grazing could be permitted outside of occupied habitat, which could allow for a low risk of disease transmission, as individual bighorn sheep can roam outside the mapped occupied range.

Cumulative

The CIAAs used to analyze potential impacts on wildlife and fisheries vary by species. The CIAAs for terrestrial wildlife are composed of the game management units that intersect the planning area. The CIAA for greater Sage-Grouse includes habitat polygons of the Parachute-Piceance-Roan population that intersect the planning area (identified in the 2008 Parachute-Piceance-Roan Greater Sage-Grouse Conservation Plan). The CIAA for Gunnison Sage-Grouse (*Centrocercus minimus*) includes the Pinyon Mesa population boundary (identified in the 2000 Pinyon Mesa Gunnison Sage-Grouse Conservation Plan). The CIAA

for fisheries covers the same area as the CIAA for water resources. It extends outside the planning area, following fourth-order watershed boundaries.

Cumulative impacts on fish and wildlife are related to those described above for vegetation, since vegetative communities provide the habitat for wildlife species and can affect habitat for fish species (e.g., riparian vegetation). Past, present, and reasonably foreseeable future actions and conditions within the CIAA that have affected and would likely continue to affect fish and wildlife include mineral exploration and development, residential and industrial development, forestry, grazing, recreation, road construction, water diversion and withdrawals, weed invasion and spread, prescribed and wildland fires, land planning efforts, vegetation treatments, habitat improvement projects, insects and disease, and drought. Many of these activities change habitat conditions, which then cause or favor other habitat changes. For example, wildland fire removes habitat, and affected areas are more susceptible to weed invasion, soil erosion, and sedimentation of waterways, all of which degrade habitats. In general, resource use activities have cumulatively caused habitat removal, fragmentation, noise, increased human presence, and weed spread. Land planning efforts and vegetation, habitat, and weed treatments have offset some of these effects by improving habitat connectivity, productivity, diversity, and health.

Climate change could cause an increase or decrease in temperatures and precipitation, which would affect soil conditions, vegetative health, and water flows and temperature. Such changes would alter habitat conditions, potentially creating conditions that could favor certain species or communities, weeds, or pests.

Under the Proposed RMP (Alternative B) and alternatives, impacts on fish and wildlife would be minimized to the extent practicable and feasible through restrictions, stipulations, closures to mineral exploration and development, recreation, and motorized travel, COAs, and by concentrating development in previously disturbed areas. In those alternatives with wildlife emphasis areas, fish and wildlife management would be improved by concentrating management efforts in certain high-value areas. Habitat conditions would be improved through treatments, weed prevention and control, acquisition of water rights, use of prescribed and wildland fire, forestry management, and grazing management. Since Alternative D would emphasize more resource use and development, impacts on fish and wildlife and habitats would be more likely to occur under this alternative. As a result, Alternative D could significantly contribute to cumulative impacts on fish and wildlife and their habitats. In contrast, the incremental contribution of Alternatives A, B, and C to cumulative impacts on fish and wildlife and habitats is expected to be less than significant.

4.3.6 Special Status Species

This section discusses impacts on special status species (including federally listed species and BLM sensitive species) and state-listed species, from proposed

management actions of other resources and resource uses. Existing conditions concerning special status species are described in **Section 3.2.8**, Special Status Species.

Methods of Analysis

Although data on currently occupied locations and habitats within the planning area are available, the data are neither complete nor comprehensive concerning all special status species known to occur and potential habitat that might exist. Known and potential special status species and currently occupied and potential habitat locations were considered in the analysis; however, the potential for species to occur outside of these areas was also considered and, as a result, some impacts are discussed in more general terms.

Impacts on special status species would primarily result from unmitigated surface disturbance such as cross-country motorized travel, wildfires, wildfire suppression activities, erosion, unauthorized collection or poaching, and trampling, including displacement of individuals due to human activities. Direct and indirect impacts on special status species result from any surface-disturbing activity or alteration to occupied habitats. All federal actions would comply with ESA consultation requirements. All implementation actions would be subject to further special status species review before site-specific projects are authorized or implemented. Standard federal protections and BLM policy protecting threatened, endangered, and sensitive species would be expected to reduce the potential impacts from permitted activities. If adverse impacts were identified, mitigation measures, including avoidance, would typically be implemented to minimize or eliminate the impacts.

Impacts on special status species and their habitats include the following:

- Violation of the ESA, Bald and Golden Eagle Protection Act, MBTA, or applicable state laws or BLM regulations (e.g., BLM Manual 6840 and related Instruction Memorandum)
- Harm, harassment, or adverse effects on any federally listed threatened or endangered species or federally proposed or candidate species
- Destruction or deterioration of federally listed threatened or endangered species' or federally proposed or candidate species' habitat, migration corridors, breeding areas, or designated or proposed critical habitat
- Decreased population viability or contribution to the need for a federal listing of any federal candidate species or BLM sensitive species
- Loss of habitat function or habitat value in BLM sensitive species habitats

Indicators of impacts on special status species include the following:

- Location, type, and intensity of disturbances relative to currently occupied or potential special status species habitat
- Extent of disturbance and amount of habitat removed
- Tolerance of a given special status species to disturbance
- Road density and distance of roads from special status species habitat
- Conflict with BLM Handbook H1740-2, Integrated Vegetation Management
- Likelihood for an activity to cause a special status species population to drop below self-sustaining numbers or cause a substantial loss or disturbance to habitat
- Likelihood for adverse effects on a federally listed or proposed species, as defined under the ESA
- Likelihood for an activity to contribute to the need to list any BLM sensitive or federal candidate species

The analysis includes the following assumptions:

- Because of the large number of special status species, it was determined that the most effective way to disclose impacts at the programmatic level will be to analyze the impacts on the habitat cover types used by these species (see **Chapter 3** for species and habitat descriptions). Accordingly, for the purposes of analysis, the special status species described in **Chapter 3** are grouped here by habitat type (**Table 4-36**, Special Status Species Grouped by Status and Habitat). Direct and indirect impacts on species were still analyzed and are generally discussed under *All Habitats and Special Status Species* headers.
- The analysis presented is largely qualitative due to the lack of data or uncertainty in existing data on certain special status species' occurrences, for example, many of the BLM sensitive plant species. Furthermore, since many special status species may potentially use habitats that are currently unoccupied and populations fluctuate, any quantitative analysis of occupied habitat will underestimate potential impacts on special status species. Where appropriate, acreages from **Table 2-1** are included to show a comparison between alternatives.
- Under all alternatives, no decision will be approved in this RMP revision or authorized on BLM-administered lands that will jeopardize the continued existence of special status species that are

Table 4-36
Special Status Species Grouped by Status and Habitat

Species Name	Sagebrush	Salt Desert Shrub	Forest and Woodland	Riparian and Wetland	Rivers and Streams	Barren
Federally listed species						
Gunnison Sage-Grouse[1]	X					
Western yellow-billed cuckoo[1]				X		
Mexican spotted owl[1]			X			
Canada lynx[1]			X			
Southwestern willow flycatcher[2, 3]				X		
Greenback cutthroat trout[1]				X	X	
Colorado pikeminnow[2]				X	X	
Razorback sucker[2]				X	X	
Bonytail[2]				X	X	
Humpback chub[2]				X	X	
Colorado hookless cactus[1]	X	X				X
DeBeque phacelia[1]						X
Parachute penstemon[1]						X
Federal candidate species						
Greater Sage-Grouse	X					
Bald and Golden Eagle Protection Act species						
Bald eagle[3]				X		
Golden eagle[3]	X	X				X
BLM sensitive species						
Great Basin spadefoot				X	X	X
Long-nosed leopard lizard		X				
Midget faded rattlesnake	X	X	X			X
Brewer's sparrow[3]	X					
Burrowing owl[3]		X				
Ferruginous hawk[3]		X				
Kit fox		X				
White-tailed prairie dog		X				
Jones' bluestar	X	X				X
Horseshoe milkvetch	X	X				
Grand Junction milkvetch		X				
Ferron milkvetch		X				
Fisher Tower's milkvetch		X				
Grand buckwheat		X				
Canyonlands biscuitroot		X				
Narrow-stem gilia		X				
Grand Junction suncup		X				
Tufted green gentian		X				
Northern goshawk			X			

Table 4-36
Special Status Species Grouped by Status and Habitat

Species Name	Sagebrush	Salt Desert Shrub	Forest and Woodland	Riparian and Wetland	Rivers and Streams	Barren
Naturita milkvetch			X			
Aromatic Indian breadroot			X			
Dolores River skeleton plant		X	X			
Boreal toad				X		
Canyon treefrog					X	
Northern leopard frog				X	X	
Milk snake		X	X	X		
American white pelican				X	X	
Long-billed curlew[3]		X		X		
White-faced ibis				X		
Western snowy plover[3]					X	
Great Basin silverspot				X		
Colorado river cutthroat trout					X	
Roundtail chub				X	X	
Bluehead sucker				X	X	
Flannelmouth sucker				X	X	
American peregrine falcon[3]						X
Desert bighorn sheep						X
Spotted bat				X		X
Fringed myotis			X	X	X	X
Townsend's big-eared bat		X	X	X		X
Big free-tailed bat		X	X	X		X
DeBeque milkvetch						X
San Rafael milkvetch						X
Gypsum Valley cateye						X
Osterhout cryptanth	X		X			X
Kachina daisy						X
Piceance bladderpod						X
Roan Cliffs blazingstar						X
Eastwood's monkeyflower				X		
Sun-loving meadowrue						X
USFWS Birds of Conservation Concern[4]						
Cassin's finch			X			
Flammulated owl			X			
Grace's warbler			X			
Gray vireo			X			
Juniper titmouse			X			
Lewis' woodpecker			X			
Pinyon jay			X			
Prairie falcon						X

[1] Federal threatened species
[2] Federal endangered species
[3] Also a USFWS Birds of Conservation Concern species
[4] Includes those USFWS Birds of Conservation Concern that are not BLM Sensitive species

listed, proposed, or candidates for listing as threatened or endangered. Implementation of the special status species program is directed at preventing the need for listing of BLM sensitive species under the ESA, protecting special status species, and improving their habitats to a point where their special status recognition is no longer warranted.

- Ground-disturbing activities could lead to modification (positive or negative) of habitat and/or loss or gain of individuals, depending on the amount of area disturbed, nature of the disturbance, the species affected, and the location of the disturbance.
- NSO stipulations will provide the greatest protection to special status species and their habitats by prohibiting surface-disturbing activities in these areas. This will prevent disturbance to species and habitats caused by fluid mineral development and would prevent direct impacts on species, as described below. CSU stipulations will provide slightly less protection to special status species and their habitats since surface-disturbing activities will be allowed and species and habitats could be disturbed. However, CSU stipulations could protect special status species and their habitats in certain instances by requiring special operational constraints or by moving the surface-disturbing activity to protect special status species. TLs will protect certain special status species during periods when species would be most sensitive to disturbance, such as during nesting and spawning and wintering periods.
- Changes in air, water, and habitat quality could lead to direct impacts and could have cumulative impacts on species survival.
- Road density in a given area (watershed) and the distance of roads from special status species habitat provides an indication of the potential for impacts on special status species. For fish and aquatic wildlife, roads are a measure of lands available for accelerated water transport and potential erosion and off-site sediment transport. For special status plants, roads also contribute to increasing exposure to dust, reducing pollinator habitat and providing a niche for the invasion of noxious weeds. However, the actual impacts and degree of impacts are dependent on additional variables, such as the class of road (dirt, gravel, paved), type and frequency of maintenance, road condition (rutted, bar ditched, properly drained), the type of vegetation between the road and occupied or suitable habitat, the topography, the ecological condition of the suitable or occupied habitat, and soil characteristics.
- Impacts on special status species will be more significant than impacts on common species because population viability is already uncertain for special status species.

- Implementation-level actions will be further assessed at an appropriate spatial and temporal scale and level of NEPA analysis. Additional field inventories will likely be needed to determine whether any special status species could be present in the project area.
- The USFWS will be consulted for any actions that have a potential to affect federally listed species.
- BMPs and SOPs, outlined in **Appendix H**, are used for analysis purposes and will be implemented to reduce impacts on special status species. These are subject to modification based on subsequent guidance.
- Short-term effects will occur over a timeframe of two years or less and long-term effects would occur over longer than two years.

Because special status species have specific habitat requirements and often thrive in a particular microhabitat, disturbance to the species or their habitat could result in population declines, which could affect survivability of local populations. Specific habitat requirements, population trends in the planning area, and factors affecting population trends in the planning area are detailed in **Section 3.2.8**. Relevant recovery plans or conservation strategies, and the biological assessment prepared for this RMP under ESA Section 7 requirements, are also described in **Chapter 3**. Three general categories of disturbance would be anticipated to be the most influential on special status species and their habitat: 1) disturbances from casual use; 2) disturbances from permitted activity; and 3) changes in habitat condition such as from fire or weed invasion.

Effects Common to All Alternatives

Under all alternatives, the BLM would maintain or improve the quality of listed (i.e., threatened or endangered) and sensitive species habitat by managing activities on BLM-administered land to support species recovery and benefit those species.

Types of Impacts – Fish and Wildlife

The types of impacts that could occur on special status fish and wildlife species would be similar to those described in **Section 4.3.5**, but their effects would be magnified because of the species' rarity.

Types of Impacts – Plants

The types of impacts that could occur on special status plant species include loss of vigor or reduced reproductive success, changes in habitat structure, competition, loss of pollinators or pollinator habitat, soil compaction, erosion or sedimentation, alteration of hydrologic conditions, and changes in fire regime.

Loss of Vigor or Reduced Reproductive Success. Trampling and contact with chemicals may not always result in direct mortality but can cause a reduction in

vigor that affects the ability of the plant to reproduce and sustain the population. Herbivory (consumption of inflorescences, seeds, or vegetative parts of special status plants) can result in reduced reproductive success, or in some cases, death. Dust deposition on special status plants may reduce photosynthetic ability or the ability of pollinators to transfer pollen between plants.

Changes in Habitat Structure. A canopy cover of shrubs offers habitat characteristics that appear to be favorable for the germination and establishment of several special status plant species, such as Colorado hookless cactus (*Sclerocactus glaucus*). Shrubs may provide protection for some special status plants from herbivory or trampling and may provide improved moisture availability or reduced moisture loss under the canopy. Surface-disturbing activities that significantly reduce the percent canopy cover of shrubs may allow increased herbivory or moisture loss, resulting in decreased vigor or mortality of special status plants. Increases in canopy cover may not always be beneficial, as some special status plant species require more open habitats.

Competition. Changes in species composition also affect special status plant populations. Proliferation of noxious weeds or other invasive plants may render habitat unsuitable by outcompeting special status plants for water and nutrients or by preventing seedling germination and establishment. Occupied Colorado hookless cactus habitat that is dominated by cheatgrass appears to inhibit germination of seedling cactus, thereby threatening the long-term viability of these populations. In some cases, increases in canopy cover and density of native species, particularly grasses, can compete with special status plants for limited water and nutrients.

Other special status plant species, such as the Parachute penstemon (*Penstemon debilis*), DeBeque phacelia (*Phacelia submutica*), and Gypsum Valley cateye (*Cryptantha gypsophila*), thrive in environments where competition is low. Increases in vegetative cover (following disturbances such as fire or mechanical treatments or seeding) may cause competition with special status plants, resulting in decreased vigor or mortality.

Designated Critical Habitat (DCH). In August 2012, Critical Habitat for the Parachute penstemon and DeBeque phacelia was designated (USFWS, http://www.gpo.gov/fdsys/pkg/FR-2012-08-13/pdf/2012-18833.pdf). The designation covers approximately 15,510 acres in 4 units for Penstemon; and 25,484 acres, in 9 units for Phacelia. To protect the primary constituent elements for which the habitat was designated, redundant, dead end, routes which ran through occupied habitat, or linear disturbance associated with past permitted ground disturbing activities (temporary access routes for project construction) were closed to the public to conserve the species and protect the habitat. At the time of designation, the critical habitat covered all known populations of the two federally threatened species, and provided adequate pollinator habitat. A reduction of routes in these sensitive areas was necessary to fulfill the Bureau's

obligation under the Endangered Species Act. In addition to individual plants being crushed by tires, impacts from roads include but are not limited to: habitat fragmentation effecting gene flow, disruption of pollinators, dust, increased erosion and sedimentation, soil compaction, weed introduction, habitat degradation and conversion, and an increased likelihood of human-caused fire.

As stated in Federal Register-2012-08-13: "Critical habitat is defined in section 3 of the Act as: (1) The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (a) essential to the conservation of the species, and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination by the Secretary that such areas are essential for the conservation of the species. Section 4 of the Act requires that, to the maximum extent prudent and determinable, critical habitat will be designated for threatened and endangered species." Route closures in the designated critical habitat for the protection and conservation of listed species is appropriate and would fall under the umbrella of "special management considerations or protection." Small populations of rare plants are especially vulnerable to slight environmental disruptions.

Loss of Pollinators or Pollinator Habitat. Actions that disturb pollinators or destroy their habitat can have a detrimental impact on special status plant species. Long-term loss of pollinators can reduce the reproductive ability of these plant species and affect maintenance and genetic diversity of populations.

Soil Compaction. Soil compaction resulting from heavy equipment or vehicle travel may reduce soil pore size and water infiltration, thereby inhibiting maintenance or establishment of special status plants.

Erosion or Sedimentation. Special status plants may be washed away or have roots exposed by erosion from surface-disturbing activities, such as blading or bulldozing of roads. Special status plants may be buried by sedimentation resulting from disturbances that occur upslope of special status plant populations.

Alteration of Hydrologic Conditions. Some special status plant species that are dependent on seasonally flooded environments, subirrigated soils, or seeps may be adversely affected by changes in water flow.

Changes in Fire Regime. Changes in species composition, either within special status plant habitat, or in adjacent plant communities, may alter the natural fire regime to which the plants are adapted. Cheatgrass, a highly flammable annual grass, may drastically increase the fire frequency in special status plant habitat, affecting the survivability and viability of the population.

Together, these impacts could lead to fewer and more fragmented special status populations that are more at risk for extirpation due to reduced habitat quality,

diminished reproductive ability, and altered fire regime. Impacts on special status plants from implementation of the RMP are summarized by alternative in the following subsections.

All Habitats and Special Status Species

Many of the impacts on special status species would be similar to those described previously in **Section 4.3.4**, Vegetation and **Section 4.3.5**, Fish and Wildlife. Similar impacts include those from recreation, comprehensive travel and transportation management, mineral resource and ROW developments, and changes to habitat conditions. In general, special status species would be more sensitive to habitat fragmentation, development, or changes in habitat conditions, as populations are often already highly fragmented, require specific microhabitats, and are especially sensitive to disturbance and human presence. Furthermore, the more acres managed for dispersed recreation, open to motorized use, and open to mineral and ROW development, the greater the impacts on special status species and habitats. In addition, lease stipulations to protect special status species would be applied under all alternatives, though the degree of protection varies by alternative (**Appendix B**). Sage-Grouse preliminary priority habitat (PPH) would not be acceptable for coal leasing under all alternatives.

Soil and water protections, through the use of NSO and CSU stipulations that overlap areas with saturated or frozen soils, would protect currently occupied and undetected special status species habitat and populations from the effects of surface-disturbing activities. Determining soil suitability for surface-disturbing activities would help maintain habitat where vegetation would be sensitive to removal and would reduce the likelihood of erosion and sedimentation of waterways.

Under all alternatives, soil and vegetation management and protection would impact special status species' habitats and could directly affect special status species. Management to improve and protect soil and vegetation conditions throughout the planning area would improve vegetative and stream cover, reduce the likelihood for erosion and sedimentation, maintain seed banks, and support special status plant species. Most vegetation treatments would not affect special status species, as they are designed to avoid occupied special status species habitat. Improved vegetative conditions would improve habitat for special status wildlife by providing more opportunities for nesting, roosting, cover, and forage over the long term. In the short term, vegetation treatments could remove potential breeding, nesting, roosting, or foraging habitat or increase the potential for weed spread. Impacts would be more likely to occur on previously undiscovered populations, since all special status species known to occur would be considered prior to implementing vegetation treatments. In addition, human disturbance and noise associated with the use of heavy equipment for vegetation removal could temporarily displace special status bird, bat or mammal species from foraging, breeding, roosting, and nesting habitats.

In general, management actions under Alternatives B, C and D would prevent the spread of wildlife diseases such as white nose syndrome, since BLM would consider closure of caves and other structures used by bats, as well as temporary closures in case of an outbreak or threat of an outbreak.

Unplanned wildfires could destroy known and undiscovered special status plant populations, depending on the location and severity. In certain circumstances, the special status plant seed bank could be destroyed through denaturing or lost by erosion. In addition, depending on the extent, location, severity, and seral stage affected, fire would have short-term impacts on special status wildlife by removing habitat for some species or by destroying streamside cover. In the long term, habitat for late seral-dependent species such as Mexican spotted owl (*Strix occidentalis lucida*) and Canada lynx (*Lynx canadensis*) may be lost, but habitat for other species may be improved through removal of decadent vegetation, improved vegetative health, and increased structural diversity.

Increased human activity and noise associated with wildland fire suppression and prescribed fire in areas occupied by special status species would affect nesting, breeding, foraging, or roosting behavior. Important habitats could be altered because of the use of heavy equipment, hand tools, and noise associated with intensive human activity. However, there is also a risk of habitat loss in areas where wildland fire suppression is absent or limited due to the increased potential for large and more severe wildfires. This in turn is balanced by the fact that a large fire could require extensive suppression operations, such as extensive staging areas and fire-line construction, that could themselves result in long-term effects on special status species and their habitats. Smaller fires that would require less extensive suppression operations would generally avoid these long-term effects.

If managed improperly, livestock grazing could have impacts on special status plants, including federally threatened Colorado hookless cactus and DeBeque phacelia, by trampling, soil compaction, and weed spread. This could cause injury or mortality to special status plants or degrade potential or occupied habitats. Impacts would go undetected if grazed areas have not been previously inventoried for special status plant species. Overgrazing could remove forage and cover that would otherwise be used by special status wildlife, creating competition for resources. Proper grazing techniques could minimize impacts. If properly managed, grazing would not conflict with special status species conservation.

Closing areas to recreational target shooting would result in reduced risk of lead poisoning and elevated lead concentrations in tissues of special status bird species that utilize these areas (USGS 2009).

WSAs would provide indirect protection to special status species and potential or occupied habitats through closure to fluid mineral leasing and NSO stipulations.

Under all alternatives, ACECs would be designated to protect special status species. ACECs provide protection to special status species and habitats in several ways. They are typically withdrawn from locatable mineral entry, managed as ROW exclusion or avoidance areas, and restricted from a net increase in travel routes. Specific management for each ACEC under each alternative is presented in **Table 2-2** and is described below under each alternative. These special management prescriptions provide broad protection from habitat fragmentation and loss of potential habitat. In general, the greater the acreage managed as ACECs, the greater the protection from surface disturbance that would be provided to special status species.

The following analysis was done for each alternative using the "In and Through", and "Proximate" categories from the TMP process. The following buffers apply to each category:

- In Through: Listed - 20 meters
- In Through: Sensitive - 20 meters
- Proximate: Listed - 200 meters
- Proximate: Sensitive - 100 meters

Route designation decisions for Special Status Plants were based on a route's proximity to the protected plants. Impacts to Special Status Plants from roads are similar to those discussed in the Critical Habitat section (**Table 4-37**, Route Impacts on Special Status Plants). To reduce conflicts with protected plants, routes were closed where practical. These decisions are consistent and supported by the Objectives and Actions in Chapter 2 (Special Status Plants, ACECs, and CTTM).

Table 4-37
Route Impacts on Special Status Plants

Miles of Routes	Alternative A	Alternative C	Alternative D	Alternative PRMP
In Through: Listed				
OPEN	3035.9	2165.9	2416.6	1140.9
CLOSED	11.9	2414.4	605.0	1824.0
In Through: Sensitive				
OPEN	901.3	270.1	414.5	344.8
CLOSED	149.4	287.7	129.1	187.4
Proximate: Listed				
OPEN	130954.4	36093.8	112969.2	63235.2
CLOSED	2454.6	89631.0	12718.0	60018.1
Proximate: Sensitive				
OPEN	30082.2	2713.1	6648.6	4799.2
CLOSED	191.3	25107.0	1219	24930.3

Source: BLM 2010a

In summary, in Alternative A, 3,336 miles of routes went through federally listed plant occurrences, and 901 miles of routes went through BLM listed sensitive plants. Additionally under this alternative 130,954 miles of routes were near federally listed plants, and 30,082 miles of routes were near BLM listed Sensitive plants.

In Alternative B there was a 62% reduction in routes going through protected plants in comparison to Alternative A. Under Alternative B there was also a 52% reduction in routes proximate to listed plants, and a 84% reduction in routes proximate to BLM Sensitive plants. Approximately 1,824 miles of routes that went through listed plants, and 187 miles of routes that went through BLM Sensitive plants were closed for resource protection. Under this Alternative 60,018 miles of routes that were proximate to listed plants, and 24,930 miles of routes proximate to BLM Sensitive plants were also closed for resource protection.

In Alternative C there was a 29% reduction in routes going through listed plants, and a 22% reduction routes going through BLM Sensitive plants in comparison to Alternative A. Under Alternative C there was also a 72% reduction in routes proximate to listed plants, and an 84% reduction in routes proximate to BLM Sensitive plants. In comparison to Alternative B. there was a 132% increase in miles of routes going through listed plants, and a 154% increase in the miles of routes going through BLM Sensitive plants would be closed for the protection of rare plants and their habitat. Additionally, there was a 149% increase in the miles of closed routes that were proximate to listed plants, and a 101% increase in the miles of closed routes proximate to BLM Sensitive plants.

In Alternative D there was a 20% reduction in routes going through listed plants, and a 54% reduction routes going through BLM Sensitive plants in comparison to Alternative A. Under Alternative D there was also a 14% reduction in routes proximate to listed plants, and a 78% reduction in routes proximate to BLM Sensitive plants. In comparison to Alternative B. 67% fewer miles of routes going through listed plants, and 31% fewer miles of routes going through BLM Sensitive plants would be closed to protect rare plants. Additionally, 79% fewer miles of routes proximate to listed plants, and 95% fewer miles of routes proximate to BLM Sensitive plants would be closed.

Climate change would impact special status species under all alternatives, but special status species may be more vulnerable to the impacts of climate change under certain alternatives. Resource uses in the planning area (e.g., livestock grazing, forestry, recreation, travel, lands and realty, and energy and minerals leasing and development) are stressors that may generally impact special status species' ability to adapt to climate change. These impacts would likely be more harmful to special status species under Alternatives A and D where there are fewer restrictions on resource uses. Under Alternative C, more stringent

restrictions would limit the impact of these stressors (as described in the analysis under Alternative C, below). Special status species' ability to adapt to climate change under Alternative B would likely fall between the other alternatives because resource use restrictions are generally more stringent than under Alternatives A and D, but less stringent than under Alternative C.

Sagebrush Habitats and Species

Similar to terrestrial wildlife in **Section 4.3.5**, many special status wildlife species avoid development, recreation, and roads. While the long-term impacts of fluid minerals development are unclear (Connelly et al. 2000), recent studies have shown effects from these activities on special status species. Greater Sage-Grouse is a well-researched species on this topic. Impacts include reduced nest initiation rates (Lyon and Anderson 2003), avoidance of developed areas and increases in movement (Lyon and Anderson 2003; Holloran 2005; Crompton 2005; Doherty et al. 2008), reduced attendance of males at lek sites (Holloran 2005; Walker et al. 2007; Crompton 2005), and reduced survivorship (Crompton 2005). Impacts occur in lekking, nesting, brood rearing, and winter habitat (Crompton 2005; Doherty et al. 2008), and negative effects have been shown to occur from 0.5 mile to 4 miles away from oil and gas development (Walker et al. 2007; Naugle et al. 2011). It is possible that Sage-Grouse may repopulate developed areas after oil and gas operation ends, but long-term studies have not yet been conducted. It is also possible that similar effects would occur to other special status species such as mountain plover (*Charadrius montanus*). Under all alternatives, the BLM would require avoidance of sensitive special status species habitats by lessees, and would apply stipulations and/or COAs to minimize impacts, though the type of stipulation would vary by alternative.

Under all alternatives, a Lease Notice would be applied in threatened and endangered species habitat, and biological and botanical inventories may be required before surface-disturbing operations are approved. The implementation-level inventory would be used to prepare special design and construction measures to reduce the impacts of surface disturbance on threatened and endangered species habitat.

Salt Desert Shrub Habitats and Species

The types of impacts on salt desert shrub habitats from casual use, permitted activities, and changes in habitat condition common to all alternatives would be similar to those described in Section 4.3.5 for *All Fish and Wildlife Habitats*.

Forest and Woodland Habitats and Species

The types of impacts on forest and woodland habitats from casual use, permitted activities, and changes in habitat condition common to all alternatives would be similar to those described in Section 4.3.5 under *All Fish and Wildlife Habitats*.

Riparian and Wetland Habitats and Species

The types of impacts on riparian habitats from casual use, permitted activities, and changes in habitat condition common to all alternatives would be similar to those described in Section 4.3.5, Fish and Wildlife under *Riparian and Wetland Habitats and Species*.

River and Stream Habitats and Species

The types of impacts on river and stream habitats from casual use, permitted activities, and changes in habitat condition common to all alternatives would be similar to those described in Section 4.3.5, Fish and Wildlife under *River and Stream Habitats and Species*.

Barren Habitats and Species

Cliff-nesting raptors such as peregrine falcons (*Falco peregrinus*) and golden eagles (*Aquila chrysaetos*), which occur or could occur in these areas, would receive protection in the Palisade and Sewemup Mesa WSAs from management actions associated with those WSAs. Special status plant species that inhabit barren areas (**Table 4-38**, Route Impacts on DeBeque Phacelia and Parachute Penstemon), such as Parachute penstemon, DeBeque phacelia, DeBeque milkvetch (*Astragalus debequaeus*), Roan Cliffs blazingstar (*Mentzelia rhizomata*), and sun-loving meadowrue (*Thalictrum heliophilum*), would also be protected for the same reason.

Table 4-38
Route Impacts on DeBeque Phacelia and Parachute Penstemon

Critical Habitat	Alternative A	Alternative B (Proposed RMP)	Alternative C	Alternative D
Total miles of open routes in Designated Debeque Phacelia habitat Field Office Wide (excluding private & Linear Disturbances)	72 miles	31 miles (43%)	17 miles (24%)	57 miles (80%)
Routes Closed within Designated Debeque Phacelia habitat (R, C)	N/A	41 miles (57%)	55 miles (76%)	14 miles (20%)
Total miles of open routes in Designated Parachute penstemon habitat Field Office Wide (excluding private routes and Linear Disturbances)	8 miles	N/A	N/A	7 miles (88%)
Routes Closed within Designated Parachute penstemon habitat (R, C)	N/A	8 miles (100%)	8 miles (100%)	1 mile (14%)

Source: BLM 2010a

Implementing management for the following resources would have negligible or no impact on special status species and are therefore not discussed in detail: air quality; cultural resources; paleontology; wild horses; national, state, and BLM

byways; Native American tribal uses; public health and safety; socioeconomics; or environmental justice.

Alternative A

General Special Status Species

In general, Alternative A would rely on outdated management guidance that would not reflect current conditions and issues, and would lack a landscape-level approach to land planning. Impacts would be similar to those described in **Section 4.3.4** and **Section 4.3.5**. Known special status species populations would be protected; impacts would be more likely to occur on previously undiscovered special status species populations.

The lack of comprehensive planning for vegetation, fish and wildlife, and special status species would result in habitat management that is applied on a case-by-case basis and that would not give the BLM the authority to implement or enforce certain management actions. Protection for known special status species and currently occupied habitats would occur, and management flexibility would allow the BLM to adaptively manage resources. NSO stipulations would be applied on 1,300 acres in the Badger Wash, Pyramid Rock, and Unaweep Seep ACECs to protect threatened, proposed, candidate, and sensitive plants. In addition, a TL stipulation would be applied around bald eagle (*Haliaeetus leucocephalus*) and peregrine falcon seasonal habitats. A Lease Notice would require lessees to submit a plan for avoidance or mitigation of impacts in black-footed ferret and threatened and endangered species habitat. An intensive inventory may be required. These stipulations would directly protect special status species. Indirect protection to potential or occupied special status species habitat would occur from other NSO, CSU, and TL stipulations, as listed in **Appendix B**. Vegetation and weed treatments and range improvements would be implemented, which would improve habitat conditions and trend toward achieving land health standards.

Fire management under Alternative A would utilize mechanical treatments and prescribed fire for resource benefit, but would be limited in the use of unplanned fire. This would cause some short-term disturbance to special status species habitats and populations and long-term improvement in habitat health and productivity, as described under Effects Common to All Alternatives.

Areas managed as VRM Class I and II on 159,200 acres, as well as stipulations to protect visual resources, would indirectly protect known and undetected special status species populations and currently occupied and potential habitats by limiting or prohibiting surface-disturbing activities in these areas.

The types of impacts from grazing would be the same as those described under Effects Common to All Alternatives and in **Section 4.3.4** and **Section 4.3.5**. Range improvements would be used to improve vegetation and habitat conditions, which in most cases would reduce potential impacts on special

status species habitats and populations over the long term. The BLM would manage 978,600 acres as open and 48,600 acres as closed to grazing under this alternative.

Under Alternative A, BLM management of SRMAs, IRMAs, and ERMAs would continue to be insufficient to accommodate current and future levels of recreation, which could lead to an increase in impacts on special status species habitats and populations as population and recreation use increase. Impacts could occur where the Rough Canyon ACEC, designated to protect Gunnison Sage-Grouse, the canyon treefrog (*Hyla arenicolor*), and Grand Junction milkvetch (*Astragalus linifolius*), overlaps with the Bangs Canyon SRMA. The overlapping RMZ would be focused to support the ACEC, which would minimize impacts. If impacts occurred, the BLM would change management within the SRMA to help protect special status species. Four SRMAs and IRMAs would be managed on 358,300 acres and one ERMA would be managed on 703,100 acres under this alternative.

Cross-country travel would be allowed on 445,400 acres, and intensive motorized use would be allowed on 12,500 acres within the decision area. This could cause impacts on habitats and known and undiscovered populations through surface disturbance, noise, erosion, sedimentation, and the potential for weed spread (see **Section 4.3.4** and **Section 4.3.5**, for more details). Areas limited to existing routes and designated routes on 568,200 acres would have fewer impacts but could still disturb special status wildlife from noise and human presence. Areas closed to motorized use on 35,300 acres (and in WSAs, where motorized and mechanized use would be limited to existing ways) would reduce the likelihood of these impacts.

Five ACECs would continue to be managed on 28,900 acres: Badger Wash, The Palisade, Pyramid Rock, Rough Canyon, and Unaweep Seep. In these areas, special status species would receive direct protection through such measures as closing areas to motorized use, managing areas as unsuitable for ROWs, and applying NSO stipulations.

Lands and realty management actions would identify 441,400 acres of ROW avoidance and 234,900 acres of ROW exclusion areas, as well as areas unsuitable for or sensitive to utility development. This would protect habitats or minimize impacts from disturbance in these areas. The BLM would manage seven corridors for utility and facility development.

Under Alternative A, the BLM would manage 300,700 acres as acceptable for coal leasing, causing impacts such as habitat removal, fragmentation, weed spread, and direct injury or mortality to special status species (see **Section 4.3.4** and **Section 4.3.5** for more details). Areas unacceptable for coal leasing on 36,700 acres would prevent habitat and special status species impacts from coal extraction on these lands.

Under Alternative A, the BLM would manage 1,134,600 acres of federal mineral estate as open to fluid mineral leasing, causing impacts such as habitat removal, fragmentation, weed spread, and direct injury or mortality to special status species (see **Section 4.3.4** and **Section 4.3.5** for more details). Areas closed to fluid mineral leasing on 96,500 acres, as well as stipulations on open lands, would prevent habitat and special status species impacts from mineral development on these lands. NSO stipulations would be applied on 433,000 acres and CSU stipulations would be applied on 74,100 acres, which would reduce the impact of fluid mineral development on special status species.

Five ACECs would continue to be managed on 28,900 acres: Badger Wash, The Palisade, Pyramid Rock, Rough Canyon, Unaweep Seep. In these areas, special status species would receive direct protection through such measures as closing areas to motorized use, managing areas as unsuitable for ROWs, and applying NSO stipulations.

In addition to those effects discussed under *General Special Status Species*, the following habitat-specific effects would occur with implementation of Alternative A.

Sagebrush Habitats

The types of impacts on sagebrush habitats from casual use, permitted activities, and changes in habitat condition under Alternative A would be the same as those described in Section 4.3.5 under *All Fish and Wildlife Habitats*. In addition, decisions for livestock grazing, lands and realty, mineral resources, and travel management would impact greater Sage-Grouse PPH and Preliminary General Habitat (PGH), as shown in **Table 4-39**, Impacts on Greater Sage-Grouse Habitat, Alternative A.

Table 4-39
Impacts on Greater Sage-Grouse Habitat, Alternative A

Resource	PPH (acres)	PGH (acres)
Livestock Grazing		
Open	5,400	8,700
Closed	0	0
Lands and Realty		
ROW avoidance	200	3,900
ROW exclusion	0	100
Mineral Resources		
Fluid minerals – open	5,600	8,900
Fluid minerals – closed	0	0
Mineral materials - open	4,800	7,300
Mineral materials - closed	800	1,600
Travel Management		
Open to all modes of travel	5,600	6,400
Seasonal closure for motorized vehicles	0	2,500

Salt Desert Shrub Habitats
The types of impacts on salt desert shrub habitats from casual use, permitted activities, and changes in habitat condition under Alternative A would be the same as those described in Section 4.3.5 under *All Fish and Wildlife Habitats*.

Forest and Woodland Habitats and Species
While special status species habitat would be excluded from commercial forestry under Alternative A, impacts on potential habitat or undiscovered populations could occur due to habitat removal, human presence and disturbance, use of vehicles and heavy machinery, noise, and potential for weed spread.

Riparian and Wetland Habitats and Species
Forestry impacts would be similar to those described under *All Fish and Wildlife Habitats* in **Section 4.3.5**.

Fourteen river segments would be managed as eligible for inclusion in the NWSRS. Interim protective management guidelines would help to protect or reduce impacts on riparian habitats and special status species which rely on these habitats, such as the federally endangered Southwestern willow flycatcher (*Empidonax traillii extimus*), cutthroat trout (*Oncorhynchus clarkii*) and other special status aquatic species, federal threatened western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), and BLM sensitive Eastwood's monkeyflower (*Mimulus eastwoodiae*), in these areas.

River and Stream Habitats and Species
Forestry impacts would be similar to those described for *Riparian and Wetland Habitats and Species*. Surface-disturbing activities would increase the likelihood for soil erosion and sedimentation of waterways as well as degradation of water quality, which would impact sediment intolerant species, such as cutthroat trout, more than sediment tolerant species.

WSR impacts would be similar to those described for *Riparian and Wetland Habitats and Species*. In addition, direct protection of special status fish and aquatic species would occur where fish are an ORV for a WSR-eligible segment.

Barren Habitats
The types of impacts on barren habitats from casual use, permitted activities, and changes in habitat condition under Alternative A would be the same as those described in **Section 4.3.5** under *All Fish and Wildlife Habitats*.

Alternative B

General Special Status Species
Under Alternative B, the BLM would implement more protective management measures for special status species, including applying NSO, CSU and TL stipulations, and managing areas as ROW avoidance and exclusion. By

prioritizing desired plant communities, managing wildlife emphasis areas, and designating ACECs, the BLM would be able to focus their habitat management efforts in the areas that would be most effective to preserve and protect habitats. Special status species would benefit directly and indirectly from these management actions.

Vegetation management under Alternative B would emphasize improving and restoring vegetation and special status species habitats. Actions would be implemented to reduce fragmentation. In addition, treatments that would provide for plant diversity and a variety of seral stages within each vegetation type would support a higher diversity of wildlife species over the long term. Adaptive drought management actions would prevent surface-disturbing activities and associated impacts during periods of extreme to exceptional drought.

Fish and wildlife management would improve and maintain habitat throughout the decision area, and applying stipulations to reduce surface-disturbing activities would prevent impacts on special status species. Fish and wildlife stipulations and restrictions include applying a CSU in high value and essential wildlife habitat, managing the Ant Research Site as a ROW exclusion area, managing the Owl Banding Station as a ROW avoidance area, and applying a CSU on deer and elk migration and movement corridors. Managing 149,700 acres of wildlife emphasis areas (no wildlife emphasis areas are identified under Alternative A) would protect known and undiscovered populations of special status species and potential habitat that occur in these areas through restrictions and stipulations (see **Section 4.3.5**).

Special status species management under Alternative B would protect known and potential locations of special status plant species and special status wildlife species from surface-disturbing activities. A variety of stipulations would be applied to protect habitats and populations, including a TL for migratory bird habitat. NSO stipulations would be applied within 200 meters of current and historically occupied habitat for threatened, endangered, proposed, and candidate plant species. In addition, CSU stipulations may require special design, construction, and implementation measures within 100 meters (328 feet) and relocation of activities within 200 meters (656 feet) of occupied habitat for BLM sensitive species and habitat necessary for species recovery. A Lease Notice would require biological inventories in areas of currently occupied or suspected habitat of special status species, and mitigation measures would be developed, if necessary. These stipulations would provide more protection for special status species than would Alternative A, which would have few stipulations for special status species. The BLM would designate the following 13 ACECs (totaling 123,000 acres) to protect special status species and would apply NSO stipulations in these areas: Atwell Gulch, Badger Wash, Dolores River Riparian, Indian Creek, Juanita Arch, Mt. Garfield, The Palisade, Pyramid Rock, Rough Canyon, Sinbad Valley, South Shale Ridge, and Unaweep Seep.

Under Alternative B, the BLM would have increased opportunities to use fire as a natural disturbance regime to meet resource objectives. Using a variety of fuel treatments would have short-term effects on special status species habitat through crushing and vegetation removal as well as increasing the likelihood of erosion and sedimentation. Increased human presence during fuel treatments could temporarily affect species by increasing the potential for habitat avoidance. In the long term, these activities would prevent uncharacteristically large or intense wildfires that could damage large expanses of habitat or kill or displace known or undiscovered populations of special status species. In addition, the condition of upland vegetation would be improved, which would benefit both terrestrial and aquatic special status species. ESR treatments would help reestablish vegetation and restore habitat for wildlife.

The types of impacts from visual resources management would be the same as those described under Alternative A. Under Alternative B, 491,100 acres (3.1 times more acres than under Alternative A) would be managed as VRM Class I and II.

The types of impacts from grazing would be the same as those described under Effects Common to All Alternatives. The BLM would manage 960,500 acres (2 percent fewer acres than under Alternative A) as open and 66,600 acres (36 percent more acres than under Alternative A) as closed to grazing under this alternative. If properly managed, grazing would not conflict with special status species conservation. In addition, the BLM would require periodic rest and limited grazing in lower elevation communities, as well as a minimum of two growing seasons of rest following vegetation treatments. This would prevent overgrazing and would allow for forage to recover.

Under Alternative B, three units on 44,100 acres would be managed for wilderness characteristics. Since special status species are a feature that contributes to an area's wilderness character, special status species within these units would be managed to maintain that character. Management would be similar to that described in **Section 4.3.5**.

The types of impacts from recreation would be the same as those described under Effects Common to All Alternatives. Impacts from overlap of the Rough Canyon ACEC and Bangs SRMA would be the same as described under Alternative A. Generally, SRMAs and ERMAs would avoid currently occupied habitats for special status species, but in some locations, dispersed recreation would be located close to special status species habitats. In these areas, the BLM would employ adaptive management to protect special status species if impacts were to occur. Impacts would be more likely to occur in areas that have not been previously inventoried for special status species.

In general, travel routes would be planned to avoid special status species habitats, particularly within ACECs (see **Section 4.5.3**, Areas of Critical Environmental Concern). This would help minimize impacts from travel, such as

disturbance to vegetation, erosion, sedimentation, reduction in water quality, noise, human presence, habitat fragmentation, weed invasion, and disruption of pollinators.

The mileages of routes are proposed to be designated administrative-only or closed based upon special status species planning criteria are shown in **Table 4-40**.

Table 4-40
Route Designations and Special Status Species Planning Criteria under Alternative B

Planning Criteria	Final Designation Administrative Use (miles)	Final Designation Closed (miles)	Total miles designated as Administrative Use or Closed
Designated Critical Habitat for plants	18.7	38.7	57.4
Federally Listed Plants	24.4	83.7	108.1
Sensitive Plants in/through	51.2	107.6	158.8
Sensitive Plants Proximate (100 meters)	57.3	133	190.3
Golden Eagle - nest sites	29.9	15.7	45.6
Gunnison Sage-Grouse - Critical Habitat, within 4 miles of active lek	44.7	22.9	67.6
Greater Sage-Grouse - PPH, PGH, within 4 miles of active lek	29.9	15.7	45.6
Bald Eagle - roost site, nest site	2.7	2.7	5.4
Special Status Fish - Cutthroat Trout	0	0.7	0.7
Total	**258.8**	**420.7**	**679.5**

Source: BLM 2010a

Under Alternative B, many special status species habitats, such as those where NSO and CSU stipulations would be applied, would also be ROW avoidance or exclusion areas (**Appendix B**). Encouraging the use of delineated utility corridors, managing five corridors for utilities and facilities, and managing solar and wind emphasis areas on 11,100 acres within the decision area would concentrate impacts away from special status species and reduce widespread impacts and habitat fragmentation. By concentrating development in corridors, the BLM would also reduce hazards such as bird collision and electrocution that would be caused by having transmission lines spread throughout the decision area.

Development of solar and wind projects would remove habitat and potentially disturb, kill, injure, or displace special status species in the short term during construction. Over the long term, wind facilities pose hazards for special status birds and bats, and solar projects would remove habitats over the long term. Solar projects would also be fenced, which would exclude some terrestrial

wildlife species. As a result these projects could represent a long term total habitat removal for special status species.

Under Alternative B, the BLM would manage 252,100 acres (16 percent fewer acres than under Alternative A) as acceptable for coal leasing, causing the types of impacts described above for mineral development under Effects Common to All Alternatives. Areas unacceptable for coal leasing on 57,400 acres (52 percent more acres than under Alternative A) would prevent special status species impacts from mineral development on these lands.

Under Alternative B, the BLM would manage 790,700 acres of BLM surface lands (18 percent fewer acres than under Alternative A) as open to fluid mineral leasing, causing the types of impacts described above for mineral development under Effects Common to All Alternatives. Areas closed to fluid mineral leasing on 270,700 acres of BLM surface lands (2.8 times more acres than under Alternative A), as well as stipulations on open lands, would minimize habitat and special status species impacts from mineral development on these lands. On lands open to fluid mineral leasing, NSO stipulations would be applied on 371,500 acres (12 percent fewer acres than under Alternative A) and CSU stipulations would be applied on 481,800 acres of BLM surface lands (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), which would reduce the impact of fluid mineral development on special status species.

Thirteen ACECs would be managed on 123,000 acres (4.2 times more acres than under Alternative A). These would be closed to wood harvest, mineral materials sales, and non-energy leasable mineral exploration and development. Other restrictions include travel route closures or limitations, ROW avoidance or exclusion areas, recreation restrictions, surface disturbance stipulations, and fluid mineral leasing closures. In comparison to Alternative A, there would be an increase of approximately 50 percent of route closures for resource protection (125 miles of open routes, 123 miles of closed routes). Closures include routes designated as for administrative or permitted use only. As such, known and undiscovered populations of special status species would be protected from surface disturbance and associated impacts within these areas.

Implementation of an interpretation and environmental education program under Alternative B would enhance awareness and appreciation of special status species and their habitats throughout the decision area. This could result in increased protective efforts by the general public.

In addition to those effects discussed under *General Special Status Species*, the following habitat-specific impacts would occur with implementation of Alternative B.

Master Leasing Plan

Approximately 183,400 acres of currently unleased federal mineral estate in the Shale Ridges and Canyons MLP analysis area would be open to leasing, under Alternative B. Protection of terrestrial wildlife would be provided by leasing stipulations and by closures to leasing in certain areas. COAs may be applied to mitigate impacts of development. For example, Alternative B would protect Greater Sage-grouse habitat by prohibiting surface-disturbing activities within 4 miles of an active lek or within sage-grouse nesting and early brood-rearing habitat. Other special status species that inhabit these areas, such as white-tailed prairie dog, would benefit from these constraints because they would limit habitat disturbance and the risk of direct mortality from development. These restrictions may also provide protection to areas that are currently leased if the leases expire.

The primary potential impacts on special status species plants and wildlife from fluid mineral development would include direct habitat loss, habitat modification, habitat fragmentation, reduced habitat effectiveness, disturbance, displacement, and direct mortality. Activities that result in ground disturbance associated with the construction of well pads, roads, pipelines, compressor and relay stations, settling ponds, geophysical exploration, and other various assorted infrastructure are the primary concern. In addition, these areas serve as niches in which invasive weedy vegetation can take hold. Collectively, or individually, these activities have the potential to substantially impact plant and wildlife habitats.

Sagebrush Habitats and Species

Sagebrush communities would be improved and maintained through vegetation treatments, avoiding planned and unplanned wildland fire in low-elevation cheatgrass-infested communities, prioritizing winter Sage-Grouse (Greater and Gunnison) habitat for treatment and restoration, developing restoration plans in non-functioning habitat, reducing pinyon-juniper encroachments, increasing habitat connectivity, and managing for age class diversity. Special status species that rely on these habitats, including ESA-listed Gunnison Sage-Grouse and ESA candidate Greater Sage-Grouse (**Table 4-36**), would directly and indirectly be affected by these management actions in the short and long term. Actions to reduce pinyon-juniper woodland invasion of upper elevation sagebrush communities would benefit special status wildlife species such as greater Sage-Grouse and Brewer's sparrow (*Spizella breweri*) that require open sage parks. The types of impacts from vegetation treatments would be similar to those described under Effects Common to All Alternatives.

Special status species management actions that would affect sagebrush species include NSO, CSU, and TL stipulations for raptors. Specifically, CSU and TL stipulations would be applied around ferruginous hawk (*Buteo regalis*) nests and red-tailed hawk (*Buteo jamaicensis*) nests, NSO and TL stipulations around golden eagle nests, a TL stipulation around burrowing owl (*Athene cunicularia*)

burrows and nest sites, a CSU stipulation around other raptor nest sites, a CSU stipulation around active kit fox (*Vulpes macrotis*) dens, CSU and TL stipulations around occupied white-tailed prairie dog (*Cynomys leucurus*) towns, and an NSO stipulation around all identified midget faded rattlesnake (*Crotalus oreganus concolor*), long-nosed leopard lizard (*Gambelia wislizenii*), and Great Basin spadefoot (*Spea intermontana*) breeding and denning sites. These stipulations would provide more protection for special status species than would Alternative A, which would have few stipulations for special status species that rely on sagebrush habitats. In addition, prairie dog relocation would only occur where disease transmission is not a concern.

A suite of management actions would be implemented to conserve Gunnison and Greater Sage-Grouse under Alternative B, including habitat improvement, habitat protection, and mineral leasing stipulations and prohibitions. Nesting, brood-rearing, and lek habitat would be improved, and vegetation management actions in sagebrush would aim to conserve, enhance, and restore Sage-Grouse habitats. Raptor perches would be removed or modified in Greater and Gunnison Sage-Grouse habitat to reduce predation, and a Sage-Grouse-safe design would be required for all fences in PPH. In addition, the Roan and Carr Creek ACEC and the Glade Park and Sunnyside wildlife emphasis areas would be managed for Sage-Grouse habitat. There would be a number of range management actions, such as authorizing new water developments when PPH would benefit and designing new structural range improvements to benefit PPH.

Stipulations and mineral leasing restrictions for Sage-Grouse include closure of all occupied Gunnison Sage-Grouse critical habitat to fluid mineral leasing; TL in occupied winter habitat; NSO for leks, nesting, and early brood-rearing habitat (with a four-mile buffer); CSU for nesting and early brood-rearing habitat (with a four-mile buffer); and TL within four miles of leks. All areas within a 0.6-mile radius of leks would be ROW exclusion areas, and Sage-Grouse occupied habitat and areas within 4 miles of leks would be ROW avoidance areas. There would be no PPH within ROW corridors. Quantitative impacts on greater Sage-Grouse habitat under Alternative B are presented in **Table 4-41**, Impacts on Greater Sage-Grouse Habitat, Alternative B. Fewer acres of PPH would be open to livestock grazing and more acres of PPH and PGH would be closed compared to Alternative A. In addition, more acres would be managed as ROW avoidance and exclusion under Alternative B. However, more acres of PPH and PGH would be impacted by mineral resources management under Alternative B.

Together, the habitat management actions and use restrictions under Alternative B would help conserve, enhance, and restore Sage-Grouse habitat within the GJFO.

National, scenic, and historic trails management under Alternative B could impact special status plant species, particularly the Colorado hookless cactus.

Table 4-41
Impacts on Greater Sage-Grouse Habitat, Alternative B

Resource	PPH (acres) (percent change from Alt A)	PGH (acres) (percent change from Alt A)
Livestock Grazing		
Open	5,200 (-3.7 percent)	8,700 (0 percent)
Closed	200[1]	100[1]
Lands and Realty		
ROW avoidance	5,000 (+2,400 percent)	8,700 (+123 percent)
ROW exclusion	600[1]	0[1]
Mineral Resources		
Fluid minerals – open	5,600 (+1.8 percent)	8,900 (0 percent)
Fluid minerals – closed	0[1]	0[1]
Mineral materials - open	4,800 (0 percent)	6,900 (-5 percent)
Mineral materials - closed	700 (-12 percent)	2,000 (+25 percent)
Travel Management[2]		
Closed to motorized and mechanized vehicles	0	0
Limited for motorized and mechanized vehicles	5,600	8,900

[1]Quantitative comparisons were not made when one of the values was zero.
[2]Acres would not be closed or limited to motorized and mechanized vehicles under Alternative A, thus there are no quantified comparisons.

Portions of the Old Spanish Trail route overlap with occupied habitat for this species, and impacts such as trampling could occur if users go off the trail.

Salt Desert Shrub Habitats and Species

Since many of the species that use salt desert shrub habitats also use sagebrush habitats, many of the impacts would be similar to those described previously for sagebrush habitats and species. Several species such as kit fox, white-tailed prairie dog, and burrowing owl primarily use salt desert shrub habitats. Under Alternative B, stipulations would be applied to protect these species and habitats. These include a CSU stipulation within 200 meters of active kit fox dens and within active white-tailed prairie dog towns. A TL stipulation would be required within 0.25 mile of active burrowing owl nest sites and burrows and in occupied prairie dog towns. These stipulations would provide more protection for special status species than would Alternative A, which would not have any stipulations for special status species that primarily use salt desert shrub habitats.

Salt desert shrub habitats would be improved and maintained through fire suppression, grazing management, erosion control in greasewood communities, and prioritization of cheatgrass treatments.

Forest and Woodland Habitats and Species

Old-growth pinyon-juniper woodlands would be managed to maintain their current acreage, and a CSU would be applied in all old-growth forests and woodlands, which would reduce impacts from surface-disturbing activities. Other forest types such as ponderosa pine, Douglas fir, aspen, and spruce/fir would be managed to increase resilience to disease and diversity in age classes and species composition. Special status species that rely on these habitats, such as federally threatened Mexican spotted owl and Canada lynx (**Table 4-36**), would directly and indirectly be affected by these management actions in the short and long term. Impacts from vegetation treatments would be similar to those described under Effects Common to All Alternatives.

A TL stipulation would be applied around goshawk nest sites, and wood product sales and/or harvest (including Christmas tree harvest).

Research on the effect of over-snow motorized travel and snow compaction is conflicting. The Canada Lynx Conservation Assessment and Strategy (Ruediger et al. 2000) suggests that increased competition has contributed to the decline of lynx populations. As a result it was recommended in the Canada Lynx Conservation Assessment and Strategy, to which the BLM is a signatory, that federal agencies limit over-snow travel in lynx habitat. Bunnell et al. (2006) confirmed that coyotes do use compacted trails to travel in heavy snow. However, research by Kolbe found little evidence of compacted trails causing increased competition (Kolbe et. al, 2007). Alternative B and the Southern Rockies Lynx Amendment (which includes National Forest System lands adjacent to the decision area) limit the expansion of consistent snow compaction unless it serves to consolidate use and improve lynx habitat. This would provide the BLM with flexibility to monitor over-snow travel and lynx habitat and respond accordingly to limit impacts.

Under Alternative B, activity level plans would be developed for certain areas to manage for healthy forests and woodlands. Over the long term, this would maintain important special status species habitat, provide habitat diversity and multiple age classes, and prevent erosion and sedimentation of waterways. Short-term impacts could occur, depending on the timing of management actions and the species and habitats that are affected. Impacts would be greater on special status species that are sensitive to disturbance or human presence, such as nesting birds or denning lynx.

Riparian and Wetland Habitats and Species

Under this alternative, mature riparian forest would be conserved, which would benefit riparian-dependent special status species, including federal threatened western yellow-billed cuckoo, delisted bald eagle, and special status aquatic species (**Table 4-36**). In addition, mitigation measures would be implemented to reduce impacts on riparian habitats, such as locate/relocate travel routes, recreation restrictions, and closure to mineral materials sales and non-energy

mineral leasing and development. Riparian areas that are identified as special status species habitat would be given priority for management, and an NSO stipulation would be applied around riparian areas, protecting federally listed species like the Colorado pikeminnow, razorback sucker, bonytail, and humpback chub.

Special status species management would apply CSU and TL stipulations around osprey and Swainson's hawk (*Buteo swainsoni*) nest sites, NSO and TL stipulations around bald eagle nest sites, a TL around bald eagle winter roost sites, and an NSO within all identified canyon treefrog, northern leopard frog, long-nosed leopard lizard, and boreal toad (*Bufo boreas boreas*) breeding and denning sites. These stipulations would provide more protection for special status species than would Alternative A, which would have few stipulations for special status species that use riparian and wetland habitats. Management plans to restore or improve yellow-billed cuckoo habitat, including a species recovery plan when released by the USFWS, would be implemented, and migratory pathways of waterfowl and shorebirds, as well as currently occupied breeding and denning sites of upland nesting shorebirds, would be protected.

Under Alternative B, a portion of the Dolores River would be determined suitable for inclusion in the NWSRS. Interim management guidelines and management measures for these segments would help to protect or reduce impacts on riparian habitats and special status species, such as the federally endangered Southwestern willow flycatcher, federal threatened western yellow-billed cuckoo, special status aquatic species, and BLM sensitive Eastwood's monkeyflower in this area.

River and Stream Habitats and Species

In general, management actions under Alternative B would prevent the spread of nuisance aquatic organisms through such measures as treating equipment used within or near perennial water sources and removing aquatic competitors from active native aquatic breeding grounds. These measures would reduce impacts caused by these species, such as changes to the food web and water conditions. However, recreation in the Dolores River SRMA may increase the likelihood for the introduction or spread of nuisance aquatic organisms.

Special status species management under Alternative B would designate three ACECs for special status fish (see **Table 2-2**). In addition, the BLM would prioritize and implement management actions to achieve desired future conditions of rivers and streams and improve river otter (*Lontra canadensis*) habitat. In the short term, these actions could increase the potential for erosion and sedimentation of waterways, which would affect sediment intolerant species, such as cutthroat trout. Stipulations would directly protect special status fish, such as a TL for salmonid and native, non-salmonid fishes (including federally listed and BLM sensitive species), and NSO and CSU around the Colorado, Gunnison, and Dolores Rivers. These stipulations would provide

more protection for special status species than would Alternative A, which would not have any stipulations for special status species that use river and stream habitats.

WSR impacts would be similar to those described under *Riparian and Wetland Habitats and Species*. In addition, direct protection of special status fish and aquatic species would occur where fish are an ORV for a WSR-eligible segment.

Implementation of Alternative B within the Shale Ridges and Canyons MLP analysis area would result in approximately 183,700 currently unleased acres of federal mineral estate open to leasing. Where public lands have been leased since the completion of the 1987 GJFO RMP, the leasing stipulations in that RMP would apply and would help minimize or eliminate impacts on special status aquatic resources. Leasing stipulations displayed in Appendix B would help minimize or eliminate impacts on cutthroat trout and amphibian species and their habitats. In addition, an extensive list of BMPs and COAs may be applied to mitigate impacts.

The primary potential impacts on special status aquatic resources include water quality alteration, water depletions, and increased sediment loading and turbidity. The primary concern is activities that result in ground disturbance, and the removal of native vegetation due to the construction of well pads, roads, pipelines, compressor and relay stations, settling ponds, geophysical exploration, and other various assorted infrastructure. Collectively, all of these activities have the potential to provide for the movement of soils off-site, increasing sediment loading and turbidity into nearby water bodies. In addition, disturbed areas are niches where invasive weedy vegetation can take hold. This reduces watershed health, and results in poor soil retention, increased run-off, and poor water infiltration and absorption. Increased numbers and densities of roads are a concern because they are long-term point sources of sediment input. Impacts are amplified and more acute in areas where natural gas development is occurring in small discrete watersheds containing cutthroat trout and amphibian species.

Where proper and timely reclamation is occurring at well pad and pipeline sites, and where proper road and drainage structure construction and maintenance is occurring, impacts resulting from offsite soil movement and sediment and turbidity generally are minimized. Where reclamation and road maintenance practices have been poor or neglected, sediment loading and turbidity impacts are occurring. Increased road density and use can impact amphibians by direct vehicular mortality, and by fragmentation of habitats that limit accessibility to limited seasonal breeding habitats.

Barren Habitats and Species

Disease transmission prevention measures, such as considering closure of caves and other structures used by bats, would help to protect special status bats from white nose syndrome in the areas where they are applied.

For DeBeque phacelia and parachute penstemon, NSO stipulations would be applied within 200 meters (656 feet) of current and historically occupied and suitable habitat, which would reduce impacts from surface-disturbing activities on these species. In addition, CSU and TL stipulations would be applied around peregrine and prairie falcon nests, and an NSO would be applied around special status bat species' roost sites and winter hibernacula. These stipulations would provide more protection for special status species than would Alternative A, which would have few stipulations for special status species that use barren habitats. In addition, a ROW exclusion area would be identified around all parachute penstemon occupied habitat.

Alternative C

General Special Status Species

The types of impacts from BLM management would be the same as those described previously under Alternative B except where differences are indicated below. Under Alternative C, the BLM would implement the most protective management measures for special status species and stipulations and restrictions to reduce impacts from resource uses.

Fish and wildlife management would be similar to that described under Alternative B. Wildlife emphasis areas would be managed on 145,400 acres (3 percent fewer acres than under Alternative B), though many of the acres not managed as wildlife emphasis areas under Alternative C would be managed as ACECs, thereby maintaining fish and wildlife protections.

As under Alternative B, adaptive drought management actions would prevent surface-disturbing activities and associated impacts during periods of extreme to exceptional drought.

Under Alternative C, a variety of stipulations would be applied to protect special status species habitats and populations. Many of these would be the same as under Alternative B. Some examples are the NSO stipulation within 200 meters (656 feet) of current and historically occupied and suitable habitat for threatened, endangered, proposed, and candidate species and a Lease Notice requiring inventories and mitigation measures. An additional stipulation would be an NSO within 200 meters of current and historically occupied and suitable habitat for BLM sensitive plant species. As a result, the stipulations under Alternative C would provide the greatest protection for special status species compared to all other alternatives. Twenty-three ACECs, covering 168,000 acres, would be designated to directly protect special status species: Atwell Gulch, Badger Wash, Colorado River Riparian, Coon Creek, Dolores River Riparian, Glade Park – Pinyon Mesa, Gunnison River Riparian, Hawxhurst Creek, John Brown Canyon, Juanita Arch, The Palisade, Plateau Creek, Prairie Canyon, Pyramid Rock, Reeder Mesa, Roan and Carr Creeks, Rough Canyon, Sinbad Valley, South Shale Ridge, and Unaweep Seep.

The types of impacts from visual resources management would be the same as those described under Alternative A. Under Alternative C, the BLM would manage 654,000 acres (4.1 times more acres than under Alternative A) as VRM Class I and II.

The types of impacts from grazing management would be the same as those described under Alternative B. Under Alternative C, the BLM would manage 586,600 acres (40 percent fewer acres than under Alternative A) as open and 440,400 acres (84 percent more acres than under Alternative A) as closed to grazing. In addition, the BLM would require periodic rest and limited grazing on more areas, which would allow plants to recover and prevent overgrazing as described under Alternative B.

The types of impacts from lands with wilderness characteristics management would be the same as those described under Alternative B. Under Alternative C, 12 units on 171,200 acres (4 times more acres than under Alternative B) would be managed for wilderness characteristics.

The types of impacts from recreation would be the same as those described under Alternative B. Although Alternative C has fewer opportunities for marketing recreation within the decision area, use would likely increase in proportion to population growth, and the BLM would have a reduced capacity to concentrate use in areas managed for recreation. As a result, special status species could be potentially impacted. In recreation areas, the BLM would adaptively manage (e.g., implement minimization measures) to protect special status species if impacts were to occur. Impacts would be more likely to occur in areas that have not been previously inventoried for special status species.

Under Alternative C, the BLM would close the most travel routes (62 percent, or 156 miles of routes) within ACECs to protect special status species (see **Section 4.5.3**). In addition, motorized vehicles would be allowed on fewer trails within areas managed as limited to designated route.

The types of impacts from lands and realty management would be the same as those described under Alternative B, except occupied, suitable, and potential special status species habitat would be ROW avoidance areas. This would help protect both known and undiscovered populations of special status species. Use of delineated utility corridors would be required, and solar and wind emphasis areas would be managed on 7,900 acres (28 percent fewer acres than under Alternative B) within the decision area. Alternative C would thus place the most restrictions on utility development of all alternatives.

Under Alternative C, disposal of occupied special status species habitat would be prohibited. This would ensure that occupied habitat remains under BLM management and would reduce the potential for impacts from land tenure adjustments.

Under Alternative C, the BLM would manage 251,200 acres (16 percent fewer acres than under Alternative A) as acceptable for coal leasing, causing the types of impacts described for mineral development under Effects Common to All Alternatives. Areas unacceptable for coal leasing on 58,200 acres (58 percent more acres than under Alternative A) would prevent impacts on special status species and their habitats from mineral development on these lands.

Under Alternative C, the BLM would manage 506,700 acres (48 percent fewer acres than under Alternative A) as open to fluid mineral leasing, causing the types of impacts described above for mineral development under Effects Common to All Alternatives. Areas closed to fluid mineral leasing on 554,700 acres (5.7 times percent more acres than under Alternative A), as well as stipulations on open lands, would prevent habitat and special status species impacts from mineral development on these lands. NSO stipulations would be applied on 858,000 acres of federal mineral estate (98 percent more acres than under Alternative A) and CSU stipulations would be applied on 664,400 acres of federal mineral estate (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), which would reduce the impact of fluid mineral development on special status species.

Impacts from ACEC management would be similar to those described under Alternative B. Under Alternative C, 23 ACECs would be managed on 168,000 acres (5.8 times more acres than under Alternative A).

In addition to those effects discussed under *General Special Status Species*, the following habitat-specific effects would occur with implementation of Alternative C.

Sagebrush Habitats and Species

Vegetation management in sagebrush habitats would be similar to those described under Alternative B. More cheatgrass treatments would be implemented under Alternative C, which would reduce infestations and restore native perennials over a greater area.

Special status species management actions that would affect sagebrush species would be similar to those described under Alternative B, but Alternative C also would apply an NSO around ferruginous hawk nests, red-tailed hawk nests, other raptor nest sites, and a 0.5-mile buffer around the NSO for reptiles and amphibians. These stipulations would provide the greatest protection for special status species that use sagebrush habitats.

Compared to the other alternatives, there would be additional protections for Gunnison and Greater Sage-Grouse under Alternative C. Roan and Carr Creek and Glade Park would be ACECs managed for Sage-Grouse habitat. In addition, habitat management and improvements would be similar to those described for Alternative B. Stipulations and restrictions would be similar to Alternative B,

except that the NSO for leks, nesting, and early brood-rearing habitat would include a 4-mile buffer to encompass most potential nesting habitat; all areas within a 0.6-mile radius of leks for below-ground facilities (e.g., utilities) and a 4-mile radius for aboveground facilities would be ROW exclusion areas; and Sage-Grouse occupied and suitable habitat would be ROW avoidance areas. Quantitative impacts on greater Sage-Grouse habitat under Alternative C are presented in **Table 4-42**, Impacts on Greater Sage-Grouse Habitat, Alternative C. Under Alternative C, all PPH and PGH would be closed to livestock grazing and fluid mineral leasing. More acres would be managed as ROW avoidance and exclusion and closed to mineral materials than under Alternative A.

As a result, management for Sage-Grouse and Sage-Grouse habitat under Alternative C would provide the greatest protection for this species, compared to all other alternatives.

Table 4-42
Impacts on Greater Sage-Grouse Habitat, Alternative C

Resource	PPH (acres) (percent change from Alt A)	PGH (acres) (percent change from Alt A)
Livestock Grazing		
Open	0[1]	0[1]
Closed	5,400[1]	8,700[1]
Lands and Realty		
ROW avoidance	2,200 (+1,000 percent)	7,300 (+87 percent)
ROW exclusion	3,300[1]	1,500 (+1,400 percent)
Mineral Resources		
Fluid minerals – open	0[1]	0[1]
Fluid minerals – closed	5,600[1]	8,900[1]
Mineral materials - open	800 (-85 percent)	5,400 (-26 percent)
Mineral materials - closed	4,800 (+500 percent)	3,500 (+120 percent)
Travel Management[2]		
Closed to motorized and mechanized vehicles	4,900	3,500
Limited for motorized and mechanized vehicles	700	5,400

[1]Quantitative comparisons were not made when one of the values was zero.
[2]Acres would not be closed or limited to motorized and mechanized vehicles under Alternative A, thus there are no quantified comparisons.

Salt Desert Shrub Habitats and Species

Since many of the species that use salt desert shrub habitats also utilize sagebrush habitats, many of the impacts would be similar to those described previously for sagebrush habitats and species. Under Alternative C, the NSO stipulation on kit fox habitat would provide greater protection than the CSU stipulation under Alternative B. The protections afforded by the TL stipulation in burrowing owl habitat would be the same as described under Alternative B. The white-tailed prairie dog CSU would be strengthened to an NSO stipulation

and would be expanded to areas within 46 meters (150 feet) of active prairie dog towns, providing additional protection for this species.

Vegetation management actions in salt desert shrub habitats would be similar to those described under Alternative B. More cheatgrass treatments would be implemented under Alternative C, which would reduce infestations and restore native perennials over a greater area.

Forest and Woodland Habitats and Species
In addition to the impacts described in **Section 4.3.5** under All Fish and Wildlife Habitats, management under Alternative C would focus on increasing mature pinyon-juniper acreage.

Riparian and Wetland Habitats and Species
There would be additional protective measures for riparian and wetland habitats and associated species than under Alternative B. For example, NSO stipulations would be applied around osprey (*Pandion haliaetus*) and Swainson's hawk nest sites, as well as within 0.5-mile around all identified canyon treefrog, northern leopard frog, and boreal toad breeding and denning sites. As a result, the stipulations under Alternative C would provide the greatest protection for special status species that rely on riparian and wetland habitats, compared to all other alternatives.

Alternative C would manage 14 stream segments as suitable for inclusion in the NWSRS. Interim management protections for suitable stream segments would help protect riparian and aquatic habitats used by special status species, such as the federally endangered southwest willow flycatcher, Colorado pikeminnow, razorback sucker, bonytail, humpback chub, and other special status aquatic species; federal threatened western yellow-billed cuckoo, and BLM sensitive Eastwood's monkeyflower.

River and Stream Habitats and Species
Special status species management for river and stream habitats and associated species would be similar to those described under Alternative B. Eight ACECs would be designated to protect special status fish (see **Table 2-2**).

WSR impacts would be similar to those described under *Riparian and Wetland Habitats and Species*. In addition, direct protection of special status fish and aquatic species would occur where fish are an ORV for a WSR-eligible segment.

Barren Habitats and Species
The types of impacts in barren habitats and on associated species would be the same as those described in Section 4.3.5 under *All Fish and Wildlife Habitats*. Special status species management for barren habitats and associated species would be similar to those described under Alternative B, except an NSO stipulation would be applied around peregrine and prairie falcon nests.

Alternative D

General Special Status Species

The types of impacts on special status species under Alternative D would be the same as those described under Alternative B except as indicated below. In general, Alternative D would emphasize habitat management for commodities and resource uses, as well as maintenance of vegetation conditions. While BLM would comply with all laws and regulations, there would be less focus on resource protection through wildlife emphasis areas and ACECs and improvement or restoration of habitats under Alternative D. There would also be fewer measures to reduce or limit surface-disturbing activities, such as fewer NSO, CSU, and TL stipulations, as well as ROW avoidance and exclusion areas. Stipulations are presented in **Table 2-1**.

As under Alternatives B and C, adaptive drought management actions would prevent surface-disturbing activities and associated impacts during periods of extreme to exceptional drought.

Fish and wildlife management would maintain habitat throughout the decision area, and stipulations to reduce surface-disturbing activities would prevent direct impacts on special status species. Under Alternative D, there would be no CSU for activities in high value and crucial wildlife habitat, no TL in big game production areas, and fewer measures to reduce habitat fragmentation. Managing 33,400 acres (82 percent fewer acres than under Alternative B) as a wildlife emphasis area would protect special status species and potential habitat that occur in these areas through restrictions and stipulations (see **Section 4.3.5**).

Fewer and less stringent special status species stipulations would be applied under Alternative D than under other action alternatives. Similar to Alternative B, an NSO would be applied within 200 meters (656 feet) of current and historically occupied habitat for threatened, endangered, proposed, and candidate plant species, and a Lease Notice would require inventories in areas of currently occupied or suspected habitat of special status species. In addition, an NSO would be applied within 200 meters of currently occupied habitat for threatened, endangered, proposed, and candidate plant species. Five existing ACECs would be maintained on 33,200 acres to protect special status species: Badger Wash, The Palisade, Pyramid Rock, Rough Canyon, and Unaweep Seep.

With its focus on commodities, Alternative D would allow the BLM to have fewer opportunities to use fire as a natural disturbance regime to meet resource objectives. This could lower biodiversity and vegetative health and vigor, increase cover of decadent (old and overgrown) plants, and prevent achieving land health standards in certain habitats. This would degrade habitat for special status species in some areas.

The types of impacts from visual resources management would be the same as those described under Alternative A. Under Alternative D, 291,300 acres (2.1 times more acres than under Alternative A) would be managed as VRM Class I and II.

The types of impacts from grazing would be the same as those described under Alternative B. The BLM would manage 977,200 acres (less than 1 percent fewer acres than under Alternative A) as open and 49,900 acres (3 percent more acres than under Alternative A) as closed to livestock grazing. However, range improvements would only be used to improve livestock forage, which would not benefit desired plant communities and special status species habitat. Further, limitations on grazing, such as requiring periodic rest or seasonal restrictions, would be applied on a case-by-case basis, which could allow for impacts on special status species or their habitats in certain locations.

Under Alternative D, the BLM would not manage any lands with wilderness characteristics for wilderness characteristics, so impacts described under Alternative B would not occur.

The types of impacts from recreation would be the same as those described under Alternative B, but increased recreation would be encouraged under Alternative D, potentially impacting special status species. In these areas, the BLM would adaptively manage to protect special status species if impacts were to occur. Impacts would be more likely to occur in areas that have not been previously inventoried for special status species. Any routes or motorcycle trials areas in the Castle Rock SRMA or elsewhere would require appropriate surveys and consultation with the Colorado State Historic Preservation Office, Native American Tribes, and USFWS before they could be designated to recreational use and in areas where significant data recovery could not be completed to mitigate adverse effects to cultural resources trails could be closed or redesigned.

The types of impacts from travel management would be the same as those described under Alternative B, but under Alternative D, motorized vehicles would be allowed on more areas managed as limited to designated routes, which would spread motorized impacts across a larger area. Approximately 19% of the routes within ACECs would be closed for resource protection. This alternative would result in greater impacts to special status plants and their habitat.

Under Alternative D, fewer areas would be ROW avoidance or exclusion areas. In addition, Alternative D would put less emphasis on using utility corridors, and would manage eight corridors for facilities and utilities and 40,000 acres (1.7 times more acres than under Alternative B) as solar and wind emphasis areas. These actions could result in more habitat fragmentation and disturbance in previously undisturbed areas.

Under Alternative D, the BLM would manage 265,600 acres (12 percent fewer acres than under Alternative A) as acceptable for coal leasing, causing the types of impacts described above for mineral development under Effects Common to All Alternatives. Areas unacceptable for coal leasing on 43,800 acres (19 percent more acres than under Alternative A) would prevent special status species impacts from mineral development on these lands.

Under Alternative D, the BLM would manage 1,130,700 acres of federal mineral estate (1 percent fewer acres than under Alternative A) as open to fluid mineral leasing, causing the types of impacts described above for mineral development under Effects Common to All Alternatives. Federal mineral estate closed to fluid mineral leasing on 100,500 acres (4 percent more acres than under Alternative A), as well as stipulations on open lands, would prevent habitat and special status species impacts from mineral development on these lands. NSO stipulations would be applied on 497,800 acres of federal mineral estate (15 percent more acres than under Alternative A) and CSU stipulations would be applied on 471,500 acres of federal mineral estate (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), which would decrease the impact of fluid mineral development on special status species.

In addition to those effects discussed under *General Special Status Species*, the following habitat-specific effects would occur with implementation of Alternative D.

Sagebrush Habitats and Species

Sagebrush communities would be maintained through vegetation treatments, prioritizing winter Sage-Grouse (Greater and Gunnison) habitat for treatment and restoration, reducing pinyon-juniper encroachments, increasing habitat connectivity, and managing for age class diversity. Fire would be allowed in low-elevation sagebrush with reseeding, which would help reduce the likelihood of cheatgrass infestation. Impacts would be similar to those described under Alternative B.

Fewer and less stringent management actions would be implemented to conserve Gunnison and Greater Sage-Grouse under Alternative D, compared to the other action alternatives. Only the Roan and Carr Creeks wildlife emphasis area would be managed for Sage-Grouse habitat, and stipulations include a CSU for nesting and early brood-rearing habitat and TL within 0.6 mile of leks. However, actions to improve habitat and modify raptor perches would be the same as those described for Alternative B. Quantitative impacts on greater Sage-Grouse habitat under Alternative D are presented in **Table 4-43**, Impacts on Greater Sage-Grouse Habitat, Alternative D. Compared to Alternative A, Alternative D would have approximately the same acreage open and closed to livestock grazing and fluid mineral leasing, fewer acres as ROW avoidance and exclusion areas, and more acres open to mineral materials.

Table 4-43
Impacts on Greater Sage-Grouse Habitat, Alternative D

Resource	PPH (acres) (percent change from Alt A)	PGH (acres) (percent change from Alt A)
Livestock Grazing		
Open	5,400 (0 percent)	8,700 (0 percent)
Closed	0 (0 percent)	0 (0 percent)
Lands and Realty		
ROW avoidance	0[1]	0[1]
ROW exclusion	0 (0 percent)	0[1]
Mineral Resources		
Fluid minerals – open	5,600 (+1.8 percent)	8,900 (0 percent)
Fluid minerals – closed	0 (0 percent)	0 (0 percent)
Mineral materials – open	5,600 (+17 percent)	8,900 (+22 percent)
Mineral materials – closed	0[1]	0[1]
Travel Management[2]		
Limited for motorized and mechanized vehicles	5,600	8,900

[1]Quantitative comparisons were not made when one of the values was zero.
[2]Acres would not be closed or limited to motorized and mechanized vehicles under Alternative A, thus there are no quantified comparisons.

Overall, degradation of Sage-Grouse habitat would be more likely to occur under Alternative D.

Salt Desert Shrub Habitats and Species

Since many of the species that use salt desert shrub habitats also utilize sagebrush habitats, many of the impacts would be similar to those described previously for sagebrush habitats and species. Less stringent stipulations would be applied under Alternative D when compared to Alternatives B and C. A CSU stipulation would be required within active white-tailed prairie dog towns. A TL would be applied within active prairie dog towns and within 0.25-mile of active burrowing owl burrows and nest sites. As a result, impacts on these species would be more likely to occur under Alternative D. Kit fox protections, mainly afforded by a CSU stipulation within 200 meters of active kit fox dens, would be the same as under Alternative B.

Salt desert shrub habitats would be maintained through fire suppression, grazing management, and erosion control in greasewood communities.

Forest and Woodland Habitats and Species

In addition to the impacts described in **Section 4.3.5** under *All Fish and Wildlife Habitats*, the BLM would not manage to maintain or increase old-growth pinyon-juniper woodlands, and wood product sales and forest harvest would be allowed within currently occupied lynx habitat in the Lynx Analysis Unit.

Riparian and Wetland Habitats and Species
The types of impacts from vegetation and special status species management would be similar to those described under Alternative B, but Alternative D would require less stringent mitigation measures, and an NSO stipulation would not be required in riparian areas. As a result, impacts on these species would be more likely to occur under Alternative D. A TL stipulation for occupied cutthroat trout waters would directly protect cutthroat trout.

Under Alternative D, no segments would be managed as eligible or suitable under the WSR Act. Impacts on river-related values, including riparian and wetland habitats, may occur because there would be no standard for protection of those values. The BLM may protect those values through other land use prescriptions and stipulations in this RMP.

River and Stream Habitats and Species
Special status species management would be similar to that described under Alternative B, but under Alternative D, the BLM would designate only one ACEC for special status fish (The Palisade). In addition, the BLM would prioritize and implement management actions to achieve desired future conditions of rivers and streams. A TL stipulation for occupied cutthroat trout waters would directly protect cutthroat trout. Since Alternative D would require fewer and less stringent stipulations than the other action alternatives, impacts on river- and stream-dependent species would be more likely under Alternative D.

Under Alternative D, no segments would be managed as eligible or suitable under the WSR Act. Impacts on river-related values, including river and stream habitats, may occur because there would be no standard for protection of those values. The BLM may protect those values through other land use prescriptions and stipulations in this RMP.

Barren Habitats and Species
The types of impacts from special status species management would be similar to those described under Alternative B, but under Alternative D, a CSU stipulation (instead of an NSO stipulation under Alternative B) would be applied around special status bat species' roost sites and winter hibernacula. As a result, impacts on these species would be more likely to occur under Alternative D.

Cumulative
The CIAAs used to analyze potential impacts on special status fish, wildlife, and plants are included in the CIAAs for **Section 4.3.4** and **Section 4.3.5**.

Cumulative impacts on special status species are related to those described for vegetation and fish and wildlife. Past, present, and reasonably foreseeable future actions and conditions within the CIAA that have affected and would likely continue to affect special status species include mineral exploration and development, forestry, grazing, recreation, road construction, water diversion

and withdrawals, weed invasion and spread, prescribed and wildland fires, land planning efforts, vegetation treatments, habitat improvement projects, insects and disease, and drought. Many of these activities change habitat conditions, which then cause or favor other habitat changes. For example, wildland fire removes habitat, and affected areas are then more susceptible to weed invasion, soil erosion, and sedimentation of waterways, all of which degrade habitats. In general, resource use activities have cumulatively caused habitat removal, fragmentation, noise, increased human presence, and weed spread, whereas land planning efforts and vegetation, habitat, and weed treatments have countered these effects by improving habitat connectivity, productivity, diversity, and health.

Climate change could cause an increase or decrease in temperatures and precipitation, which would affect soil conditions, vegetative health, and water flows and temperature. Such changes would alter habitat conditions, potentially creating conditions that could favor certain species or communities, weeds, or pests. Since special status species often inhabit very specific microhabitats, small changes could cause large effects.

Under the Proposed RMP (Alternative B) and alternatives, impacts on special status species would be minimized to the extent practical and feasible through compliance with the ESA and BLM Manual 6840, restrictions, stipulations, closures to mineral exploration and development, recreation, motorized travel, designation of ACECs to protect certain special status species, COAs, and by concentrating development in previously disturbed areas. Habitat conditions would be improved through treatments, weed prevention and control, acquisition of water rights, use of prescribed and wildland fire, forestry management, and grazing management. Since Alternative D would emphasize more resource use and development, impacts on special status species would be more likely to occur under this alternative. As a result, Alternative D could significantly contribute to cumulative impacts on special status species. In contrast, the incremental contribution of Alternatives A, B, and C to cumulative impacts on special status species is expected to be less than significant.

4.3.7 Wild Horses

This section discusses impacts on wild horses from proposed management actions of other resources and resource uses. Existing conditions concerning wild horses are described in **Section 3.2.9**, Wild Horses.

Impacts on wild horses generally result from activities that affect available forage and water or cause harassment or disruption to the wild and free roaming nature of a herd. Forage conditions could generally be affected by surface-disturbing activities and use of forage by wildlife. Surface disturbance or restrictions on surface disturbance in the LBCWHR could affect forage conditions. Likewise, management actions that disturb or restrict access or

reduce disturbance to water resources could also affect wild horses or their habitat.

The wild and free-roaming character of wild horses is also integral to their preservation. Management actions that result in undisturbed natural areas with limited human presence or intervention preserve this character. In these areas, wild horses can be managed and viewed with limited impediments on their movement across the landscape. Management actions that alter the landscape and/or increase human disturbances and presence could reduce the wild and free-roaming nature of wild horses by disrupting their use of habitat and impeding normal wild horse behavior.

Methods of Analysis

Indicators of impacts on wild horses include the following:

- Changes in available forage and water
- Changes in AML
- Changes in body condition
- Changes in wild horse behavior

The analysis includes the following assumptions:

- The wild horse population will continue to increase through recruitment of foals. Recruitment rates will vary depending on fertility control program and natural mortality.
- Excess wild horses will be removed when monitoring data indicate there is no longer a thriving natural ecological balance in the LBCWHR.
- The LBCWHR wild horse herd will be managed within the AML range through gathers and the selected application of additional population control practices.

Effects Common to All Alternatives

Management of wild horses would help ensure healthier viable herds by preventing overpopulation that could lead to overgrazing ranges, damage to water sources, and increased competition with wildlife.

Healthy uplands, watersheds, and soils would increase the potential for increased forage and water productivity, which would indirectly benefit wild horses. Management actions designed to reduce erosion and maintain or improve soils and vegetative cover and reclaim disturbed areas could indirectly benefit wild horses by increasing forage plants and maintaining or improving the plant communities.

Proper management of springs and riparian areas would provide for additional forage areas and ensuring reliable water sources. Control or eradication of noxious weeds would provide improved forage for wild horses by increasing the potential for the presence and vigor of forage plants.

Protecting special status plants and special status species habitat could directly affect wild horses by limiting access to site-specific areas or preventing forage improvement projects. Conversely, protecting areas that support special status species could prevent activities that inhibit wild horse activities and could provide cleaner and more dependable water sources for wild horses in the long term.

Wildlife species could compete with wild horses for forage, water, and cover when they occupy the same area. For example, big game species such as elk compete for similar forage as wild horses. In the long term, management actions to improve water quality, improve vegetation conditions, and increase forage production would limit competition.

Wildland fire would have varying effects on wild horses, depending on fire size and intensity, the timing of the fire, and fuel moisture content. Wildland fire would initially displace horses, and depending on the proximity of the horses to the fire, horses could be stressed, injured, or killed. Wildland fire would remove vegetation and forage over the short term. Over the long term, wildland fire could improve forage production, especially when fire rehabilitation efforts are implemented. Restoring natural disturbance regimes such as fire, and using vegetative treatments to accomplish biodiversity objectives in resilient plant communities, would also benefit wild horses by maintaining a balance of seral stages.

Managing the Little Book Cliffs WSA (which overlays the LBCWHR) as VRM Class I would limit surface-disturbing activities that eliminate forage, harass wild horses, and disrupt the distribution and usage patterns of the herds.

Mineral extraction could temporarily or permanently remove forage areas for wild horses, depending on the location of the mineral extraction. The only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area. Activities associated with exploration and extraction could disrupt herd dynamics and open the potential for human activity to disturb herds. Loss of rangeland and forage could be mitigated by post-mining reclamation. Roads associated with mineral extraction would remove vegetative habitat until or if they were reclaimed and would increase opportunities for humans to disturb herds. Withdrawal or closure of areas for mineral development would reduce the potential for human-herd interaction and rangeland and forage loss. However, the LBCWHR would not be proposed for withdrawal from locatable mineral entry under any of the alternatives.

Protection of resources through mitigation measures, standard operating procedures, and BMPs would preserve and restore range health.

Applying NSO stipulations would prohibit surface occupancy and surface-disturbing activities in the LBCWHR year-round instead of solely during crucial foaling and development time periods, reducing the risk of forage degradation and disturbance of wild horses. The NSO stipulation acreages would vary by alternative.

The application of CSU stipulations would mitigate surface-disturbing activities and limit disturbances to wild horses and their habitat. The CSU stipulation acreages would vary by alternative.

While horses would not be excluded from certain areas within the LBCWHR, short-term impacts of recreation activities on wild horses include degradation of habitat, loss of forage, and spatial disturbance. Long-term impacts of recreation on wild horses include loss of forage, reduced forage palatability because of dust on vegetation, disturbance and harassment caused by increased levels of human activities, altering traditional use areas, and the potential for recreational opportunities that help foster stewardship of the wild horse herd. Long-term impacts on wild horse distribution and usage patterns would reduce the horses' free-roaming nature. However, management of the Little Book Cliffs WSA would prohibit many recreational activities that could impact wild horse behavior.

The short-term impacts of travel within the LBCWHR include degradation of habitat, loss of forage, and temporary displacement of horses. Long-term impacts of motorized use on wild horses include loss of forage, reduced forage palatability because of dust on vegetation, and disturbance and harassment caused by human and vehicle presence. These impacts are reduced when travel is closed or limited to designated trails. No areas would be managed as open for cross-country motorized use within the LBCWHR under any of the alternatives.

Any secondary road that is decommissioned or closed would benefit wild horses by limiting human access and allowing for revegetation. Actions to limit erosion and the spread of weeds would impact wild horses by improving the general health of wild horse habitat in the long term. However, if wild horses were the cause of erosion, changes would be made to AML or their behavior patterns. This could include treatment of other areas that could improve distribution of use. New roads would remove range forage and increase the possibility of human disturbance.

Short-term impacts from site-specific lands and realty actions such as small land transfers, construction of power lines and pipelines, and other construction activities within ROWs could include the temporary removal of forage and harassment and the displacement of wild horses. Long-term impacts from site-specific lands and realty actions include loss of forage, reduced forage palatability

because of dust on vegetation, and disturbance and harassment from increased levels of human activities. Managing ROW avoidance and exclusion areas would reduce impacts by mitigating or excluding surface-disturbing activities. Specific areas managed as ROW avoidance or exclusion areas differ per alternative and are identified below.

Continuing to manage the Little Book Cliffs WSA, which overlaps 22,800 acres (65 percent) of the LBCWHR, would result in direct and indirect impacts. In general, the protections afforded to the Little Book Cliffs WSA, such as restrictions on surface-disturbing and other disruptive activities, would reduce harassment of wild horses and would help maintain and improve vegetation conditions, thereby maintaining or improving the forage base. On the other hand, managing the area as a WSA would restrict some activities that would be beneficial for wild horse management, such as vegetative treatments and water facilities construction.

Interpretation and environmental education could serve as an important tool in fostering understanding and stewardship of the wild horse herd.

Climate change would impact wild horses under all alternatives, but wild horses may be more vulnerable to the impacts of climate change under certain alternatives. Resource uses in the planning area (e.g., livestock grazing, forestry, recreation, travel, lands and realty, and energy and minerals leasing and development) are stressors that may generally impact wild horses' ability to adapt to climate change. These impacts would likely be more harmful to wild horses under Alternatives A and D where there are fewer restrictions on resource uses. Under Alternative C, more stringent restrictions would limit the impact of these stressors (as described in the analysis under Alternative C, below). Wild horses' ability to adapt to climate change under Alternative B would likely fall between the other alternatives because resource use restrictions are generally more stringent than under Alternatives A and D, but less stringent than under Alternative C.

Implementing management for the following resources would have negligible or no impact on wild horses and are therefore not discussed in detail: air; cultural resources; paleontology; livestock grazing; lands with wilderness characteristics; national trails; national, state, and BLM byways; and WSRs.

Quantitative impacts pertaining to wild horses in the 35,200-acre LBCWHR are displayed in **Table 4-44**, Acreage Impacts within the Little Book Cliffs Wild Horse Range.

Table 4-44
Acreage Impacts within the Little Book Cliffs Wild Horse Range

Management Action	Alternative A	Alternative B	Alternative C	Alternative D
Motorized Use Limited to Designated Trails	29,100	9,400	9,300	10,100
Motorized Use Seasonally Limited	6,000	2,100	2,300	2,300
Closed to Motorized Use	0	23,600	23,600	22,800
ROW Avoidance Areas	30,400	10,900	100	13,300
ROW Exclusion Areas	2,600	23,700	33,600	22,800
Acceptable for Coal Leasing	16,600	8,200	8,200	9,000
Open to Fluid Mineral Leasing	12,400	12,400	0	12,400
Subject to NSO Stipulation	*4,600*	*12,400*	*0*	*5,300*
Subject to CSU Stipulation	*12,400*	*6,500*	*0*	*12,400*
Open for Mineral Material Sales	12,300	11,500	0	12,300
Open for Non-energy Mineral Leasing	12,300	0	0	12,300
SRMAs	4,600	0	0	0
ACECs	0	900	3,100	0

Source: BLM 2010a

Alternative A

Maintaining Coal Canyon as available for the placement of mine mouth facilities under Alternative A, which allows for a greater footprint of disturbance to accommodate facilities such as power plants, rather than the typical disturbance footprint of a mine, would limit wild horse habitat, reduce forage, and contribute to disturbance of the herd.

Under Alternative A, Stipulations TL-10, Wild Horse Winter Range, and TL-11, Wild Horse Foaling Area, would restrict mineral lease activities during certain crucial seasons for wild horse development, thereby preventing forage degradation or harassment of wild horses from other uses of public land.

Approximately 16,600 acres would be acceptable for coal development under Alternative A, temporarily or permanently removing forage areas for wild horses, depending on the location of the development. This is the greatest acreage acceptable for coal development under any alternative.

Approximately 12,400 acres would continue to be open to fluid mineral development under Alternative A, but 4,600 of those acres would be covered by an NSO stipulation and all 12,400 acres would be subject to a CSU

stipulation, greatly reducing the effects identified under Effects Common to All Alternatives.

Approximately 12,300 acres would be open to mineral material sales under Alternatives A. The types of impacts would be the same as identified under Effects Common to All Alternatives.

Approximately 4,600 acres of the LBCWHR would continue to overlap the Grand Valley IRMA under Alternative A. While IRMAs introduce additional opportunity for impacts on wild horses from increased recreational use, they also provide for increased management and control of conflicts.

Cross-country foot and horse travel would be allowed throughout the LBCWHR and cross-country mechanized travel would be permitted outside the WSA. There would continue to be 29,100 acres managed as limited to existing roads and trails for motorized travel, 6,000 acres with seasonal closures, and 0 acres closed to motorized use. Together, this alternative has the fewest restrictions on travel of any alternative. While the Little Book Cliffs WSA was not explicitly closed to motorized use in the 1987 RMP, the area is closed to motorized and mechanized use per BLM Manual 6330, Management of Wilderness Study Areas (BLM 2012i).

Prohibiting new ROWs or other surface-disturbing activities that would change the semi-primitive character in the LBCWHR would benefit wild horses by reducing potential effects on wild horses or their habitat from other uses of public land. Approximately 30,400 acres would be managed as ROW avoidance under Alternative A. Approximately 2,600 acres would be managed as ROW exclusion under Alternative A, less than under any other alternative. It should be noted, however, that within the Little Book Cliffs WSA, new ROWs could only be permitted for temporary uses that satisfy the nonimpairment criteria (BLM 2012i), providing some protection for wild horses and their habitat.

Alternative B

Management of desired plant communities under Alternative B would equally benefit a variety of resources. Management of woodland communities towards a mixture of seral stages would provide for an optimal forage base for wild horses.

Maintaining an appropriate AML and allowing adjustments based on defined conditions would benefit wild horse management under Alternative B. A proper AML assures a viable, healthy wild horse population in balance with healthy rangelands. Alternative B would provide additional protection for wild horses over Alternative A by prohibiting mineral material sales and non-energy mineral leasing activities.

Prohibiting target shooting in the Coal Canyon and Main Canyon areas of the LBCWHR would provide more protection for wild horses than under Alternative A by reducing the risk of harassment or accidental death.

Closing Coal Canyon to the development of mine mouth facilities under this alternative would reduce the potential impact on habitat and water sources in the area. Further protection would be provided by applying an NSO stipulation to the LBCWHR under this alternative. An NSO stipulation would prohibit all surface-disturbing activities, not just mine mouth facilities, which would further reduce potential impacts on the herd.

Approximately 8,200 acres within the LBCWHR would be acceptable for coal development under Alternative B (51 percent fewer acres than under Alternative A). The types of impacts would be the same as those described under Alternative A, but would occur over a smaller area.

Approximately 12,400 acres (same acreage as Alternative A) would be open to fluid mineral leasing under Alternative B, all of which would be subject to NSO stipulations (6,500 acres would be subject to CSU stipulations). The types of impacts would be the same as those described under Alternative A except that there would be stronger protections for wild horses because the NSO stipulations would cover a greater area.

No SRMAs within the LBCWHR would be identified under Alternative B. This would result in fewer focused recreation opportunities and fewer impacts from recreation in comparison to Alternative A, which has 4,600 acres managed as an IRMA that overlap the LBCWHR.

Closing the LBCWHR to motorized and mechanized over-snow travel would reduce the risk of harassment to horses during winter months. Under Alternative B, 9,400 acres of the LBCWHR would be designated as limited to designated roads and trails for motorized and mechanized travel (57 percent fewer acres than under Alternative A), 2,100 acres along Coal Canyon Road would contain seasonal closures, and 23,600 acres would be closed to motorized and mechanized travel, resulting in greater restrictions on travel and consequently less of an impact than under Alternative A.

Approximately 10,900 acres (66 percent fewer acres than under Alternative A) would be managed as ROW avoidance under Alternative B. However, approximately 23,700 acres (9.1 times greater than under Alternative A) would be managed as ROW exclusion, resulting in greater restrictions on ROW development and fewer impacts on wild horses than under Alternative A.

Designating the Mt. Garfield ACEC (of which 900 acres overlaps the LBCWHR) would indirectly protect forage, water sources, and the free-roaming nature of the horses through ROW exclusions and restrictions on mineral development.

Master Leasing Plan
The entire LBCWHR is within the Shale Ridges and Canyons MLP analysis area. Under Alternative B, protection would be afforded by using COAs and stipulations to restrict surface occupancy and surface-disturbing activities. For example, applying the proposed NSO leasing stipulation within the entire LBCWHR would reduce disturbances to wild horse habitat, including food sources, within that area.

Alternative C
Managing for desired plant communities with an emphasis on maintaining or enhancing special status species habitat would have a greater impact on wild horses than under Alternative B by decreasing the availability of multiple types of vegetative feed. Managing for pinyon and juniper with an emphasis on old-growth retention would also prevent the necessary mixed seral stage plant communities that provide optimal forage for wild horses as identified under Alternative B.

Minimizing the use of mechanized and chemical treatments would reduce the tools available to maintain vegetation types suitable for wild horses.

Alternative C would provide additional protection of wild horses over Alternative A by prohibiting mineral material sales and non-energy mineral leasing activities.

Closing Coal Canyon to the development of mine mouth facilities in addition to applying an NSO stipulation to the LBCWHR would have the same impact on wild horses as described under Alternative B.

Approximately 8,200 acres (51 percent fewer acres than under Alternative A) would be acceptable for coal development under Alternative C. The types of impacts would be the same as under Alternative A, but would occur over a smaller area.

Closing the LBCWHR to fluid mineral leasing would eliminate impacts associated with fluid mineral development.

The type of impacts from prohibiting target shooting and motorized over-snow travel in the LBCWHR would be the same as identified under Alternative B.

Impacts from SRMAs would be identical to those described under Alternative B.

Under Alternative C, 9,300 acres of the LBCWHR would be designated as limited to designated roads and trails for motorized travel (68 percent fewer acres than under Alternative A), 2,300 acres along Coal Canyon Road would contain seasonal closures, and 23,600 acres would be closed to motorized and mechanized travel, resulting in more restrictions on motorized and mechanized travel and fewer disturbances to wild horses than under Alternative A.

There would be approximately 100 acres (99 percent fewer acres than under Alternative A) managed as ROW avoidance and 33,600 acres (12.9 times more acres than under Alternative A) managed as ROW exclusion under Alternative C. The types of impacts would be the same as described under Alternative A, but the increase in acres of ROW exclusion would result in greater restrictions on ROW development and more protection for wild horses.

The types of impacts from designating the 5,700-acre Mt. Garfield ACEC (of which 3,100 acres overlaps the LBCWHR) would be similar to described under Alternative B, except that the larger amount of overlapping ACEC acreage would provide greater protection for wild horses.

Alternative D

The types of impacts from desired plant community management would be the same as described under Alternative C.

Alternative D would provide additional protection of wild horses over Alternative A by prohibiting mineral material sales and non-energy mineral leasing activities.

Closing Coal Canyon to the development of mine mouth facilities under this alternative would reduce the potential impact on habitat and water sources in the area.

Approximately 12,400 acres (the same as under Alternative A) would be open to fluid mineral development under Alternative D, all of which would be covered by a CSU stipulation and 5,300 acres (15 percent more acres than under Alternative A) of which would be covered by an NSO stipulation. The types of impacts would be the same as described under Alternative B, but because NSO stipulations would apply to fewer acres, there would be less stringent restrictions on fluid mineral leasing and surface-disturbing activities. The CSU stipulation would only require mitigating measures for fluid mineral leasing and could present the opportunity for activities harmful to the herd.

Approximately 9,000 acres (46 percent fewer acres than under Alternative A) would be acceptable for coal development under Alternative D, representing less of an impact from coal development than under Alternative A.

Impacts from SRMAs would be identical to those described under Alternative B.

Under Alternative D, 10,100 acres (65 percent fewer acres than under Alternative A) of the LBCWHR would be designated as limited to designated roads and trails, 2,300 acres along Coal Canyon Road would contain seasonal closures, and 22,800 acres would be closed to motorized and mechanized travel, resulting in more restrictions on motorized and mechanized travel and fewer disturbances to wild horses than under Alternative A.

Approximately 13,300 acres (56 percent fewer acres than under Alternative A) would be managed as ROW avoidance under Alternative D and approximately 22,800 acres (8.8 times more acres than under Alternative A) would be managed as ROW exclusion. The types of impacts would be the same as described under Alternative A, but the increase in acres of ROW exclusion would result in greater restrictions on ROW development and more protection for wild horses.

Cumulative

The CIAA used to analyze cumulative impacts on wild horses includes the entire planning area because impacts are expected to be limited to those actions originating within the planning area.

Cumulative impacts on wild horses are similar to those described under Effects Common to All Alternatives, above. Wild horses would directly benefit from actions to increase forage opportunities, to continue to retain no livestock grazing within the LBCWHR, to improve range conditions, to maintain or improve water sources, and to eliminate barriers to movement. Wild horse would indirectly benefit from restrictions on motorized travel or other potentials for disturbance from people, vehicles, and industrial activity.

Managing within the AML based on monitoring and range carrying capacity would benefit wild horses by preventing overpopulation, which could lead to overgrazing and range deterioration, which in turn could lead to impaired herd health.

4.3.8 Cultural Resources

This section discusses effects on cultural resources from proposed management actions of other resources and resource uses. Existing conditions concerning cultural resources are described in **Section 3.2.11**, Cultural Resources.

Cultural resources are past and present expressions of human culture and history in the physical environment. The term "cultural resource" can refer to archaeological and architectural sites, structures, or places with important public and scientific uses, and may include locations (e.g., sites, natural features, resource gathering areas or places) of traditional cultural or religious importance to specified social and/or cultural groups.

The primary goals of cultural resource management are to identify and evaluate these resources, to determine their appropriate uses or management, and to administer them accordingly, both on public lands and on other lands where BLM decisions could affect cultural resources. The objective of cultural resource management has several parts: preserving sites and landscapes, promoting public outreach and education, encouraging professional and academic research, and facilitating Native American traditional uses and consultation with interested groups.

Methods of Analysis

Effects on cultural resources would primarily result from unmitigated surface disturbance, such as cross-country travel, wildfires, wildfire suppression activities, erosion, unauthorized collection, vandalism, and trampling. Direct and indirect effects on cultural resources result from any surface-disturbing activity or alteration to the integrity of the resource, including setting. Federal actions defined as federal undertakings under Section 106 of the NHPA require the identification, evaluation, and consideration of adverse effects and the appropriate mitigation of those effects. Nearly all implementation actions would be subject to further cultural resource review before site-specific projects are authorized or implemented. If adverse effects are identified, mitigation measures, including avoidance, would have to be considered to minimize or eliminate the effects.

It is important to note that cultural resource inventory and mitigation—such as data recovery—associated with multiple use surface-disturbing actions can affect cultural resources by contributing to the identification, preservation, protection, and/or scientific knowledge of cultural resources. Cases of mitigation where data recovery or excavation is involved provide for unique opportunities to acquire data and scientific knowledge about the past that otherwise would not be learned through surface inventory. These methods of data recovery are inherently destructive and while they result in adding to our current understanding of the past, they prevent future researchers, who might have better scientific techniques, from recovering data at the impacted locations. Also, these methods may not be preferred by Native American Tribes or other interested parties.

Effects from unauthorized cross-country travel, wildfires, wildfire suppression activities, erosion, unauthorized collection, vandalism, and trampling are not usually considered under Section 106 of NHPA and could result in the unmitigated loss of cultural resource information. Most effects are difficult to quantify because the locations of most cultural resource sites in the planning area are unknown, assessment of most known locations are limited to brief surface evaluations during Class III inventory, monitoring of known locations is difficult, and planning-level alternatives typically do not identify specific areas for surface-disturbing activities.

Effects on cultural resources occur when there is damage or loss of these resources or their settings. The primary indicator for determining if an effect would occur is the effect on cultural resources eligible for listing on the NRHP or areas of importance to Native American or other traditional communities. Indicators of effects on cultural resources include the following:

- Extent of ground surface-disturbing activities and their potential for affecting known or unknown cultural resources, or areas of importance to Native American or other traditional communities

- Increased access to, or activity in, areas where resources are present or anticipated. Vandalism or unauthorized collecting can destroy a cultural resource in a single incident. Public access to areas where cultural resources are present can increase the risk of vandalism or unauthorized collection of materials.
- The extent to which an action changes the potential for erosion or other natural processes that could affect cultural resources. Natural processes, such as erosion or weathering, will degrade the integrity of many types of cultural resources over time. Human visitation, recreation, vehicle use, livestock grazing, fire, trampling, and other activities can increase the rate of deterioration through natural processes.
- Measures that withdraw land or restrict surface development for the purpose of resource protection can provide direct and indirect protection of cultural resources from disturbance and from incompatible and unauthorized activities
- The extent to which an action alters the setting (such as visual and audible factors) where relevant to certain cultural resources
- The extent to which an action alters the availability of cultural resources for appropriate uses, including access to spiritual sites or traditional resource gathering areas by Native Americans

For this analysis, effects on cultural resources would be significant if cultural resources listed or eligible for listing on the NRHP or similar state register or allocated to a use category where long-term preservation is an objective (inadvertently or intentionally) were damaged, destroyed, or lost or removed from federal protections without appropriate mitigation. The analysis includes the following assumptions:

- Effects on cultural resources are assessed by applying the criteria of adverse effect, as defined in 36 CFR, Part 800.5a: "An adverse effect is found when an action may alter the characteristics of a historic property that qualify it for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the action that may occur later in time, be farther removed in distance, or be cumulative."
- The criteria of adverse effect provide a general framework for identifying and determining the context and intensity of potential effects on other categories of cultural resources as well, if these are present. Assessment of effects involving Native American or other traditional community, cultural, or religious practices or resources also requires focused consultation with the affected group.

- The BLM will comply with 36 CFR 800, Section 106 (including Native American consultation) and the Colorado Protocol when addressing federal undertakings; therefore, adverse effects on known cultural resources would be appropriately mitigated.
- The Archeological Resources Protection Act of 1979, as amended, provides permitting for the authorized removal of archaeological material through data recovery and excavation enforcement and legal remedies for all unauthorized removal of archaeological resources from federal land.
- Human occupation of North America for more than 10,000 years has left its mark on all landforms. The attributes by which the significance of a site is evaluated may be manifest on the surface, slightly obscured by soil deposits, or deeply buried.
- There may be areas of importance to contemporary Native Americans that are not readily identifiable outside of those communities.
- Although there is limited information on cultural resources in the planning area, prehistoric and historic archaeological sensitivity overlays have been developed in conjunction with the Class I cultural resources inventory. These models are based on the results of research and compliance inventory projects and depict the relative potential for cultural resource sites within the planning area. However, as these data are geographically biased toward past project-oriented undertakings, this analysis does not attempt to quantify affected resources.
- Cultural resource protection and mitigation measures apply to all federal discretionary actions or federally funded actions (undertakings) and to leases granted by BLM, and would be applied at project design and implementation phases.
- Cultural resource inventories, initiated by either federal undertakings or Section 110 inventories, would result in the continued identification of cultural resources. Cultural Resources are also reevaluated and new information can result in a change to a site's eligibility or allocation. The cultural resource data acquired through these inventories and evaluations will increase overall knowledge and understanding of the distribution of cultural resources in the region.
- Effects on known cultural resource sites from authorized uses would be mitigated after appropriate Section 106 consultation requirements are met. Mitigation can include project cancellation, redesign, avoidance, or data recovery.

- The number of sites that could be affected by authorized actions depends on the type and quantity of surface-disturbing activities within the planning area and the cultural sensitivity of the area.

Effects Common to All Alternatives

Cultural resource compliance actions would continue under all alternatives. New protective measures based on cultural resource use categories would be expanded under Alternatives B, C, and D. Likewise, additional measures addressing protection of Native American resources and traditional uses would be expanded under the three action alternatives.

Potential effects from subsequent undertakings for all resources, resource uses, and special designations would be addressed at the project design and implementation phase. Required separate compliance with Section 106 would result in the continued identification, evaluation, mitigation, and nominations to the NRHP. Effects on cultural resources eligible for listing in the NRHP would be avoided or mitigated. If previously undiscovered resources are identified during an undertaking, work would be suspended while the resource is evaluated and mitigated to avoid any further effects. Consultation would continue with Native American groups to identify any traditional cultural properties or resource uses and address effects. Through this process, effects would be minimized or eliminated, although residual effects and adverse effects as defined by 36 CFR, Part 800 would be possible. Many cultural resources are evaluated only by their surface manifestations and many resources evaluated as not eligible may actually be eligible, but these are lost through project implementation. Effects, especially on unidentified resources, resulting from ongoing unevaluated or unsupervised activities, natural processes, and unanticipated events such as wildfire, would continue.

Actions to protect watersheds and municipal source waters through surface use restrictions and erosion controls would provide incidental protections from effects due to surface disturbance and erosion. Some water sources and features may be important to Native Americans and actions that protect and maintain these water features and native plant and animal natural resources would help preserve these tribal values and traditional resources. Actions to modify or remove water control structures, develop wells, acquire water rights and sources, and modify water features include risks of disturbance of cultural resources and traditional uses and values through ground-disturbing activities, livestock trampling, changes in access, visibility, and setting of water features and changes to the water features themselves. As for all resources, effects on cultural resources would be evaluated for these undertakings, and protections and mitigations would be applied at project design and implementation phases.

Soil protection measures would seek to limit erosion resulting from ground-disturbing activities and actions on steep slopes. Many cultural resources are susceptible to erosion damage, including modifying spatial relationships of

artifacts and destroying features and stratified deposits. The information loss is relevant to the site function, dates of occupation, subsistence, and past environments; all of these are important to understanding past culture. These measures to protect soils could preserve the integrity of cultural deposits and prevent damage from natural processes.

Vegetation management measures addressing land health, plant diversity, restoring natural processes, promotion of desired plant communities, maintaining forest health, reducing effects on rangeland during drought, and eliminating weeds would largely be compatible with cultural resource management goals and preservation. Many of the measures would reduce the potential for erosion of cultural sites, maintain and improve soil health, maintain or restore the historic setting, and protect plant resources that may be important to Native American communities. However, mechanical, biological, and chemical treatments could affect cultural resources and could restrict access to resources for cultural purposes during treatment. Ground-disturbing mechanical vegetation treatments could modify the spatial relationships of artifacts and site features and break artifacts. Chemical treatments could alter the chemistry of soils and artifact residues and affect the reliability of dating surface features and affect artifact residue analysis. Use of fire as a treatment could affect flammable cultural resource artifacts and features, cause spalling and staining of rock (either as a surface for rock art or as part of a feature or structure), and distort the temporal and functional analysis of artifacts.

Measures to protect special status species and measures protecting other fish, wildlife, and plants include protective designations and stipulations and restrictions on surface and vehicle use that would provide protections for cultural resources from effects due to surface disturbance, erosion, effects on setting and access leading to vandalism, inadvertent damage, and unauthorized collection of cultural resources. Protective measures may inhibit Native American cultural uses in some areas.

The effects of wild horses or actions of managing the wild horses on cultural resources are similar to those for livestock grazing. Improper grazing and trampling reduces vegetative cover and disturbs the soil, which accelerates erosion and weathering. Cultural resources can be directly affected by the modification, displacement and loss of artifacts, features, middens, and loss of culturally important plants. Effects can also occur from land treatments or can be intensified when animals are concentrated near water sources where cultural resources may be present. Maintaining the LBCWHR as defined would avoid effects on other areas by concentrating effects to the defined area. Improving rangeland health and surface use restrictions on other activities could reduce the potential for effects on the physical integrity and setting of cultural resources.

The alternatives vary in current and proposed VRM class objectives. Cultural resources and cultural landscapes can contribute to the visual character and may be considered in determining VRM classifications. Managing areas as VRM Class I and II provide protection of cultural resources where visual setting is a contributor to the significance of the property or the traditional use. Effects would be directly and indirectly reduced where designations limit surface-disturbing activities in the more sensitive VRM class areas. Use of the visual resource contrast rating system during project planning could reduce the effect of visual intrusions on cultural resources, but projects may be directed to VRM Class IV or undesignated areas where cultural resources may be present. Visual intrusion on the setting of cultural resources must be considered in the Section 106 process and tribal consultation, regardless of VRM designation.

Wildland fire would have the potential to result in direct disturbance or loss of cultural resources through the destruction or modification of structures, features, artifacts, cultural use areas, and culturally modified trees. Organic materials are especially vulnerable to heat damage. Fire management activities would involve ground-disturbing activities that could also directly affect cultural resources by altering the spatial relationships within archaeological sites. Also, fire retardant chemicals and heat could affect the accuracy of paleobotanical or radiocarbon data obtained from cultural resources. The removal of vegetation increases the visibility of cultural resources and exposes previously undiscovered resources. Sites exposed by fire or prepared for fire avoidance in prescribed burns are more susceptible to unauthorized collection, vandalism, and subsequent erosion. The risk of adverse effects on cultural resources is greatest from unplanned wildland fire since the locations of cultural resources are less likely to be known and avoided. Effects from prescribed fire would be similar to those of wildland fire, but prescribed fire is an undertaking subject to project-level analysis and Section 106 process. Ute Traditional leaders make a distinction between human intervention and ignition (both prescribed and arson) and natural ignition fires.

Forestry resource uses can lead to effects depending on the methods used, the amount of ground-disturbing activity permitted, and the potential for subsequent erosion. Increasing access for commercial harvesting of forest products can also lead to direct disturbance and erosion, alterations of the setting, vandalism, and unauthorized collection. Management measures vary between alternatives and include restrictions targeting culturally sensitive areas as well as other areas where incidental protection of cultural resources would occur. Measures that include thinning and other less ground destructive treatments and techniques would have less effect on cultural resources than intensive management. Measures that contribute to the restoration and preservation of forest health and structure may preserve Native American uses and their settings.

In areas open to grazing, livestock grazing is associated with ongoing effects on or near the ground surface. Improper grazing and trampling reduces vegetative cover and disturbs the soil, which accelerates erosion and weathering. The modification, displacement, and loss of artifacts, features, and middens results in loss of valuable cultural resource information regarding site function, date of use, subsistence, past environments, and other research questions. Trampling and grazing can also affect Native American use areas and culturally important plants. Effects on cultural resources occur more frequently where livestock concentrate such as permanent and intermittent water sources. The construction or maintenance of range improvements such as springs, reservoirs, fences, corrals, and livestock trails have the potential to affect cultural resources, especially if these areas have not been previously inventoried. File searches are conducted at the time of permit renewal with a recommendation for inventories and/or site evaluations in areas with a high potential for cultural resources where livestock congregate, and, if conflicts exist, mitigation measures are proposed. Range improvements are an undertaking subject to project-level analysis and Section 106 process and protections and mitigations would be applied at project design and implementation phases. In all alternatives, cultural resources in areas closed to livestock grazing are directly protected.

Actions under all alternatives to protect springs and wetland riparian areas from livestock grazing would help protect water features and sources that may be culturally important to tribes. Actions that improve rangeland health could reduce the potential for effects from direct disturbance, erosion, and wildland fire.

Increased recreation use can affect cultural resources and sensitive Native American resources through direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to setting, and unauthorized collection or vandalism. The potential for effects on cultural resources increases when there is an increase in population, there is a change in recreation use that alters the visual or audible character of the setting, or when recreational use is concentrated in sensitive areas. The effect of repeated uses or visits over time could also increase the intensity of effects due to natural processes. Repeated visits to sites can create social trails, directing more people to sites that may not be recorded or sites that have not been allocated to Public Use. Increased access to more remote areas can lead to effects on undisturbed resources. Continuing and enhancing interpretation and public education can vest the public in resource protection and respect for Native Americans and cultural values.

Depending on area-specific recreation objectives, areas managed as SRMAs or ERMAs may increase the intensity of permitted use of these areas and the risk for direct, indirect, and inadvertent damage to cultural and Native American resources from camping, visitor use, recreation, vandalism, firewood gathering, and other activities. An increase in human presence can also intrude on settings

that may be important for cultural resources or Native American uses. In some cases, SRMA or ERMA objectives may enhance protections of cultural resources by limiting or redirecting recreation activities away from sensitive resources. Area-specific recreation objectives promoting interpretation and education can integrate cultural resource information and stewardship messages to enhance protection of cultural resources. NSO stipulations to preserve recreational areas or scenic landscape values may also provide incidental protection for cultural resources.

Existing travel management without limitation or designation can result in serious effects. Restricting motorized and mechanized use to existing or designated trails reduces the risk of disturbing cultural resources located off trails and helps protect the integrity and setting of sensitive Native American resources from effects. The closure of areas to multiple methods of travel provides the greatest protection for cultural resources as long as administrative access is maintained to permit Native American access for identified cultural uses. The Comprehensive Travel and Transportation Management alternatives vary in the location and extent of travel restrictions. Direct effects should be identified through inventory, and adverse effects addressed through avoidance by redesign or mitigation. Ongoing indirect effects on cultural resources from use of designated trails are less likely to be detected or monitored and enforcing restrictions is difficult. Unauthorized travel would probably continue, and the potential risk of unauthorized collection or vandalism due to creation of unauthorized access would likely continue.

All alternatives include provisions to retain and acquire lands that contain significant cultural resources and culturally sensitive areas, to maintain access to resources, to reduce incompatible uses, and to minimize disturbance when delineating ROWs. The potential acquisition of new land would provide long-term federal consideration under the NHPA to any cultural resources included in the transaction and could enhance currently managed resources by consolidating holdings and potentially protecting the setting of cultural resources. Land tenure adjustments and new transportation facilities that allow for better access to public lands could facilitate cultural uses but could also lead to vandalism or unauthorized collection of cultural resources. Exchange or disposal of lands to nonfederal entities would permanently remove federal protections for any significant cultural resources present, which would be an adverse effect under the NHPA. Exchanges, disposal, and subsequent landscape changes could also result in effects on the setting of cultural resources.

The development and operation of transportation systems, pipelines, transmission lines, communication sites, renewable energy resources, and other land use authorizations can disturb large tracts of land containing many cultural resources and affect the setting of cultural resources over a great distance. Defining exclusion and avoidance areas for ROWs and other realty actions reduces the potential for effects on cultural resources resulting from

discretionary actions at those locations. Siting ROWs along existing corridors does not reduce the potential for effects on cultural resources.

Potential effects associated with the exploration and development of coal resources, oil and gas, oil shale, geothermal resources, locatable minerals, mineral materials, and non-energy leasable minerals include physical disturbance and loss of setting. However, the only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area. Archaeological deposits, historic structures, cultural landscapes, and Native American resources are affected by disturbance for facilities and roads; visual and aural intrusions; interference with cultural uses; and increased access that can lead to vandalism and unauthorized collection. The alternatives vary in amount of land and locations available for each kind exploration and development and the applicable requirements according to the objective of each alternative. The acreages in the planning area open to exploration and development vary widely by leasable, locatable, or salable mineral commodity. Depending on the alternative adopted, specific areas of the planning area could be subject to new disturbance and further development.

Discretionary mineral exploration and development activities are subject to further cultural resource review at each stage of development either through the Section 106 process, mine regulations, or permitting stipulations. Measures restricting activities that could affect cultural resources sites or requiring additional mitigations would maintain protection for these resources. Withdrawals for preserving natural resources would provide additional indirect protection for cultural resources and Native American resources in those locations from ground disturbance and alterations to setting alteration. Potential ongoing effects in the vicinity of existing mines and drilling locations would continue.

Surface use restrictions, completion of the NHPA Section 106 process, and permitting stipulations would mitigate or prevent many potential effects. However, potential effects on Native American resources and their settings would likely be difficult or impossible to adequately mitigate across the entire decision area, and any alterations to the landscape could affect the setting of cultural and Native American resources.

Nondiscretionary mining notices are not federal undertakings and are therefore not subject to NHPA regulations, but 43 CFR 3809 prohibits mining operators on claims of any size from knowingly disturbing or damaging them. Mining notices must be reviewed within 15 days, even though it may be difficult to determine the presence of resources in areas that have not been inventoried.

Areas with special designations, such as ACECs, are afforded special management measures designed to protect a variety of resource values, including geologic, botanic, historic, cultural, scenic, fish and wildlife resources,

and rare or exemplary natural systems, or to protect human life and property from natural hazards. Protections afforded by the management measures for other resources would provide incidental protections for cultural resources. Management measures vary but include surface use restrictions, ground disturbance restrictions, prohibitions on motorized uses, VRM classifications, and other restrictions on incompatible activities. Designation may help preserve and enhance culturally important natural resources, but in some instances restrictions could impede Native American access and uses. Designations may attract more recreational use and the potential for inadvertent effects on cultural resources from recreation or intentional vandalism or unauthorized collection. Increased use of the internet by interested individuals to disseminate site location and encourage visitation to sites that are unrecorded or have not been allocated to public use can expose cultural resources to impacts.

Effects from managing four WSAs totaling 96,500 acres would be similar to those described for managing ACECs, but more restrictive management actions in WSAs would further reduce the potential for effects.

Measures for interpretation, environmental education, use of cultural resources in SRPs, and promotion of national, state, and BLM byways may enhance appreciation and understanding of the fragile and finite nature of cultural resources; however, it can also lead to effects from access, degradation from use, vandalism, and unauthorized collection. Therefore, resources that are not suitable for public uses are not allocated to that use category and are not included in interpretation or education projects or SRPs.

Implementing management for the following resources would have negligible or no impact on cultural resources and are therefore not discussed in detail: air quality and paleontology.

Alternative A

BLM policy requires that management concerns for cultural resources be addressed through the allocation of recorded and projected resources to "use categories" as identified in BLM Manual 8110.42. Current management of cultural resources under Alternative A in the planning area does not include these proactive measures for consideration of scientific, educational, recreational, traditional, or experimental purposes and the development of appropriate management prescriptions. Alternative A does not include other proactive goals, objectives, and actions to accommodate and enhance Native American uses and values in their traditional homeland. Cultural resource compliance would continue as described in the methods and assumptions section, and effects would be as described under Effects Common to All Alternatives.

Alternative A would continue current measures, stipulations, and surface occupancy restrictions for the protection of soil, water, watersheds, vegetation, fish and wildlife, and special status species that would provide indirect

protection of cultural resources, and potential Native American uses and values. These include restricting surface disturbance, reducing erosion, and reducing access and use. Including a 4,600-acre NSO stipulation for cultural resources, NSO stipulations designed to protect several different resources would be applied on 433,000 acres in this alternative, directly and indirectly protecting cultural resources by restricting surface disturbance. Cultural uses may be inhibited by vegetation treatments and access restrictions.

Prescribed fire is permitted for natural resource benefit. Wildland fire and fire suppression have the potential to result in direct disturbance or loss of cultural resources, especially in areas where resources have not been inventoried or cannot be considered in an emergency response.

Under Alternative A, indirect protections of the visual setting of cultural resources through VRM Class I and II designations would continue on 159,200 acres. Designations in these areas could also limit surface-disturbing activities protecting effects on cultural resources. However, 696,100 acres would remain undesignated under this alternative, and projects may be directed to culturally sensitive areas.

General effects due to livestock grazing are described under Effects Common to All Alternatives. Alternative A has the most land open for grazing (978,600 acres) and the least amount closed (48,600 acres).

General effects due to recreation are described under Effects Common to All Alternatives. Four special management areas on 358,300 acres (Bangs Canyon SRMA, North Fruita Desert SMA, Gateway IRMA, and Grand Valley IRMA) and one ERMA (703,100 acres) for recreation would be managed under Alternative A. Recreational uses are not as structured under this alternative, and the risk of effects on cultural resources is likely greater.

Current management designates 445,400 acres of the decision area as open to cross-country motorized use and 12,500 acres as open to intensive motorized use. Inventories were not conducted prior to allowing this use, and it is expected that effects on cultural resources have occurred and are ongoing through direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to setting, and access leading to unauthorized collection or vandalism.

Effects from land and realty actions are described under Effects Common to All Alternatives. Alternative A identifies 441,400 acres as ROW avoidance and 234,900 acres as exclusion areas for utility development. Seven corridors are managed as such, concentrating potential development and alterations to setting in those areas. Policy and standard stipulations address effects on cultural resources from lands and realty actions.

Five ACECs totaling 28,900 acres (Badger Wash, The Palisade, Pyramid Rock, Rough Canyon, and Unaweep Seep) are afforded special management measures to protect a variety of resource values that would also protect cultural resources from incompatible uses. While all ACECs include cultural resources, the cultural resources of Rough Canyon are specific ACEC values in the designation. Protections include closures, limitations on motorized use, and surface and ROW restrictions.

Land adjacent to eligible WSR segments totaling 99.5 miles through BLM-administered land would receive indirect protection from incompatible development and ground-disturbing activities under Alternative A. Increased use of these areas by the public, based on the designations, may lead to effects.

Alternative B

Under Alternative B, cultural resource management measures would allocate cultural resources to "use categories" as identified in BLM Manual 8110.42 and incorporate additional actions to accommodate Native American traditional uses.

Proactive management actions would be implemented based on allocations of cultural resources to scientific, educational, recreational, traditional, or experimental use. Actions include NSO stipulations for the resource and a buffer surrounding the resource. Specific acreages for NSO stipulations driven by cultural resources are unavailable, but NSO stipulations for all resources would be applied on 371,500 acres (12 percent fewer acres than under Alternative A) under this alternative. Additional actions include the nomination of resources to the NRHP; cultural resource management plans and NSO stipulations for East and West Indian Creek areas; cultural resource management plans guiding public and scientific uses; and subsurface inventory requirements for construction disturbance for the identification and documentation of buried resources. CSU stipulations would be applied on 642,400 acres (including 53,500 acres for cultural resources) of federal mineral estate for all resources (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate). Incorporating these actions would provide some additional protection of cultural resources and their settings from incompatible activities such as development, surface disturbance, vehicle use, vandalism, unauthorized collection, and visual intrusions. These allocations would also provide early guidance for identifying and resolving conflicts from land uses, for avoiding effects, and for developing appropriate mitigation options. Cultural resources discharged from management include those resources that no longer meet active management objectives of the other five use categories.

BLM would implement actions to identify and protect traditional cultural properties, collaborate with Native American tribes in the management and interpretation of resources important to them, and enhance opportunities to

exercise Native American traditional use of cultural landscapes, cultural properties, and important plant resources. In addition to NSO buffers, the BLM would also nominate traditional sites to the NRHP, develop cultural resource management plans, and formalize protocols for gathering information for identifying sites that are important for cultural and religious purposes.

Managing cultural properties according to use categories does not replace BLM's compliance obligations under the NHPA. Cultural resource compliance would continue as described in the methods and assumptions section. Effects would be as described under Effects Common to All Alternatives.

Alternative B would expand current measures, stipulations, and surface occupancy restrictions for the protection of soil, water, watersheds, vegetation, fish and wildlife, and special status species. As described under Effects Common to All Alternatives, these measures would provide indirect protection of cultural resources and their settings and may enhance resources important for Native American uses. Expanded vegetation and fuel treatments to meet habitat and land health objectives may temporarily inhibit access for Native American cultural uses. Alternative B would also include a full range of wildfire management actions. Wildland fire and fire suppression have the potential to result in direct disturbance or loss of cultural resources, especially in areas where cultural resources have not been inventoried or cannot be considered in an emergency response.

Under Alternative B, indirect protections of the visual setting of cultural resources through VRM Class I and II designations would be expanded to 491,100 acres (3.1 times more acres than Alternative A). Designations in these areas could also limit surface-disturbing activities, reducing effects on cultural resources. Cultural resources in VRM Class III and IV on 570,500 acres (2.8 times more than Alternative A) would not benefit from these indirect protections, and projects may be directed to culturally sensitive areas.

General effects due to livestock grazing are described under Effects Common to All Alternatives. Alternative B reduces the amount of land open for grazing to 960,500 acres (2 percent fewer acres than under Alternative A) and increases the amount closed to 66,600 acres (37 percent more acres than under Alternative A).

General effects due to recreation are described under Effects Common to All Alternatives. Alternative B adds additional measures to structure recreational opportunities in SRMAs and ERMAs. Cultural resource inventories would be required prior to surface-disturbing implementation actions. The BLM would manage 5 SRMAs totaling 87,200 (Bangs, Dolores River Canyon, Grand Valley OHV, North Fruita Desert, and Palisade Rim) (75 percent fewer than under Alternative A). These include important cultural resource values. Additional surface use stipulations would be implemented that can indirectly protect cultural sites from large-scale disturbance, but effects from recreational use

could still occur. There may be opportunities to further structure recreational opportunities to avoid effects or provide interpretive or educational information. Six individual ERMAs totaling 217,400 acres (69 percent fewer acres than under Alternative A) would be recognized to provide for targeted recreation opportunities.

Alternative B would reduce to 10,200 acres the area open to intensive cross-country motorized use (18 percent fewer acres than under Alternative A) and limit motorized travel to designated routes on 925,200 acres (4.1 times more acres than under Alternative A). Mechanized travel, which is not subject to planning area-wide route designations under Alternative A, would be limited to designated routes on 931,900 acres. Foot and horse travel would be limited to designated routes on 3,900 acres and foot and horse travel would be prohibited in Pyramid Rock. As compared to Alternative A, these actions would greatly reduce the potential for effects on cultural resources over a wide area from direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to setting, and access leading to unauthorized collection or vandalism. These effects would be primarily concentrated in the 10,200 acres open to intensive cross-country use and in the vicinity of designated trails for all uses.

The mileages of routes are proposed to be designated administrative-only or closed based upon cultural resources planning criteria are shown in **Table 4-45**.

Table 4-45
Route Designations and Cultural Resources Planning Criteria under Alternative B

Planning Criteria	Final Designation Administrative Use (miles)	Final Designation Closed (miles)	Total miles designated as Administrative Use or Closed
High Potential Cultural	243	645.4	888.4
Known Cultural Sites - in/through, proximate, visible or nuisance	126.7	278.5	405.2
Historic Trail	0	1.7	1.7
Total	**369.7**	**925.6**	**1,295.3**

Source: BLM 2010a

Effects from land and realty actions are described under Effects Common to All Alternatives. Defining exclusion and avoidance areas for ROWs and other realty actions reduces the potential for effects on cultural resources resulting from discretionary actions at those locations. Alternative B identifies 789,400 acres (79 percent more acres than under Alternative A) as ROW avoidance and 210,000 acres (11 percent fewer acres than under Alternative A) as exclusion areas for utility development. Managing for only five corridors would concentrate potential development and alterations to setting in those areas. The cultural resources at Indian Creek ACEC would be in an ROW exclusion area.

Alternative B includes three units covering 44,100 acres that would be managed for wilderness characteristics (Bangs, Maverick, and Unaweep). Cultural resources are important supplemental values to an area's wilderness characteristics and can be protected by management measures such as NSO and CSU stipulations, ROW exclusion, travel restrictions, and mineral closures.

Alternative B would increase the number of ACECs to 13 totaling 123,000 acres (same five as Alternative A as well as Atwell Gulch, Dolores River Riparian, Indian Creek, Juanita Arch, Mt. Garfield, Roan and Carr Creeks, Sinbad Valley, and South Shale Ridge) (4.2 times more acres than under Alternative A). Special management measures in the ACECs vary but may include surface use restrictions and closures, travel management measures, ROW exclusions, and other stipulations that would restrict incompatible uses. In ACECs, an exception would be granted for ROWs to existing oil and gas leases issued under the 1987 RMP without NSO stipulations.

While all ACECs include cultural resources, the cultural resources of Atwell Gulch, Indian Creek, Rough Canyon, Sinbad Valley, and Pyramid Rock are called out as having ACEC values. The Pyramid Rock ACEC would be managed as unacceptable for further consideration of coal leasing and development under this alternative, protecting sensitive cultural resource values in the ACEC from potential subsidence impacts.

Identifying 10.38 miles (89 percent fewer miles than Alternative A) of the Dolores River as suitable for inclusion in the NWSRS would provide indirect protection through CSU stipulations and ROW avoidance measures.

Surface use stipulations and ROW avoidance measures create a 50-meter buffer along the Old Spanish National Historic Trail and may provide protection of any archaeological resources associated with the trail and help preserve the trail setting. Tabeguache Trail would not be proposed as a National Recreation Trail. This would help avoid potential surface effects on cultural resources from recreational use and possible vandalism associated with designation.

Alternative B would expand interpretation and environmental education programs that could lead to protection and appreciation of cultural resource values in the decision area.

Implementing the Shale Ridges and Canyons MLP may reduce impacts on cultural resources when COAs applied to new and existing leases in the MLP analysis area reduce surface-disturbing activities and the potential for disturbing or damaging cultural resources. NSO stipulations would also restrict the location of drilling locations in sensitive areas. This would be especially true in areas managed specifically to protect cultural resources, such as Castle Rock and Pyramid Rock. Mitigation would reduce inadvertent damage to cultural resources.

Alternative C

Cultural resource management measures would be the same as described under Alternative B. The BLM would allocate resources to "use categories" and use these to define proactive management measures to meet desired outcomes. These allocations would provide early guidance for identifying and resolving conflicts from land uses, for avoiding effects, and for developing appropriate mitigation options. The BLM would also implement the measures to identify and protect traditional cultural properties, collaborate with the Ute tribes in the management and interpretation of resources important to them, and enhance opportunities to exercise Native American traditional use of cultural landscapes, cultural properties, and important plant resources. Incorporating these actions would provide additional protection of cultural resources and their settings from incompatible activities such as development, surface disturbance, vehicle use, vandalism, unauthorized collection, and visual intrusions.

The BLM would continue to meet its compliance obligations under the NHPA as described in the methods and assumptions section. Effects would be the same as described under Effects Common to All Alternatives.

Alternative C would further expand current measures, stipulations, and surface occupancy restrictions for the protection of soil, water, watersheds, vegetation, fish and wildlife, and special status species. Under Alternative C, NSO stipulations would be applied on 858,000 acres of federal mineral estate (98 percent more acres than under Alternative A). CSU stipulations for cultural resources would be applied on 68,400 acres (28 percent more acres than under Alternative B) for subsurface inventory requirements for construction disturbance, providing additional potential for the identification and documentation of buried resources. As described under Effects Common to All Alternatives, these measures would provide indirect protection of cultural resources and their settings and may enhance resources important for Native American uses. Expanded vegetation and fuel treatments methods may inhibit access for Native American cultural uses. Wildland fire management measures and potential effects would be the same as described under Alternative B.

Indirect protections of the visual setting of cultural resources through VRM Class I and II designations would be expanded to 654,000 acres (4.1 times more acres than under Alternative A). Designations in these areas could also limit surface-disturbing activities, reducing effects. Cultural resources in VRM Classes III and IV on 407,400 acres (55 percent fewer acres than under Alternative A) would not benefit from these indirect protections, and projects may be directed to culturally sensitive areas.

General effects due to livestock grazing are described under Effects Common to All Alternatives. Alternative C further reduces the amount of land open for grazing to 586,600 acres (40 percent fewer acres than under Alternative A) and

increases the amount closed to 440,400 acres (84 percent more acres than under Alternative A).

General effects due to recreation are described under Effects Common to All Alternatives. Like Alternative B, Alternative C includes additional measures to structure recreational opportunities in SRMAs and to implement surface use restrictions that provide incidental protection for cultural resources. Cultural resource inventories would be required for implementation. The BLM would manage two SRMAs on 60,000 acres (Bangs and the North Fruita Desert SRMAs) (84 percent fewer acres than under Alternative A). These include important cultural resource values. This may increase recreational use of these areas leading to more effects. Additional surface use stipulations would be implemented that can indirectly protect cultural sites (e.g., applying an NSO stipulation to Bangs and RMZ 1 in the North Fruita Desert SRMA), but effects from recreational use could still occur.

Alternative C is the most restrictive alternative in terms of travel designations. The decision area would be closed to all cross-country motorized use. Acres closed to motorized use would be increased to 379,500 acres (10.8 times more acres than under Alternative A), and mechanized travel would be closed on 367,000 acres. Foot and horse restrictions would be the same as described under Alternative B. Placing greater restrictions on travel would further reduce the potential for effects from direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to setting, and access leading to unauthorized collection or vandalism. Potential effects would be concentrated in the vicinity of designated trails. Pyramid Rock would be closed to all uses, except tribal and administrative uses, reducing the potential for effects.

Effects from land and realty actions are described under Effects Common to All Alternatives. Exclusion and avoidance areas for ROWs and other realty actions reduces the potential for effects resulting from discretionary actions at those locations. Alternative C identifies 627,000 acres (42 percent more acres than under Alternative A) as ROW avoidance areas and expands the exclusion areas for utility development to 365,800 acres (39 percent more acres than under Alternative A). Managing for six corridors would concentrate potential development and alterations to setting in those areas. The cultural resources at Indian Creek ACEC would be in a ROW exclusion area.

Alternative C includes 171,200 acres in 12 units that would be managed for wilderness characteristics (same as Alternative B as well as Bangs Canyon, East Demaree Canyon, East Salt Creek, Hunter Canyon, Kings Canyon, Lumsden Canyon, Spink Canyon, Spring Canyon, and South Shale Ridge) (7 times more acres than under Alternative B). Cultural resources are important supplemental values to an area's wilderness characteristics and can be protected by management measures such as NSO and CSU stipulations, ROW exclusion, travel restrictions, and mineral closures.

Alternative C would increase the number of ACECs to 23, totaling 168,000 acres (same 13 as Alternative B as well as Colorado River Riparian, Coon Creek, Glade Park-Pinyon Mesa, Gunnison River Riparian, Hawxhurst Creek, John Brown Canyon, Nine-mile Hill Boulders, Plateau Creek, Prairie Canyon, and Reeder Mesa) (5.8 times more acres than under Alternative A). Special management measures in the ACECs and ACEC values attributed to the designations are the same as described under Alternative B.

Cultural resources along the 14 NWSRS-suitable segments would receive indirect protection from NSO or CSU and ROW exclusion or ROW avoidance measures. Actions that would adversely affect ORVs would not be permitted; the restriction of actions to protect ORVs would indirectly benefit cultural resources along the segments where cultural resources are not an ORV. Where cultural resources are an ORV, they would be directly protected.

Effects from national trails are similar to those described under Alternative B. Surface use stipulations and ROW avoidance measures addressing the buffers around the Old Spanish National Historic Trail may provide protection of any archaeological resources associated with the trail and may help preserve the trail setting. Protection of trail resources through a 0.5-mile NSO stipulation buffer is increased under Alternative C. The Tabeguache Trail would be proposed as a National Recreation Trail. Designation may lead to surface effects on cultural resources from recreational use and possible vandalism. Actions proposed to protect, interpret, and enhance the values of the trails and trail resources and to retain their setting are compatible and complementary with cultural resource protection.

Alternative C would further expand interpretation and environmental education programs that could lead to protection and appreciation of cultural resource values in the decision area.

Alternative D

Cultural resource management measures would be the same as described under Alternative B. The BLM would allocate resources to "use categories" and use these to define proactive management measures to meet desired outcomes. The BLM would also implement the measures to identify and protect traditional cultural properties, collaborate with Native American tribes in the management and interpretation of resources important to them, and enhance opportunities to exercise Native American traditional use of cultural landscapes, cultural properties, and important plant resources.

BLM would continue to meet its compliance obligations under the NHPA and the Colorado Protocol as described in the methods and assumptions section. Effects would be as described under Effects Common to All Alternatives.

Alternative D would emphasize commodity and resource uses. As such it would expand most current measures, stipulations, and surface occupancy restrictions

for the protection of soil, water, watersheds, vegetation, fish and wildlife, and special status species, but not to the extent provided under Alternatives B and C. NSO stipulations would be applied on 497,800 acres of federal mineral estate (15 percent more acres than under Alternative A) under Alternative D. CSU stipulations for cultural resources would be applied on 51,400 acres (4 percent fewer acres than under Alternative B) for subsurface inventory requirements for construction disturbance, thereby increasing the risk for more resources to be damaged or destroyed by inadvertent discovery in those areas. As described under Effects Common to All Alternatives, these measures would provide indirect protection of cultural resources and their settings and may enhance resources important for Native American uses. Compared to Alternatives B and C, mapped NSO stipulations specific to cultural resources are reduced by 1,180 acres in this alternative, resulting in greater potential for surface disturbances that could impact cultural resources. Use of vegetation and fuel treatments methods may inhibit access for Native American cultural uses. Wildfire management actions, from full suppression to using unplanned ignitions for natural resource benefits, would occur on fewer acres than Alternatives B and C. Current management under Alternative A does not specify where unplanned ignitions are managed for resource benefit. Wildland fire and fire suppression have the potential to result in direct disturbance or loss of cultural resources, especially in areas where cultural resources have not been inventoried or cannot be considered in an emergency response.

Indirect protections of the visual setting of cultural resources through VRM Class I and II designations on 291,300 acres would be 2.1 times more acres than current management under Alternative A, but would be far less than Alternatives B and C. Similarly, the 727,500 acres (19 percent fewer acres than under Alternative A) of VRM Class III and IV would be much higher than Alternatives B (34 percent more acres) and C (79 percent more acres). The effects of these designations would be similar to those described under Alternative C.

General effects due to livestock grazing are described under Effects Common to All Alternatives. The amount of land open for grazing would be 977,200 acres (less than 1 percent fewer acres than under Alternative A) and the amount of land closed to grazing would be 49,900 acres (3 percent more acres than under Alternative A), which are very similar to current grazing levels.

General effects due to recreation are described under Effects Common to All Alternatives. Like Alternatives B and C, Alternative D adds additional measures to structure recreational opportunities in SRMAs and ERMAs. Cultural resource inventories would be required for implementation. The BLM would manage six SRMAs totaling 79,000 acres (Bangs, Castle Rock, Gunnison River Bluffs, Grand Valley OHV, North Fruita Desert, Palisade Rim) (78 percent fewer acres than under Alternative A). These are known to include important cultural resource values. Identification of the 4,400-acre Castle Rock SRMA would have significant

impacts on cultural resources. Additional surface use stipulations would be implemented that can indirectly protect cultural sites from large-scale disturbance, but effects from recreational use could still occur. There may be opportunities to further structure recreational opportunities to avoid effects or provide interpretive or educational information. Six individual ERMAs totaling 61,900 acres (91 percent fewer acres than under Alternative A) would be recognized to provide for targeted recreation opportunities. Closure to camping would be implemented at Pyramid Rock and other locations to protect cultural resources.

Limiting travel to foot travel in Pyramid Rock would mitigate the potential for effects in this sensitive area. (Access for Traditional Use by Native Americans may be accommodated through consultation.) Limiting equestrian travel to designated routes in Bangs SRMA would reduce the potential for effects in these areas. Alternative D would reduce to 10,200 acres (18 percent fewer acres than under Alternative A) the area open to cross-country motorized use. Compared to Alternative A, Alternative D would greatly reduce the potential for effects from direct disturbance, soil compaction, altered surface water drainage, erosion, intrusions to setting, and access leading to unauthorized collection or vandalism. Potential effects on cultural resources would primarily be concentrated in the 10,200 acres of OHV open areas and in the vicinity of designated trails.

Effects from land and realty actions are described under Effects Common to All Alternatives. Exclusion and avoidance areas for ROWs and other realty actions reduces the potential for effects resulting from discretionary actions at those locations. Alternative D identifies 80,500 acres (82 percent fewer acres than under Alternative A) as ROW avoidance areas and 104,100 acres (56 percent fewer acres than under Alternative A) as exclusion areas for utility development. This is the least amount of any alternative. Managing for eight corridors would increase potential development and alterations to setting in additional areas.

Alternative D includes no lands with wilderness characteristics that would be managed for wilderness characteristics, so cultural resources would not be afforded additional incidental protections.

Under Alternative D, the BLM would continue managing five ACECs totaling 33,200 acres (same as Alternative A, though with Badger Wash, Pyramid Rock, and The Palisade expanded in acreage) (15 percent more acres than under Alternative A). These would be managed to protect a variety of resource values that would also protect cultural resources from incompatible uses. While all ACECs include cultural resources, the cultural resources of Rough Canyon and Pyramid Rock are called out as ACEC values in the designation. Protections include closures and limitations to motorized, equestrian, and mechanized travel and ROW restriction.

Surface use stipulations and ROW avoidance measures create a 50-meter buffer along the Old Spanish National Historic Trail and may provide protection of any archaeological resources associated with the trail and help preserve the trail setting. The Tabeguache Trail would be proposed as a National Recreation Trail. Actions that promote these trails may include opportunities for interpretation, but may also lead to surface effects from recreational use and possible vandalism. Actions proposed to protect, interpret, and enhance the values of the trails and trail resources and to retain their setting are compatible and complementary with cultural resource protection.

Compared to Alternative A, Alternative D would expand interpretation and environmental education programs that could lead to protection and appreciation of cultural resource values in the decision area.

Cumulative

The CIAA used to analyze cumulative effects on cultural resources extends outside the planning area, following fourth-order watershed boundaries that completely or partially overlap the planning area. Fourth-order watersheds were used as the basic unit of analysis because effects from most management actions proposed under the RMP and other existing activity plans are not expected to have cumulative influence beyond this scale.

The types of effects on cultural resources that have occurred in the past include destruction of cultural resources, loss of integrity due to physical or other disturbances, loss of setting, degradation from natural processes such as erosion and weathering, incremental disturbance from use or access, and effects from vandalism and unauthorized collection. Loss of access to Traditional Cultural Properties has not been specifically identified through consultation but is possible.

Current and future trends include population growth, urban encroachment, increases in mining, fluid mineral leasing, leasable minerals, renewable energy development, ongoing grazing, increase in recreational demand, road construction, water diversions, invasive species, erosion, wildland fire, forest disease and insects, drought, and climate change. These would continue to affect cultural resources and cultural landscapes through loss or disturbance of resources that are not or cannot be protected, changes in setting, pressure from incremental use, loss of access for Native Americans to resources, and theft or vandalism of cultural resources.

Cultural resources adjacent to areas of growth and development would be most susceptible to future effects. Development near public lands is also increasing as adjacent agricultural lands are being converted into subdivisions, increasing the risk of effects on cultural resources. The effects on cultural resources on adjacent private lands would be greater than on federal lands since they would not be subject to the same requirements or protections. The construction of buildings, roads, and associated structures increases ground disturbance, causing

effects on cultural resources and their settings. In general, the more people and development in an area, the greater the potential for disturbance and increased cumulative effects. Enforcement of measures designed to protect cultural resources and the natural resources and places used by Native Americans would become more difficult as population and use increase. Areas where intensive, cross-country motorized use is allowed would continue to expose cultural resources to effects. Designating routes can protect cultural resources located off the routes, but restrictions are difficult to enforce, especially as population and recreational use grows and other areas are closed. Increased use of GPS and off-road vehicles can facilitate vandalism and unauthorized collecting. Increased use of the internet to disseminate site location and encourage visitation to sites that are unrecorded or have not been allocated to public use would continue to expose cultural resources to impacts.

Actions related to recreation, grazing, vegetation treatment, wildland fire, mineral development, and energy development have had past effects and are expected to continue to affect cultural resources. Increased frequency of wildland fire due to drought, climate change, and forest health may lead to additional direct loss of cultural resources and effects due to suppression.

For actions that could affect cultural resources on federal land or actions that are funded, licensed, or permitted by the federal government, compliance is required with the NHPA and other laws, statutes, and regulations. Consideration of the effects of undertakings on protected cultural resources would be required, and most adverse effects would be resolved. For many types of cultural resources, information on the regional cultural resource base is not available or is scarce and needs to be developed to properly assess the significance of the resource base. Many cultural resources are evaluated only by their surface manifestations and many resources evaluated as not eligible may actually be eligible, but these are lost through project implementation. State agency actions using federal funds or needing a federal permit require cultural resource review. Effects would be avoided or mitigated in many of the regional actions. Some effects would be unavoidable. Measures are in place to identify threats to resources and to prioritize management actions, but some effects on known or unknown cultural resources resulting from activities such as natural processes, wildland fire, grazing, dispersed recreation, recreational use, and vandalism can go unnoticed and may not be mitigated. Mitigation could preclude other desirable management options and future uses. Development or actions on lands that are not protected by federal or other cultural resource statutes and regulatory protections could lead to loss of these resources and the regional heritage and knowledge that they contain.

Decisions from this RMP would have effects that, when combined with other past, present, and reasonably foreseeable actions, could produce cumulative effects on cultural resources and religious, traditional, or other sensitive Native American resources. Cumulative effects would result from the destruction and

loss of known and unrecorded resources and unanticipated discoveries. The continued documentation of new cultural resources from undertakings and permitted actions that would require inventory for compliance would result in additional information to expand and explain the area's cultural history. Proactive planning measures under Alternatives B, C, and D would improve current management of cultural resources in the decision area. The restrictions on open, cross-country use would drastically reduce the amount of land where cultural resources would be affected. Alternative C would be the most protective of the cultural resource base through measures targeting resource protection. In addition, all undertakings would be subject to the Section 106 process of the NHPA and other applicable laws and regulations. Adherence to appropriate predevelopment, development, and post-development protective measures would reduce most effects to an insignificant level. As such, implementation of the Proposed RMP (Alternative B) is not anticipated to contribute to cumulative effects in the CIAA.

4.3.9 Paleontology

This section discusses impacts on paleontological resources from proposed management actions of other resources and resource uses. Existing conditions concerning paleontological resources are described in **Section 3.2.12**, Paleontology.

Paleontological resources include any fossilized remains, traces, or imprints of organisms preserved in or on the earth's crust that are of scientific interest and that provide information about the history of life on earth. BLM policy is to manage paleontological resources for scientific, educational, and recreational values and to protect or mitigate these resources from adverse impacts. To accomplish this goal, paleontological resources must be professionally identified and evaluated, and paleontological data should be considered as early as possible in the decision-making process.

Requirements under all the alternatives to identify resources in areas of high potential prior to ground disturbance would allow evaluation, avoidance, recovery, or other mitigation to preserve the scientific, educational, and interpretive resource uses. Damage from cross-country motorized travel, wildfire suppression activities, erosion, unauthorized collection, and inadvertent vandalism could result in the unmitigated loss of scientific information. Cross-country motorized use is eliminated under the action alternatives, reducing the potential for surface impacts and access that may facilitate unauthorized removal.

Methods of Analysis

Impacts on paleontological resources occur from natural weathering and erosion and from surface-disturbing activities, excavation, and theft or vandalism.

Indicators of impacts on paleontological resources include the following:

- Physical destruction or damage of fossil-bearing geological formations that results in the loss of vertebrate fossils or other scientifically significant fossil resources

Without removing some rock surrounding fossils, they would remain largely undetected; therefore, management actions that result in erosion do not necessarily result in damage to paleontological resources. Excessive erosion, especially from other surface disturbance on exposed localities, could damage fossils at the surface. While the location of every significant paleontological locality in the field office is not known, the analysis considers the different management actions and their potential to directly or indirectly affect paleontological resources. Education and public access can increase support for the appreciation and protection of paleontological resources but may also increase visitation and the potential for vandalism and unauthorized removal.

For this analysis, impacts on paleontological resources would be significant if there were substantial direct or indirect damage or destruction to or loss of vertebrate fossils or other scientifically significant fossil resources.

The analysis includes the following assumptions:

- Occurrences of paleontological resources are closely tied to the geologic units (e.g., 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.
- Geologic mapping can be used for assessing the potential for the occurrence of paleontological resources using the BLM's PFYC system.
- For the purpose of assessing impacts, only those objectives and actions potentially affecting vertebrate and scientifically important paleontological resources are considered.
- Scientifically important fossils will continue to be discovered throughout the planning area. Discoveries are most likely in geologic units classified as high potential PFYC Class 4 or 5, but known rich localities also have been found in the planning area in PYFC Class 3 units.
- Inventories conducted before surface disturbance or construction monitoring in high-probability areas may result in the identification and evaluation of previously undiscovered resources, which the BLM will manage accordingly.

- Unmitigated surface-disturbing activities could dislodge or damage paleontological resources and features that were not visible before surface disturbance.
- A paleontological resource use permit is required to collect paleontological resources of scientific interest. Collections made on public land remain the property of the US and must be made available for research and education. Casual collecting of common invertebrate and plant fossils is allowed without permit throughout the planning area except where special designation may prohibit fossil collection.
- Mining claims targeting fossils are not permitted and commercial sale of petrified wood is prohibited.
- There is large market for fossil specimens. Scientifically important paleontological resources have been illegally removed from public lands without permits.

Effects Common to All Alternatives

Potential impacts on vertebrate and scientifically important paleontological resources were reviewed for all resource and resource use management measures.

Under all alternatives paleontological resources would be managed according to their PFYC classification, derived currently in the planning area from large-scale mapping of generalized geologic units. Inventories of proposed surface-disturbing activities would continue to be required in PFYC Class 4, 5, and sometimes Class 3 paleontological areas per current BLM policy. Proposed surface-disturbing actions in other areas would continue to be reviewed and inventories would be considered on a case-by case basis depending on knowledge of the proposed project area, the potential for paleontological resources to be present, the depth and extent of ground disturbance, and the presence of the known localities in the vicinity. Monitoring of construction and stipulations to stop work if resources are discovered would continue to be implemented in high potential areas. Paleontological resources are sometimes discovered through substantial excavations. These measures would help ensure the protection of paleontological resources from impacts due to authorized surface-disturbing activities and help ensure preservation of opportunities for scientific, educational, and recreational uses of these resources.

Paleontological resources near the ground surface can be exposed by natural erosion that can be exacerbated by surface-disturbing activities. Exposure can lead to discovery and appropriate resource uses, but fossils can be damaged or lost by the direct action of ground disturbance, subsequent erosion, and unauthorized collection. Measures to control erosion and loss of ground cover by reducing soil disturbance from construction, mineral exploration and development, grazing, forestry, steep slope restrictions, implementing

stormwater protection stipulations, managing vegetation, and post-burn fire rehabilitation have the potential for reducing erosion and potential impacts on paleontological resources near the ground surface.

While most areas with paleontological resources on the surface would not support significant amounts of vegetation, fire management activities related to unplanned ignitions can involve ground-disturbing activities at depths that can directly impact paleontological resources, if present. These actions include constructing fire lines and using heavy equipment. High severity fire can also damage surface fossils, including cracking, spalling, and oxidizing. Fire can result in impacts through erosion and the increased visibility of paleontological resources. Fire can also remove vegetation and expose previously undiscovered resources, allowing for their study and protection; however, locations exposed by fire can be susceptible to damage by subsequent erosion, vandalism, and unauthorized collecting.

Recreation can physically alter paleontological resources if present near the ground surface, lead to damage from erosion, and facilitate unauthorized collection and vandalism. Although recreational fossil collecting is allowed throughout the decision area except where special designation may prohibit fossil collection, recreational collectors may inadvertently collect scientifically important fossil specimens or exceed collecting limits. Vertebrate fossils, which include dinosaurs, mammals, sharks, and fish or any animal with a skeletal structure, or any scientifically important invertebrate or plant fossil cannot be collected on public lands without a special collecting permit. Douglas Pass along Highway 139 is heavily used by recreational fossil collectors, collecting the easily accessible fossils, and sometimes removing vegetation and topsoil to expose them. The Bangs Canyon area, which contains paleontological resources, would continue to be an SRMA under all alternatives. Developed recreational sites and structured recreational opportunities tend to concentrate any potential impacts in particular areas, but impacts due to dispersed recreation are more difficult to anticipate, monitor, and mitigate. In addition to the potential for damage of surface fossils from all forms of recreational travel, motorized vehicles can provide access to otherwise less accessible areas, potentially leading to new discoveries or leading to damage or unauthorized removal. Impacts from physical damage and unauthorized collection reduce opportunities for scientific, educational, and recreational uses of these resources.

Ground-disturbing lands and realty actions, exploration and development of oil and gas, oil shale, geothermal resources, and mineral resources in PFYC Class 4, 5 and sometimes Class 3 geologic formations would require paleontological inventories. The alternatives vary in amount of land and locations available for each kind development and in the applicable requirements according to the focus of the individual alternatives. Although large portions of the planning area would be open to future development, only a small portion of the planning area is expected to be subject to new disturbance or further development.

Paleontological resources may be discovered, preserved, or recovered as a result of survey, monitoring, or inadvertent discovery. These measures would help ensure the protection of paleontological resources from impacts due to authorized surface-disturbing activities and help ensure preservation of opportunities for scientific, educational, and recreational uses of these resources.

Areas with special designations, such as ACECs and WSAs, are afforded special management measures designed to protect a variety of resource values, including geologic, botanic, historic, cultural, paleontological, scenic, fish and wildlife resources, and rare or exemplary natural systems, or to protect human life and property from natural hazards. Management measures vary but include surface use restrictions, ground disturbance restrictions, prohibitions on motorized travel, VRM classifications, annual monitoring, and other restrictions on development and resource use. Paleontological resources within these areas would be preserved in situ, or collected only by approved scientific/educational permit. New discoveries from development and deep excavations would be less likely in these areas, but permits for scientific uses (collection, excavation, and curation) would be considered if compatible with the resource values that the designation is protecting. Pyramid Rock is an ACEC under all alternatives, and paleontological resources are called out as an ACEC value in the designation. All alternatives include four WSAs totaling 96,500 acres.

Measures for interpretation, environmental education, and promotion of national, state, and BLM byways may enhance appreciation and understanding of paleontological resources and the restrictions on collection. However, publicizing locations can also lead to impacts from vandalism, over-collecting, and unauthorized collection of scientifically important fossils.

Implementing management for the following resources would have negligible or no impact on paleontological resources and are therefore not discussed in detail: water resources, fish and wildlife, special status species, wild horses, and cultural resources.

Alternative A

Paleontological resources would continue to be managed according to their PFYC classification, and inventories of proposed surface-disturbing activities would continue to be required in PFYC Class 4, 5, and sometimes Class 3 paleontological areas and where paleontological resources are anticipated. These measures would help ensure the protection of paleontological resources from impacts due to authorized surface-disturbing activities and help ensure preservation of opportunities for scientific, educational, and recreational uses of these resources. Except as noted, anticipated impacts would be the same for all resources and resource uses as described under Effects Common to all Alternatives.

Under Alternative A, the BLM would continue to manage a very large portion (445,400 acres) of the decision area as open to cross-country motorized use and 12,500 acres as open to intensive motorized use. In addition to the potential for damage of surface fossils from all forms of travel, this level of open cross-country motorized use can provide access to otherwise less accessible areas, potentially leading to new discoveries or, alternately, damage or unauthorized removal. Impacts from physical damage and unauthorized collection reduce opportunities for scientific, educational, and recreational uses of these resources.

Five ACECs, including Pyramid Rock and totaling 28,900 acres, are afforded special management measures to protect a variety of resource values that would also impact the management of any paleontological resources present. Management measures can include surface use restrictions, ground disturbance restrictions, prohibitions on cross-country travel, VRM classifications, annual monitoring, and other restrictions on development and resource use. The surface use restrictions could prevent new discoveries and/or excavations

Land adjacent to eligible WSR segments totaling 99.5 miles through BLM-administered land would be subject to surface use restrictions under Alternative A. While paleontological resources may be present elsewhere, paleontological resources are recognized as an ORV for the study segment of the Dolores River. Paleontological resources would be preserved; however, increased use of these areas by the public based on the designations may lead to impacts from unauthorized collection and vandalism. The surface use restrictions could prevent new discoveries and/or excavations.

The types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 300,700 acres as acceptable for coal leasing. Managing 36,700 acres as unacceptable for coal leasing, as well as applying stipulations on some acceptable lands, would reduce paleontological resource impacts from coal mining.

Five ACECs would be managed on 28,900 acres; within these areas paleontological resources would be protected as these would be closed to mineral material sales, and non-energy leasable mineral exploration and development. However, the only area known to have potential for non-energy leasable minerals is the 2,800-acre potash potential area in Sinbad Valley. Therefore, no effects are expected in the remainder of the decision area.

Alternative B

Except as noted, anticipated impacts would be the same for all resources as described under Effects Common to All Alternatives. The BLM proposes to proactively identify priority paleontological resource areas and conduct field inventories of highly sensitive localities. These actions would add to the scientific knowledge of the resources managed by BLM, guide further research,

determine if any protective measures are needed, and assist BLM in planning decisions.

Alternative B adds additional measures to structure recreational opportunities in SRMAs and ERMAs. The BLM would manage 5 SRMAs on 87,200 acres (75 percent fewer acres than under Alternative A), all of which include important paleontological resource values. Additional surface use stipulations would be implemented that can indirectly protect paleontological resources from large-scale disturbance, but recreational use impacts could still occur. There may be opportunities to further structure recreational opportunities to avoid impacts or provide interpretive or educational information.

Alternative B would close the decision area to cross-country motorized use and reduce to 10,200 acres (18 percent fewer than under Alternative A) the area open to intensive cross-country motorized use. These actions would greatly reduce the potential for impacts on paleontological resources over a wide area for damage of surface fossils from travel and would reduce vehicle access to otherwise remote areas. Increased access could potentially lead to new discoveries or damage or unauthorized removal. Impacts from physical damage and unauthorized collection reduce opportunities for scientific, educational, and recreational uses of these resources. Potential impacts on surface fossils, if present, would be concentrated in the 10,200-acre OHV open areas and in the vicinity of designated trails.

The mileages of routes are proposed to be designated administrative-only or closed based upon paleontological resources planning criteria are shown in **Table 4-46**.

Table 4-46
Route Designations and Paleontological Resources Planning Criteria under Alternative B

Planning Criteria	Final Designation Administrative Use (miles)	Final Designation Closed (miles)	Total miles designated as Administrative Use or Closed
Paleo Sites in/through, proximate (200m)	10.7	25.2	35.9

Source: BLM 2010a

Alternative B includes 3 units covering 44,100 acres that would be managed for wilderness characteristics. Paleontological resources are supplemental values to an area's wilderness characteristics and would be subject to management measures such as NSO stipulations, ROW exclusion, travel restrictions, and mineral closures. Paleontological resources would be preserved, but surface use restrictions may preclude new discoveries. The surface use restrictions could prevent new discoveries and/or excavations, except under scientific permit as reviewed on a case by case basis.

Alternative B would increase the number of ACECs to 13, totaling 123,000 acres (4.2 times more acres than under Alternative A). ACECs are afforded special management measures to protect a variety of resource values that would also impact the management of any paleontological resources present. The paleontological resources of Dolores River Riparian and Pyramid Rock are called out as ACEC values in the designations. Management measures to protect ACEC values can include surface use and ground disturbance restrictions; restrictions on cross-country or other types of travel (e.g., Pyramid Rock would be closed to all uses, except tribal and administrative uses); VRM classifications; annual monitoring; and other restrictions on development (e.g., coal leasing) and resource use (e.g., livestock grazing) to protect a variety of resource values that would also impact the management of any paleontological resources present.

Paleontological resources adjacent to the Dolores River would receive indirect protection through CSU and ROW avoidance measures under interim management guidelines for suitable WSRs.

Alternative B would expand interpretation and environmental education programs that could lead to protection and appreciation of paleontological resource values in the decision area. Measures to enhance, promote, interpret, and protect the paleontological resources of the Dinosaur Diamond National Scenic Byway may enhance appreciation and understanding of paleontological resources and the restrictions on collection. However, publicizing locations can also lead to impacts from vandalism, over-collecting, and unauthorized collection of scientifically important fossils.

The types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 252,100 acres (16 percent fewer acres than under Alternative A) within the coal resource potential development area as acceptable for coal leasing and development. There would be 57,400 acres (52 percent more acres than under Alternative A) managed as unacceptable for coal leasing and development. This, as well as stipulations on acceptable lands, would reduce paleontological resource impacts from coal mining and exploration by preventing or limiting development.

Under Alternative B, 20,600 acres would be petitioned for withdrawal from locatable mineral exploration or development. If withdrawn, these areas would provide additional protection to paleontological resources from surface-disturbing activities.

Implementing the Shale Ridges and Canyons MLP may reduce impacts on paleontological resources when COAs applied to new and existing leases in the MLP analysis area reduce surface-disturbing activities and the potential for disturbing or damaging paleontological resources.

Alternative C

Except as noted, anticipated impacts would be the same for all resources as described under Effects Common to all Alternatives. As with Alternative B, the BLM proposes to also proactively identify priority paleontological resource areas and conduct field inventories of highly sensitive localities. These actions would add to the scientific knowledge of the resources managed by BLM, guide further research, determine if any protective measures are needed, and assist BLM in planning decisions.

Like Alternative B, Alternative C includes additional measures to structure recreational opportunities in SRMAs. The BLM would manage two SRMAs on 60,000 acres (84 percent fewer acres than under Alternative A), including Bangs, which includes important paleontological resource values. This may increase recreational use of these areas, leading to more impacts. Additional surface use stipulations would be implemented that can indirectly protect paleontological resources. There may be opportunities to further structure recreational opportunities to avoid impacts or provide interpretive or educational information.

Alternative C would close the decision area to cross-country motorized and mechanized use, and total acres closed to motorized use would be increased to 379,500 acres, which is more than the other alternatives (10.8 times more acres than under Alternative A). Similar to Alternative B, Pyramid Rock would be closed to all uses, except tribal and administrative uses. These actions would further reduce the potential for impacts on paleontological resources over a wide area for damage of surface fossils from travel and would reduce vehicle access to otherwise remote areas. Increased access could potentially lead to new discoveries or damage or unauthorized removal. Potential impacts on surface fossils, if present, would be concentrated in the vicinity of designated trails.

Alternative C includes 171,200 acres (7 times more acres than under Alternative B) in 12 units that would be managed for wilderness characteristics, including Bangs Canyon. Paleontological resources are supplemental values to an area's wilderness characteristics and would be subject to management measures such as NSO and CSU stipulations, ROW exclusion, travel restrictions, and mineral closures. Paleontological resources would be preserved, but surface use restrictions may preclude new discoveries and excavations, except under scientific permit as reviewed on a case by case basis.

Alternative C would designate 23 ACECs totaling 168,000 acres (5.8 times more acres than under Alternative A). ACECs are afforded special management measures to protect a variety of resource values that would also impact the management of any paleontological resources present. The paleontological resources of Dolores River Riparian, Nine-mile Hill Boulders, and Pyramid Rock are called out as ACEC values in the designation. Management measures can

include surface use restrictions, ground disturbance restrictions, prohibitions on cross-country travel, VRM classifications, annual monitoring, and other restrictions on development and resource use to protect a variety of resource values that would also impact the management of any paleontological resources present.

Under Alternative C, the types of impacts from coal leasing would be the same as those described for mineral development under Effects Common to All Alternatives, and the BLM would manage 251,200 acres (16 percent fewer acres than under Alternative A) as acceptable for coal leasing and development. There would be 58,200 acres (58 percent more acres than under Alternative A) managed as unacceptable for coal leasing and development. This, as well as applying stipulations on lands acceptable for coal leasing and development, would reduce paleontological resource impacts from coal mining and exploration.

The types of impacts from withdrawal from locatable mineral exploration or development would be the same as those described under Alternative B. However, under Alternative C, 45,100 acres (2.2 times more acres than under Alternative B) would be petitioned for withdrawal.

Effects on paleontological resources in suitable WSR segments are the same as those described under Alternative A.

Effects on paleontological resources from expanded interpretation and environmental education programs and measures to enhance, promote, interpret and protect the paleontological resources of the Dinosaur Diamond National Scenic Byway are the same as those described under Alternative B.

Alternative D

Except as noted, anticipated impacts would be the same for all resources as described under Effects Common to All Alternatives. As with Alternative B, the BLM proposes to also proactively identify priority paleontological resource areas and conduct field inventories of highly sensitive localities. These actions would add to the scientific knowledge of the resources managed by the BLM, guide further research, determine if any protective measures are needed, and assist the BLM in planning decisions.

Like Alternatives B and C, Alternative D adds additional measures to structure recreational opportunities in SRMAs and ERMAs. The BLM would manage six SRMAs on 79,000 acres (78 percent fewer acres than under Alternative A), including Bangs, which includes important paleontological resource values. Additional surface use stipulations would be implemented that can indirectly protect paleontological sites from large-scale disturbance, but recreational use impacts could still occur. There may be opportunities to further structure recreational opportunities to avoid impacts or provide interpretive or educational information.

Cross-country motorized use would be reduced to 10,200 acres (18 percent fewer acres than under Alternative A). This action would greatly reduce the potential for impacts on paleontological resources over a wide area for damage of surface fossils from travel and would reduce vehicle access to otherwise remote areas. Increased access could potentially lead to new discoveries or damage or unauthorized removal. Impacts from physical damage and unauthorized collection reduce opportunities for scientific, educational, and recreational uses of these resources. Potential impacts on surface fossils, if present, would be concentrated in the 10,200 acres of OHV open areas and in the vicinity of designated trails.

Alternative D would keep the currently managed ACECs. Five ACECs totaling 32,200 acres (15 percent more acres than under Alternative A), including Pyramid Rock, are afforded special management measures to protect a variety of resource values that would also impact the management of any paleontological resources present. Management measures can include surface use restrictions, ground disturbance restrictions, prohibitions on cross-country travel, VRM classifications, annual monitoring, and other restrictions on development and resource use to protect a variety of resource values that would also impact the management of any paleontological resources present.

The types of impacts from coal leasing and development would be the same as those described for mineral development under Effects Common to All Alternatives, and BLM would manage 265,600 acres (12 percent fewer acres than under Alternative A) as acceptable for coal leasing and development. There would be 43,800 acres (19 percent more acres than under Alternative A) managed as unacceptable for coal leasing and development. This, as well as applying stipulations on lands acceptable for coal lasing and development, would reduce paleontological resource impacts from coal mining and exploration.

The types of impacts from withdrawal from locatable mineral exploration or development would be the same as those described under Alternative B. However, under Alternative D, 1,300 acres (94 percent fewer acres than under Alternative B) would be petitioned for withdrawal.

Effects on paleontological resources from expanded interpretation and environmental education programs and measures to enhance, promote, interpret, and protect the paleontological resources of the Dinosaur Diamond National Scenic Byway are the same as those described under Alternative B.

Cumulative

The CIAA used to analyze cumulative impacts on paleontological resources extends outside the planning area, following fourth-order watershed boundaries that completely or partially overlap the planning area. The fourth-order watersheds were used as the basic unit of analysis because impacts from most management actions proposed under the RMP and other existing activity plans are not expected to have cumulative influence beyond this scale. The types of

effects on paleontological resources that have occurred in the past likely include destruction or damage of resources without the benefit of scientific study or interpretation due to construction, recreation, theft, vandalism, and the effects of natural processes without the benefit of recovery, scientific study, or interpretation.

Current and future trends include population growth, urbanization, mining, fluid mineral leasing, renewable energy development, increase in recreational demand, road construction, and erosion. For actions on public land and the mineral estate managed by BLM, impacts would be minimized through existing laws, regulations, and stipulations addressing surface-disturbing activities within PFYC Class 4 and 5 areas and other sensitive areas. Other ground-disturbing activities such as road construction, real estate development, and utility infrastructure in the CIAA may be reviewed by other federal, state, or local agencies for the presence and scientific value of paleontological resources and steps taken to recover or avoid significant finds. Actions on private land could result in the inadvertent destruction of paleontological resources or the removal of fossils without any scientific study. Population growth and increasing recreational demand can impact resources from unauthorized removal, vandalism, incremental damage of surface resources, and subsequent erosion.

Decisions from this RMP could contribute to cumulative impacts on paleontological resources when combined with other past, present, and reasonably foreseeable actions. The cumulative effects of surface-disturbing activities such as mineral development and lands and realty actions within PFYC Class 2, 3, 4, and 5 areas have the potential to damage or destroy some resources. Some fossils would be destroyed in the course of legitimate uses of public lands, as well as through natural weathering and erosion. Measures to identify resources in areas of high potential would allow evaluation by paleontologists in areas that had not been previously studied. Fossils that would have otherwise been destroyed would be avoided or recovered and made available for study in university and museum repositories. Beyond authorized ground disturbance, cumulative impacts could occur from intensive travel, dispersed recreation, wildfire suppression activities, erosion, unauthorized collection, and vandalism. These could result in the unmitigated loss of scientific information and could reduce the educational and interpretative potential of the resource. Measures under Alternatives B, C, and D would reduce the potential effect of effects of intensive recreational use. Adherence to appropriate predevelopment, development, and post-development protective measures would reduce most impacts to an insignificant level. As such implementation of the Proposed RMP (Alternative B) is not anticipated to contribute to cumulative effects in the CIAA.

4.3.10 Visual Resources

This section discusses impacts on visual resources from proposed management actions of other resources and resource uses. Existing conditions concerning visual resources are described in **Section 3.2.13**, Visual Resources.

Methods of Analysis

The components of the visual resource inventory (VRI) form the basis for analysis in this section. VRI classes use the same numerical scale (i.e., I through IV) as VRM classes. They are the categories the BLM uses to classify the current visual character of the landscape and are a way to communicate the degree of visual value in the area. Generally VRI Class II indicates high visual value and VRI Class IV indicates low visual value. VRI Class I is reserved for areas where Congressional or administrative decisions were already made to maintain a natural landscape. The visual resource inventory is on file at the GJFO.

The intensity of impacts would depend on the three components of the visual resource inventory (scenic quality, sensitivity level, and distance zones). Landscapes with a high scenic quality rating have more visual variety and can hide development more easily than landscapes with little visual variety. That said, areas with high scenic quality are likely more valued, and changes that would be allowed under VRM Class III and IV management would result in higher intensity impacts than areas with lower scenic quality. Of the three inventory components, the sensitivity level is the best measure of the intensity of impacts on visual resources. Landscapes with high sensitivity are landscapes the public regards as high value and where changes would likely be noticed. The intensity of impacts from VRM Class III and IV management would be greater in areas with the highest scenic quality rating and in areas with the highest sensitivity level rating.

Anticipated Intensity of Impacts on Inventoried Visual Resources from VRM Classifications

Visual Resource Inventory Component	Class I (Minimal Landscape Modifications)	Class II	Class III	Class IV (Major Landscape Modifications)
Distance Zone	Low	Low	Moderate	High
Scenic Quality	Low	Low – Moderate	Moderate	High
Sensitivity	Low	Low – Moderate	Moderate	High

The relative intensities of impacts anticipated as a result of applying certain VRM classifications to certain VRI classifications are displayed in the following diagram. In general, the intensity of impact increases as both the value of the landscape and allowable landscape modifications increase.

Applying VRM Class I objectives to any VRI classification would preserve the existing character of the landscape. In other words, the VRI classification would be expected to remain the same because only minimal landscape modifications

would be permitted. On the other hand, while managing lands according to VRM Class IV objectives would allow for major landscape modifications, the perceived intensity of impact would be greater in VRI Class I areas than in VRI Class IV areas because of the higher value of the landscape. It should be noted that landscapes with higher scenic quality, generally identified as VRI Class II (VRI Class I areas are not inventoried for scenic quality), often have more visual variety than landscapes with lower scenic quality, generally identified as VRI Class III or IV, and may have more opportunities for blending modifications into the landscape.

When assessing scenic quality, seven factors are considered: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications. Where cultural modifications would be allowed, not only would the built environment change the landscape, but there could be a change in the landform or variety of vegetation forms, patterns, or texture from construction activities, removing topsoil and vegetation, changing soil composition, etc. Furthermore, where cultural modifications would be allowed to the extent that the basic components of the landscape (e.g., vegetation, soil, rock) changed drastically, the variety, contrast, and harmony of color could change as well. Changes to water could be incurred by the development of diversions, dams, or construction of facilities that block the feature from view. Cultural modifications in one area could also impact the adjacent scenery of another area. Finally, while the scarcity of the landscape itself would not change, modifications of scarce landscapes could be perceived as more intense than modification of more common landscapes, depending upon the sensitivity of the area.

Indicators of impacts on visual resources include the following:

- A proposed VRM class that would allow changes to the inventoried landscape that could alter its character enough that future visual resource inventories would result in a reclassification. For example, an area currently managed for VRM Class IV has VRI class II lands. The level of change allowed by VRM Class IV could alter the landscape to the point that future visual resource inventories could result in reclassifying the area to VRI Class III or IV.

The results of the VRI completed in 2009 are presented in **Table 3-25**, Visual Resource Inventory Component Distribution. The number of acres of each VRI Class in each VRM Class for all alternatives is shown in **Table 4-47**, Summary of Visual Resource Inventory Class by Visual Resource Management Class. Because 0 acres were rated as VRI Class I during the inventory, this table only displays data for VRI Classes II, III, and IV.

While topography and vegetation can allow for some landscape modifications, many built structures and roads can dominate the landscape, depending on their size, position, color, and contrast with surrounding conditions. As such, this

Table 4-47
Summary of Visual Resource Inventory Class by Visual Resource Management Class

VRM Class	Alternative acres (percent)			
	A	B	C	D
VRI Class II – 376,100 acres				
VRM Class I	23,100 (6 %)	98,500 (26%)	99,800 (27%)	96,200 (26%)
VRM Class II	87,600 (23 %)	246,800 (66%)	271,800 (72%)	162,000 (43%)
VRM Class III	117,400 (31%)	30,100 (8%)	3,800 (1%)	92,700 (25%)
VRM Class IV	-	700 (<1%)	-	25,600 (7%)
Undesignated	148,000 (39%)	-	-	-
VRI Class III – 382,300 acres				
VRM Class I	4,000 (1%)	100 (<1%)	100 (<1%)	100 (<1%)
VRM Class II	34,800 (9%)	105,100 (27%)	187,700 (49%)	25,900 (7%)
VRM Class III	72,900 (19%)	277,000 (72%)	194,000 (51%)	339,400 (89%)
VRM Class IV	-	100 (<1%)	100 (<1%)	17,000 (4%)
Undesignated	270,600 (71%)	0	-	-
VRI Class IV – 302,700 acres				
VRM Class I	-	200 (<1%)	200 (<1%)	-
VRM Class II	9,900 (3%)	40,400 (13%)	97,000 (32%)	7,000 (2%)
VRM Class III	15,700 (5%)	89,700 (30%)	17,200 (6%)	97,900 (32%)
VRM Class IV	-	172,300 (57%)	187,900 (62%)	197,400 (65%)
Undesignated	277,000 (92%)	-	-	-

Source: BLM 2010a

analysis focuses on management actions and allowable uses that have the most potential to increase or decrease VRI Class.

The analysis includes the following assumptions:

- The scenic vistas within the planning area will increase in sensitivity or public concern over the next 20 years.
- Visitors to BLM-administered lands or residents living near BLM-administered lands are sensitive receptors for impacts on visual quality.
- Activities that cause contrast and are noticeable to the viewer and the public will be considered to have effects on scenic quality and perceived impact on sensitive landscapes.
- The more protection that is associated with the management of other resources and special designations, the greater the benefit to visual resources of the surrounding viewsheds.
- Visual resource design techniques and BMPs will be implemented to mitigate potentially harmful impacts.

- The visual contrast rating system will be used as a guide to analyze compliance with VRM class objectives for site-specific projects as well as facility design and placement. These facilities will be designed to minimize their visual contrast to conform to the area's VRM class objective. This will allow the BLM to ensure compliance with the assigned VRM class.

Effects Common to All Alternatives

Implementing management actions for wildland fire management, soil resources, fish and wildlife, vegetation, and water resources have the potential to result in short-term effects on visual resources, including the following underlying components of scenic quality: vegetation, color, and cultural modifications. However, since the ground-disturbing activities associated with these resource programs are primarily involved in restoring healthier and more diverse native plant communities to the landscape, these programs would enhance the vegetation and color components of scenic quality over the long term. Cultural resource management actions may also result in short-term, isolated disturbances associated with scientific excavation but would not have permanent effects.

Managing land as forestry and harvest zones would result in localized, long-term impacts by allowing for the removal of timber that would alter the visual setting. Impacts would be site-specific depending upon the VRI Class of the area for harvest but would primarily affect the vegetation, color, and cultural modification components of scenic quality.

Livestock and wild horse grazing may cause secondary effects on visual resources through trampling, compaction and grazing of vegetation, and channel incision. Watering areas are especially prone to disturbance, where concentrated vegetation and soil damage can occur. Structures associated with livestock grazing management (e.g., fences, stock ponds, guzzlers, cattle guards, feeding troughs) could create visual intrusions. It is unlikely that these activities or structures would degrade the scenic quality of an area so as to change the VRI Class. Modifications to grazing practices to improve land health needed as a result of overgrazing would also help restore the visual quality of the area.

Casual recreation use generally would not impact visual resources or the visual character of the area. However, limiting use or travel to designated routes can provide a measure of assurance against trail proliferation and promote the recovery of natural processes in the area, thereby potentially enhancing scenic quality. All forms of travel that produce established routes can impact visual resources. These impacts are generally confined to the route itself. In contrast, areas open to intensive use can affect visual resources by affecting the visual character of the entire area. Where cross-country travel occurs within scenic quality A or high sensitivity landscapes, the perceived impacts would be the most intense.

Managing areas as ROW exclusion would protect visual resources by prohibiting new cultural modifications requiring a ROW permit such as roads; pipelines; transmission lines; communication sites; wind, solar, and geothermal development; and other land use authorizations that could alter the visual quality of an area. These types of activities could also affect the vegetation and color components of scenic quality, particularly during construction periods. Right-of-way avoidance would provide limited protection by requiring mitigation measures to minimize alteration of the physical setting. In other areas, utilities such as new transmission lines, access roads, and related development have the potential to permanently affect visual resources. For each alternative, delineated utility corridors and wind and solar emphasis areas is compared to the VRI class of those areas to determine whether or not such development would impact the visual quality.

Under all alternatives, portions of the planning area would be available for mineral and energy development. While the coal potential in the GJFO is subsurface, there would be impacts on visual resources from associated facilities including vents, storage areas, waste rock piles, treatment facilities, and conveyors. VRI Class II areas would be particularly sensitive to such development but would be protected by VRM Class I or, to a lesser degree, VRM Class II management. Acres of impacts are discussed under each alternative below. Coal development would not greatly impact visual resources as the coal potential in the GJFO is subsurface.

Much of the decision area with oil and gas development potential is already leased. So while development associated with oil and gas extraction can impact scenic quality, impacts from decisions made in this RMP affecting new leases would be minimal. Areas of high to very high development potential over the life of the plan are predominately VRI Class III and IV, so new development would primarily have impact on areas of lesser scenic quality.

Stipulations for fluid mineral leasing and surface-disturbing activities (i.e., NSO, CSU, and TL) would mitigate impacts on visual quality from such action. Applying NSO stipulations would provide direct protection for visual resources by preventing surface occupancy and use that could alter viewsheds, vegetation, color, adjacent scenery, and cultural modifications associated with the scenic quality of an area. CSU stipulations would protect visual resources to a lesser extent because surface-disturbing activities would only have to be modified or moved to a different location. In high quality visual areas, these stipulations would provide some protection against the reclassification of areas to a lower VRI Class in the future. In general, alternatives with more acres protected by stipulations would provide more protection to high quality visual areas.

Visual character is related to the criteria used to determine the presence of wilderness characteristics including the absence of roads; structures such as developed recreation facilities, fences, pipelines, and power lines; and

modifications such as vegetation treatment areas and mines (see **Section 3.2.14**, Lands with Wilderness Characteristics, for more information). The wilderness characteristics inventory identified 12 areas totaling 171,200 acres as having wilderness characteristics. Of those, 76,400 acres inventoried as VRI Class II; 79,700 acres inventoried as VRI Class III, and 15,200 acres inventoried as VRI Class IV. All lands with wilderness characteristics units are VRM Class II under alternatives in which they are managed to protect wilderness characteristics, except existing range improvements in Bangs would be managed as VRM Class III.

Designating ACECs to protect scenic values would maintain the natural character of the landscape and the scenic values that led to their designation. Approximately 82,400 acres in seven areas (Colorado River Riparian, Dolores River Riparian, Juanita Arch, Mt. Garfield, the Palisade, Sinbad Valley, and South Shale Ridge) were determined to have relevant and important scenic values during the evaluation of nominated ACECs. The number and size of the ACECs varies across alternatives. All ACECs are either VRM Class I or VRM Class II under alternatives in which they are designated, except the Palisade ACEC, a portion of which would be managed as VRM Class III under Alternatives A and D (see Alternatives A and D below) and a 300-acre portion of the Dolores River Riparian ACEC which would be managed as VRM Class III. Managing ACECs with scenic values as VRM Class I or II would maintain the scenic quality of the ACECs.

Implementing management for the following resources would have negligible or no impact on visual resources and are therefore not discussed in detail: air; soil resources; water resources; vegetation; special status species; fish and wildlife; wild horses; cultural resources; paleontology; livestock grazing; coal; national trails; and national, state, and BLM byways.

Alternative A

Under Alternative A, 6 percent of VRI Class II lands would be managed as VRM Class I, resulting in preservation of the existing visual character of those areas. An additional 23 percent would be managed as VRM Class II, allowing for a low level of change. The remaining 265,400 acres (70 percent) would be managed as VRM Class III or is undesignated (see **Table 4-47**). Nearly all of the acres that are managed as VRM Class III or Undesignated are scenic quality B landscapes and have high visual sensitivity, so changes to these landscapes would be perceived as more intense than in lower value landscapes. Projects in areas without a VRM classification could impact visual resources on a case-by-case basis depending upon the project.

All stipulations for fluid mineral leasing and other surface-disturbing activities would provide direct or indirect protection for visual resources. However, Alternative A contains the fewest acres of stipulations. In addition, NSOs under Alternative A only apply to fluid mineral leasing, not all surface-disturbing

activities. As such, fluid mineral development and other surface-disturbing activities have the most potential to impact visual resources under this alternative. The nature of the impacts is the same as that described under Effects Common to All Alternatives.

Under Alternative A, approximately 136,900 acres of VRI Class II lands are within the area of coal potential. Of those acres, none are managed as VRM Class I and approximately 2,500 acres (2 percent) are managed as VRM Class II. This alternative offers the least amount of protection to visual resources from coal development. Impacts are described under Effects Common to All Alternatives.

ROW exclusion and avoidance areas would directly benefit visual resources by preventing new developments that would create visual contrast. There are 234,900 acres managed as ROW exclusion and 441,400 acres managed as ROW avoidance under Alternative A. Of the remaining area, 89,300 acres (24 percent) of VRI Class II areas would be available for ROW location. Impacts from ROW management are discussed under Effects Common to All Alternatives.

Under Alternative A, 11,000 acres are open to intensive motorized use in VRI Class III and IV areas. Because of the low visual value of these areas, the intensity of impact from motorized travel is less than if the activity occurred in areas of higher visual value (i.e., VRI Class II landscapes). On the other hand, approximately 126,800 acres of VRI Class II lands are open to non-intensive, cross-country motorized travel and could be impacted, as described under Impacts Common to All Alternatives.

Under Alternative A, WSAs are managed under a variety of VRM Classes ranging from VRM Class I (Sewemup Mesa and a portion of the Palisade) to undesignated (portions of Demaree Canyon and Little Book Cliffs). While managing for less than VRM Class I might normally allow for degradation of scenic quality and allow modifications in high sensitivity landscapes, interim management protection for WSAs requires management as VRM I and is such that development that would impair the areas' suitability for wilderness designation would not be allowed, thereby protecting the scenic quality of WSAs.

Under Alternative A, no lands with wilderness characteristics would be managed to protect their wilderness characteristics, thus none of those areas would receive management for wilderness characteristics that could benefit their visual character.

The BLM would designate five ACECs under Alternative A (Badger Wash, The Palisade, Pyramid Rock, Rough Canyon and Unaweep Seep). Under Alternative A, only 23,600 acres in one area (The Palisade) would be designated as an ACEC to protect scenic values. A portion of The Palisade (1,400 acres) would be managed as VRM Class III and the remaining area would be managed as VRM

Class I (4,100 acres) or II (18,000 acres). VRM Class III could allow for development that would diminish the scenic quality of the area. However, because the ACEC would be designated and managed to protect scenic values, among others, it is unlikely that development that would adversely impact the scenic quality of the area would be permitted. Scenic values of the 14 eligible WSR segments in this alternative would be protected because actions that would impair their ORVs would be prohibited. This is especially true for the eight segments that have a scenic ORV. Along stream segments eligible or suitable for inclusion in the NWSRS that have a scenic ORV (see **Table 2-4**, Summary of Wild and Scenic River Study Segments), the BLM would not permit any actions that would have an adverse effect on the visual quality of the segment, thereby protecting visual resources in these areas.

Alternative B

Under Alternative B, 26 percent of VRI Class II lands would be managed as VRM Class I (4.3 times more acres than under Alternative A), resulting in preservation of the existing visual character of those areas. An additional 66 percent would be managed as VRM Class II (2.8 times more acres than under Alternative A), allowing for a low level of change. All of the VRI Class II scenic quality A landscapes and 90 percent of scenic quality B landscapes would be managed as either VRM Class I or II. In addition, 91 percent of the VRI Class II high sensitivity landscapes and 90 percent of VRI Class II medium sensitivity landscapes would be managed as either VRM Class I or II. Finally, 8 percent of VRI Class II landscapes would be managed as VRM Class III (75 percent fewer acres than under Alternative A), and the existing character of the landscape would be partially retained (see **Table 4-47**). All of the VRI Class II lands that would be managed as VRM Class III are of scenic quality B. Furthermore, 26,600 acres of VRI Class II high sensitivity landscapes would be managed as VRM Class III, which could result in more intense impacts than modifications to lower value landscapes.

There would be 210,000 acres (11 percent fewer acres than under Alternative A) of ROW exclusion and 789,400 acres (79 percent more acres than under Alternative A) of ROW avoidance. In the remaining area, 13,700 acres (less than 1 percent) of VRI Class II areas would be located in a ROW corridor. All VRM Class I areas would be classified as ROW exclusion and all VRM Class II areas, except for delineated corridors, would be classified as ROW avoidance. Impacts would be similar to those described under Effects Common to All Alternatives.

There would be 8,700 acres identified as an emphasis area for solar development and 2,400 acres for wind power development. Solar and wind energy development would not likely degrade visual quality as all emphasis areas are VRI Class IV.

Under Alternative B, 10,200 acres (18 percent fewer acres than under Alternative A) would be open to cross-country motorized use in VRI Class III or

IV areas; the magnitude of perceived impacts would be lower because of the low visual value in those areas. Additionally, 115,100 acres of VRI Class II lands would be closed to motorized use.

The mileages of routes are proposed to be designated administrative-only or closed based upon visual resources planning criteria are shown in **Table 4-48**.

Table 4-48
Route Designations and Visual Resources Planning Criteria under Alternative B

Planning Criteria	Final Designation Administrative Use (miles)	Final Designation Closed (miles)	Total miles designated as Administrative Use or Closed
VRM Class II	125	165.6	290.6

Source: BLM 2010a

Under Alternative B, approximately 126,100 acres of VRI Class II lands are within the area of coal potential. Of those, 41,700 acres (33 percent) would be managed as VRM Class I; 74,500 acres (59 percent) would be managed as VRM Class II; and 9,800 acres (8 percent) would be managed as VRM Class III. Impacts on visual resources from coal development on the 116,200 acres of lands managed as VRM Class I and II would be minimal as most development associated with coal extraction would be precluded by the inability to conform to VRM Class I or II objectives. On the 9,800 acres managed as VRM Class III, construction of facilities needed for coal development would likely impact vegetation and color and would also add new cultural modifications. Impacts are described under Effects Common to All Alternatives.

Under Alternative B, WSAs would be managed as VRM Class I which would protect the scenic quality and sensitive landscapes of the areas.

Under Alternative B, 44,100 acres in three units would be managed to protect their wilderness characteristics. Approximately 35 percent of VRI Class II acres in all lands with wilderness characteristics units would be managed to protect their wilderness characteristics, management that would benefit their visual quality and provide protection to the sensitive landscapes. Impacts are described under Effects Common to All Alternatives.

Under Alternative B, 79,100 acres (3.4 times more acres than under Alternative A) in six areas (Atwell Gulch, Dolores River Riparian, Mt. Garfield, The Palisade, Sinbad Valley, and South Shale Ridge) would be designated as ACECs to protect scenic values, all of which would be managed as VRM Class I (35 percent) or VRM Class II (65 percent). The remaining area found to have relevant and important scenic values but not designated as an ACEC under Alternative B (Colorado River Riparian) would still be managed as VRM Class II, which would help maintain the scenic quality of the area.

Portions of the Dolores River would be determined suitable for inclusion in the NWSRS. Scenic values are an identified ORV for the segment and the suitable portion would be managed as VRM Class II. Impacts would be the same as those described under Alternative A.

There would be one national scenic byway and two state scenic byways and all except for a portion of the Dinosaur Diamond National Scenic Byway would be managed as VRM Class II. As such, the scenic quality along the byways would be protected for the enjoyment of drivers.

Implementing the Shale Ridges and Canyons MLP may reduce impacts on visual resources due to the possibility of applying additional COAs that would restrict the type, design, and size of facilities. The 211,500 acres within the MLP analysis area managed as VRM Class II would be protected by a CSU stipulation, which would limit surface-disturbing activities. This includes visually sensitive areas such as South Shale Ridge (27,800 acres). The South Shale Ridge ACEC would be protected by an NSO stipulation, which would further restrict surface-disturbing activities within this sensitive area.

Alternative C

Under Alternative C, 27 percent of VRI Class II lands would be managed as VRM Class I (4.3 times more acres than under Alternative A), resulting in preservation of the existing visual character of those areas. An additional 72 percent would be managed as VRM Class II (3.2 times more acres than under Alternative A), allowing for a low level of change. Finally 3,800 acres of VRI Class II lands would be managed as VRM Class III (97 percent fewer acres than under Alternative A), and the existing character of the landscape would be partially retained (see **Table 4-47**). Within the VRI Class II lands that would be managed as VRM Class III, all are of scenic quality B ranking and most (79 percent) have medium sensitivity. The remaining 21 percent are high sensitivity landscapes, and the intensity of perceived impact would be greatest in these areas. However, this only accounts for 800 acres within the decision area.

There would be 365,800 acres (56 percent more acres than under Alternative A) of ROW exclusion and 627,000 acres (42 percent more acres than under Alternative A) of ROW avoidance. In the remaining area, 300 acres of VRI Class II areas would be available for ROW location. As under Alternative B, all VRM Class I areas would be classified as ROW exclusion and all VRM Class II areas, except for delineated corridors, would be classified as ROW avoidance. Impacts would be similar to those described under Effects Common to All Alternatives.

There would be 5,300 acres (39 percent fewer acres than under Alternative B) identified as emphasis areas for solar energy development and 2,400 acres (same as under Alternative B) for wind energy development, fewer or the same as Alternatives B and D. The emphasis areas are in VRI Class IV areas; impacts would be the same as those described under Alternative B.

Under Alternative C, cross-country motorized use would be prohibited so there would be no impacts from cross-country motorized use.

Under Alternative C, approximately 125,800 acres of VRI Class II lands are within the area of coal potential. Of those acres, most would be managed as either VRM Class I (43,100 acres, 34 percent) or VRM Class II (79,900 acres, 63 percent). Impacts on visual resources from coal development on the 123,000 acres of lands managed as VRM Class I or II would be minimal as most development associated with coal extraction would be precluded by the inability to conform to VRM Class I or II objectives. On the 2,900 acres managed as VRM Class III, construction of facilities needed for coal development would likely impact vegetation and color and would also add new cultural modifications. Impacts are described under Effects Common to All Alternatives.

Impacts from WSA management would be the same as those described under Alternative B.

Under Alternative C, all 12 lands with wilderness characteristics units, totaling 171,200 acres, would be managed for wilderness characteristics (3.8 times more acres than under Alternative B), thus all of those acres would receive management that could benefit their visual resources (including management as VRM Class II). Impacts are described under Effects Common to All Alternatives.

Under Alternative C, all 86,900 acres in seven areas found to have relevant and important scenic values would be designated as ACECs to protect scenic values. All would be managed as VRM Class I (35 percent) or II (65 percent), which would help maintain the scenic quality of the areas.

There would be 14 WSR segments managed as suitable for inclusion in the NWSRS. Eight segments are managed to protect scenic values as an ORV. One segment would be VRM Class I and the remaining would be VRM Class II. The types of impacts would be similar to those described under Alternative A.

Alternative D

Under Alternative D, 26 percent (4.2 times more acres than under Alternative A) of VRI Class II lands would be managed as VRM Class I, resulting in preservation of the existing visual character of those areas. An additional 43 percent (89 percent more acres than under Alternative A) would be managed as VRM Class II, allowing for a low level of change; 25 percent (21 percent fewer acres than under Alternative A) would be managed as VRM Class III, potentially resulting in only partially retaining the character of those lands; and 7 percent would be managed as VRM Class IV, potentially resulting in a high level of change in those areas (see **Table 4-47**).

Within the VRI Class II lands that would be managed as VRM Class III, 7,700 acres (8 percent) are scenic quality A landscapes and an additional 85,000 acres (92 percent) are scenic quality B landscapes. Furthermore, 62,300 acres (67

percent) are of high sensitivity and the remaining acres (33 percent) are of medium sensitivity. Within the VRI Class II lands that would be managed as VRM Class IV, all are scenic quality B landscapes but have high sensitivity. Impacts from landscape modifications in these areas would be perceived as more intense than modifications in areas with lower visual value.

There would be 104,100 acres (56 percent fewer acres than under Alternative A) of ROW exclusion and 80,500 acres (82 percent fewer acres than under Alternative A) of ROW avoidance, the fewest of any alternative. In the remaining area, 220,800 acres (59 percent) of VRI Class II areas would be available for ROW location. As under Alternatives B and C, all VRM Class I areas would be classified as ROW exclusion. However, VRM Class II areas would not be classified as ROW avoidance, leading to the potential for impacts on visual resources in those areas.

There would be 36,300 acres (approximately 2 times more acres than under Alternative A) identified as emphasis areas for solar energy development and 3,700 acres (42 percent more acres than under Alternative A) for wind energy development, more than in any other alternative. All emphasis areas are in VRI Class IV; impacts would be the same as those described under Alternative B.

Under Alternative D, 9,800 acres (11 percent fewer acres than under Alternative A) would be open to cross-country motorized travel in VRI Class III or IV areas; the magnitude of perceived impacts would be less intense because of the lower visual value in those areas. Additionally, 106,900 acres of VRI Class II lands would be closed to motorized travel.

Under Alternative D, approximately 125,800 acres of VRI Class II lands are within the area of coal potential. Of those acres, 41,700 acres (33 percent) would be managed as VRM Class I and 44,200 acres (35 percent) would be managed as VRM Class II. VRM Class I or II management would protect about 68 percent of VRI Class II lands in the area of coal potential and impacts on visual resources would be minimal. However, the remaining 40,000 acres would be managed as either VRM Class III (25,000 acres, 20 percent) or VRM Class IV (15,000 acres, 12 percent), and these areas would be susceptible to impacts from coal development.

Impacts from WSA management would be the same as those described under Alternative B.

Under Alternative D, no lands with wilderness characteristics would be managed for wilderness characteristics, thus none of those areas would receive management for wilderness characteristics that could benefit their visual character. Impacts are described under Effects Common to All Alternatives.

The BLM would designate five ACECs under Alternative D (Badger Wash, The Palisade, Pyramid Rock, Rough Canyon and Unaweep Seep). Under Alternative

D, only 26,900 acres (15 percent more than under Alternative A) in one area (The Palisade) would be designated as an ACEC to protect scenic values. All of it would either be managed as VRM Class I (26,600 acres) or II (300 acres). There would not be any eligible or suitable WSR segments under Alternative D, thus none of those areas would receive management to maintain the eligibility or suitability that could benefit their visual character.

Visually Sensitive Areas

The GJFO administers several visually prominent resources and landscape features in the planning area. These include the Book Cliffs, Douglas Pass, Hunter Canyon, Mt. Garfield, The Palisade, Sinbad Valley, South Shale Ridge, and the Unaweep-Tabeguache Scenic and Historic Byway. Any impact to the scenic quality of these areas would have a disproportionate impact on the public's perception of the visual quality of BLM-administered lands. Because the magnitude of impacts on VRI Class II areas are perceived as more intense because of the high value of the landscape, **Table 4-49**, Visual Resource Management Classes by Visual Resource Inventory Class II for Visually Sensitive Areas, compares the VRI Class II acres of visually sensitive areas with the proposed VRM classification across alternatives.

Though VRM classification for the features themselves is largely consistent across alternatives, considerable differences appear when looking at the VRM classification of the broader area surrounding these features. Many of the identified areas are surrounded by smaller acreages of VRM Class I or II under Alternative D than under Alternatives B or C, leading to the potential for development on surrounding landscapes that directly or indirectly contribute to the values of the visually sensitive areas.

For example, some lands comprising and surrounding the Book Cliffs and Douglas Pass are undesignated under Alternative A, introducing the potential for intrusions that would alter their VRI class. Alternatives B, C, and D would provide more defined protection to these destinations and their surrounding viewsheds by assigning VRM classes to the entire vicinity of each area.

Areas managed as VRM Class III or IV would allow more change that could impact the visual quality and sensitive landscapes of the areas. The Book Cliffs, Douglas Pass, South Shale Ridge, and the Unaweep-Tabeguache Scenic and Historic Byway would be managed as VRM Class III or IV in portions of VRI Class II areas across one or more alternatives (see **Table 4-49**). These areas could experience a level of change that would cause a reclassification of the VRI in the area.

On the other hand, the Book Cliffs, Mt. Garfield, the Palisade, Sinbad Valley, and the Unaweep-Tabeguache Scenic and Historic Byway would be managed as VRM Class I or II in portions of VRI Class II areas across one or more alternatives. In these areas, visual character would generally be preserved.

Table 4-49
Visual Resource Management Classes by Visual Resource Inventory Class II for Visually Sensitive Areas

VRM Class (*VRI Class II Acres*)	Alternative A	Alternative B	Alternative C	Alternative D
Book Cliffs (105,700)				
VRM Class I	--	43,700 (41%)	45,300 (43%)	43,700 (41%)
VRM Class II	4,200 (4%)	53,000 (50%)	60,400 (57%)	44,700 (42%)
VRM Class III	58,400 (55%)	8,400 (8%)	--	12,800 (12%)
VRM Class IV	43,000 (41%)	600 (<1%)	--	4,500 (4%)
Douglas Pass (1,900)				
VRM Class II	--	1,900 (100%)	1,900 (100%)	1,900 (100%)
VRM Class III	1,800 (95%)	--	--	--
VRM Class IV	100 (5%)	--	--	--
Hunter Canyon (1,600)				
VRM Class II	1,000 (63%)	200 (13%)	1,600 (100%)	1,600 (100%)
VRM Class III	600 (37%)	1,400 (88%)	--	--
Mt. Garfield (3,300)				
VRM Class I	900 (27%)	2,200 (67%)	2,500 (76%)	--
VRM Class II	700 (21%)	--	800 (24%)	2,000 (61%)
VRM Class III	1,600 (49%)	1,100 (33%)	--	1,300 (39%)
VRM Class IV	100 (3%)	--	--	--
The Palisade (4,800)				
VRM Class I	4,100 (85%)	4,800 (100%)	4,800 (100%)	4,800 (100%)
VRM Class II	700 (15%)	--	--	--
Sinbad Valley (3,700)				
VRM Class I	3,400 (92%)	3,400 (92%)	3,400 (92%)	3,400 (92%)
VRM Class II	--	300 (8%)	300 (8%)	300 (8%)
VRM Class III	300 (8%)	--	--	--
South Shale Ridge (21,500)				
VRM Class I	--	--	--	--
VRM Class II	--	21,500 (100%)	21,500 (100%)	--
VRM Class III	18,700 (87%)	--	--	1,800 (8%)
VRM Class IV		--	--	19,700 (92%)
Undesignated	2,800 (13%)	--	--	--
Unaweep-Tabeguache Scenic and Historic Byway (61,900)				
VRM Class I	14,600 (24%)	28,700 (46%)	28,700 (46%)	28,700 (46%)
VRM Class II	46,500 (75%)	33,200 (54%)	33,200 (54%)	11,600 (19%)
VRM Class III	300 (>1%)	--	--	21,600 (35%)
VRM Class IV	600 (1%)	--	--	--

Cumulative

The CIAA for visual resources is composed of those 4th-order watersheds that completely or partially overlap the planning area. Fourth-order watersheds were used as the basic unit of analysis because impacts from management actions proposed under the RMP and other existing activity plans are not expected to have cumulative influence beyond this scale.

Past and present actions within the CIAA that have affected visual resources include wildland fires, wildland fire management activities, timber harvesting, mining, cross-country travel, noxious weed invasion, urban and suburban sprawl, and road construction.

Actions likely to have the greatest future effect on visual resources in the CIAA are activities associated with energy and minerals development, continued urbanization, road construction, vegetation management, developed recreation, and utility development. Energy development, primarily dependent upon a variety of external factors, could have widespread and long-term effects on visual resources, and although sites are required to be reclaimed, some visual impacts remain (e.g., well caps). Urbanization has and is expected to continue to result in residential and/or commercial development expanding incrementally closer to BLM-administered lands, which presents the GJFO with further challenges in meeting visual resources goals and objectives.

Continued urban growth and development of lands in the vicinity of BLM-administered lands could also lead to an increased demand for energy resources, building materials, utilities, and minerals, all of which could spur development that would affect visual resources.

4.3.11 Wildland Fire Management

This section discusses impacts on wildland fire management from proposed management actions of other resources and resource uses. Existing conditions concerning wildland fire management are described in **Section 3.2.10**, Wildland Fire Management.

Methods of Analysis

Impacts on resources and resource uses resulting from implementation of the wildland fire management program are discussed in those particular resource sections in this chapter. Impacts on wildland fire management generally result from activities that affect fire intensity, frequency, and suppression efforts.

Indicators of impacts on wildland fire management include the following:

- Alteration of vegetative cover (standing and non-standing) that results in a substantial upward shift in the fire regime condition classes of the planning area (away from average reference conditions)
- A substantial increase in the risk of wildland fire ignitions in areas where it is not desired
- Management actions that substantially inhibit a response to wildland fire or appropriate treatments to prevent wildland fire

The analysis includes the following assumptions:

- Fire is an important functional, natural disturbance in many of the ecological systems found in the planning area.
- A direct relationship exists between the density of human use within the planning area and the frequency of human-caused fires.
- A direct relationship exists between fuel loading and potential fire intensity and severity.
- Human-caused wildfires will have a suppression strategy.
- Demand for fuels treatments will likely increase over the life of this plan.
- Most fires in the planning area have natural causes (e.g., lightning strikes).

Effects Common to All Alternatives

Impacts on wildland fire management common to all alternatives include changes in fire frequency and intensity, and the ability to employ fire-suppression methods, all of which would affect management of fire within the GJFO planning area. Many different resource uses may introduce additional ignition sources into the GJFO planning area, which increase the probability of wildland fire occurrence and the need for fire-suppression activities. Fire intensity can be affected by activities that decrease fuel loading, such as vegetation treatments and harvesting of timber products, and activities that alter the composition and structure of vegetation communities. High-intensity fires generally result in a greater loss of vegetation cover, changes to soil chemistry, damage to root structures, and a greater ability for non-native species to become established. Restrictions associated with the management of WSAs, ACECs, lands with wilderness characteristics, cultural and paleontological resources, and special status species may limit fire suppression tactics and fuels treatment methods.

In lower elevation sagebrush, both planned and unplanned fire would generally be avoided, but limited application based on site specific conditions (e.g., areas not infested with cheatgrass) would be allowed. Mechanical fuel treatments in lower elevation sagebrush may require seeding. Vegetation treatments that target conifer encroachment in sagebrush would reduce fuels for future wildfires.

Managing habitat for a variety of wildlife species could include performing vegetation manipulation, prescribed fire, or managing unplanned wildfire for resource benefits. Under all alternatives, this would affect the wildland fire management program by reducing costs and potential for large, damaging unplanned fires.

Through consultation Native American Traditional Leaders have remarked that natural ignition fires are not necessarily a threat to cultural values, sites, or natural resources that may be of interest to them because a natural fire is part of the natural world. However, prescribed fire and arson-caused wildland fire is of concern. The BLM would continue to consult with Native American Traditional Leaders regarding prescribed fire on a case-by-case basis.

Forestry actions can impact wildland fire by reducing fuels loadings, thinning stands, and creating more fire-resilient stands that lower the risk of catastrophic wildfire. Forest management activities may slightly increase the risk of human-caused fires by introducing the presence of potential ignition sources.

While recreation use increases the risk of human-caused ignitions, intensive recreation management may reduce this risk by providing targeted activities and outcomes. However, with more overall recreation use comes the increased potential for human-caused ignition.

Livestock grazing may reduce fuels loading in certain areas, but quantifying the impact on wildland fire can be difficult because the effect of grazing is related to the fuel type where a fire burns. The impact is greatest where grass fuel types are the main carrier of the fire and only a small percentage of lands grazed in the decision area meet this criterion. Therefore, because AUMs vary only slightly across the four alternatives the effect on wildland fire is considered to be consistent across all alternatives.

Soils and water resources impacts are similar across all alternatives. Impacts on the fuels management program could include alterations on fuels treatment design and methods. Slopes, soil characteristics, distance from riparian areas, and other factors associated with these resources all impact the options available for wildland fire and fuels management.

The development of energy and minerals resources increases the risk of wildfires by introducing new ignition sources. Facilities, infrastructure and transmission lines can increase fire and fuels program costs while decreasing fire management flexibility with regards to suppression options. Energy development also poses hazards to firefighters, including unknown toxins, facility protection, evacuation of industry personnel, and dangerous overhead power lines. Fire programs could incur additional costs to train firefighting personnel for emergency situations associated with energy development.

The road infrastructure supporting energy and minerals development would provide increased accessibility to remote areas for fire suppression and would provide fuel breaks in the event of wildland fire.

Issuance of ROWs, which are considered part of the WUI, can impact wildland fire management in several ways. Access and program costs are increased because of the increased potential for fire in the WUI. There may also be

slightly higher risk of human-caused ignitions from construction, maintenance, and use of ROWs. As new WUI sites are developed, additional fuels treatments are necessary to address potential impacts from wildland fires.

Critical infrastructure ROW corridors would need maintenance throughout their life to keep vegetation at a level that would moderate fire behavior and allow for some protection from an unplanned wildland fire. Vegetation maintenance would ensure that critical infrastructure would not fail at a time of need, such as during a wildland fire.

Comprehensive travel and transportation management impacts the wildland fire program by way of increased risk of human-caused ignitions, especially where motorized vehicles travel cross-country. All forms of travel encourage the spread of invasive weeds, particularly cheatgrass, which can shift fire regimes and increase fire behavior potential. When routes are closed and rehabilitated, they become unavailable for response to wildfires, limiting access opportunities.

To preserve wilderness characteristics in WSAs, there would be little to no fuels management in these areas. Likewise, fire management response to wildfire in WSAs would be limited so not to impair the suitability of such areas for wilderness designation.

Implementing management for the following resources would have negligible or no impact on wildland fire management and are therefore not discussed in detail: air quality; wild horses; paleontology; WSRs; national, trails; national, state and BLM byways; interpretation and environmental education; public health and safety; socioeconomics; or environmental justice.

Alternative A

Vegetation management and weed treatments would serve to decrease both standing and non-standing vegetation (fuel load) across the planning area, which would decrease the intensity of wildland fires and allow fires to be more easily controlled. These activities would also modify the composition and structure of vegetation communities by creating mosaic vegetation patterns and natural fuel breaks, and by promoting healthy, diverse vegetation communities that generally fuel low-intensity fires. Specifically, efforts to reduce incursion of non-native annual grasses (primarily cheatgrass), encroachment of shrubby vegetation, buildup of biomass in forested areas, and proliferation of noxious and invasive weeds would help to achieve this effect. Similarly, treatments for habitat improvement and forage would reduce fuels and reduce the likelihood for stand-replacing fire.

Designating 28,900 acres as ACEC could result in fewer human-caused ignitions due to restrictive management actions. Vegetation treatments would be those that benefit the identified relevant and important values of the particular ACEC. As a result, there is potential that little to no fuels treatments would be allowed in some ACECs and the risk of catastrophic wildfire would not be reduced.

Fewer special status species restrictions in this alternative mean there would be fewer modifications necessary for hazardous fuels treatments.

The wildland fire management program would continue to avoid implementing fuels treatments in areas with known cultural resources that would be adversely affected by fire and vegetative treatments. The presence of cultural sites may necessitate a modification to the design of fuels treatments and sometimes cause the fuels treatment unit to be withdrawn from treatment. As a result, these areas would be at a higher risk for larger, more-intense wildland fires.

The extent of planned ignitions and mechanical treatments would be altered in design and potentially limited in the 159,200 acres of VRM Class I and II lands.

Managing 542,700 acres as unsuitable for forest harvest would increase fuel loading in those areas and subsequently the potential for more severe fires. Conversely, specific harvesting methods of forest and woodlands would reduce fuel accumulations in wooded areas and subsequently reduce wildland fire intensity and the demand for wildland fire management resources.

Continuing to manage 1,134,600 acres of the federal mineral estate as open to fluid mineral leasing would increase development activities and ignition sources, the impacts of which would be the same as those described under Effects Common to All Alternatives.

The impacts of managing 300,700 acres as acceptable for further coal leasing and development and 385,100 acres as suitable for public utilities would be the same as those described under Effects Common to All Alternatives, but would occur over a greater acreage than under other alternatives.

Regarding comprehensive travel and transportation management, Alternative A would have greatest potential for human-caused fire because it includes the least travel restrictions, thereby increasing the potential for the spread of invasives and new ignition sources.

No lands with wilderness characteristics would be managed for wilderness characteristics under Alternative A. The absence of such management would allow greater flexibility in hazardous fuels treatments, especially in those areas suited for mechanical treatments.

Alternative B

Under Alternative B, vegetation and weed treatments would decrease both standing and non-standing vegetation (fuel load) across the planning area, which would decrease the intensity of wildland fires and allow fires to be more easily controlled. The use of planned and unplanned fires to meet resource objectives would further decrease fire intensity and fuel loading. Mechanical treatments in all vegetation types, but especially in forest communities, could also help reduce the potential for crown fires and make them easier to manage and control.

Planned and unplanned fires would be avoided in black brush and salt desert shrub communities, which would prevent the increase of invasive annuals that generally leads to a higher fire frequency.

The use of fire to maintain and increase desired plant community diversity would also help reduce fuel loads across the planning area. Management of salt desert shrub communities requires suppression of all fires. Vegetation treatments in these communities targeting cheatgrass would reduce the risk of wildfire.

Following guidelines in the BAR Program would improve the fire and fuel program's efficiency over the long term. Implementing BAR objectives would allow the fire and fuel program to focus their efforts and resources in areas at greatest risk for severe wildfire damage, implement cost-effective fire management plans, and assist in the re-establishment of native species.

Within mountain shrub communities such as Gambel oak (*Quercus gambelii*), the BLM would allow planned and unplanned ignitions and mechanical treatments to create canopy openings and reduce fuel loads.

Maintaining pinyon-juniper woodlands across seral stages would help to reduce the size and extent of late seral crown fires; fires in the earlier seral stages are easier to suppress and are typically smaller in size than late seral crown fires.

Management of conifer stands in this alternative would reduce fuel loads and increase canopy openings. This would reduce the potential for large wildfires and crown fires and the costs and resources associated with responding to them. However, actions involving mechanized equipment could slightly increase the potential for ignition sources and cost.

Adaptive drought management could limit prescribed burns and vegetation treatments during periods of extreme and exceptional drought. This would potentially reduce the acres mitigated against fire, but would also decrease the chance of invasive species outcompeting native vegetation post-treatment.

Designating 123,000 acres (4.2 times more acres than under Alternative A) as ACECs would result in impacts similar to those described under Alternative A, but occurring over a much larger area.

Managing 10 wildlife emphasis areas on 149,700 acres could increase the cost and limit flexibility for fuel treatment efforts. Hazardous fuels treatments could need wildlife mitigations, which could lead to increased costs, TLs, and alteration of project design.

Stipulations for special-status species management (including active nesting sites) could reduce fuels treatments flexibility. The impacts would vary by stipulation,

with buffer distances and exceptions presenting unique impacts regarding increased survey costs and design alterations for fuels treatments.

The impacts from cultural resources management actions would be the same as those described under Alternative A, but there would be additional restrictions in the form of NSO stipulations and management actions for the Allocation to Use category.

The types of impacts from forestry would be the same as those under Alternative A, but only 239,400 acres (56 percent fewer acres than under Alternative A) would be closed to wood product sales and or harvest.

The types of impacts from visual resources management actions would be the same as those described under Alternative A but VRM Class I and II lands would be managed on 491,100 acres (3.1 times more acres than under Alternative A).

The types of impacts from fluid minerals, coal, and lands and realty would be the same as those described under Alternative A, but would affect a smaller area.

The impacts from comprehensive travel and transportation management would be the same as those described under Effects Common to All Alternatives. There would be 0 acres open to cross-country motorized and mechanized travel under Alternative B, resulting in fewer opportunities for unplanned ignition (intensive use would be allowed on 10,200 acres, in areas largely devoid of vegetation). Cross-country foot and horse travel would still present the potential for the spread of invasives and human-caused ignition.

Managing 44,100 acres for wilderness characteristics under Alternative B could result in reduced flexibility for hazardous fuels treatments.

Implementing the Shale Ridges and Canyons MLP may reduce opportunities for human-caused ignition due to the possibility of applying additional COAs to new and existing leases in the MLP analysis area.

Alternative C

The types of impacts from soils management actions would be the same as those described under Alternative B.

The types of impacts from vegetation management actions would be similar to those described under Alternative B, but increased fuel loading could be expected as a result of a reduction in mechanical treatments under Alternative C. For example, managing pinyon-juniper woodlands to increase old-growth would increase the size and extent of crown fires. Fires in older stands tend to burn intensely, are costly to suppress, and are typically larger in size. Other restrictions unique to Alterative C include less use of mechanical hazardous fuels treatments in mountain shrub communities and emphasizing vegetation management for the enhancement special status species habitat that could

reduce acreage available for hazardous fuels treatment. These actions could increase fuel levels sufficient to produce a landscape with larger and more costly fires.

The types of impacts from managing ACECs would be similar to those described under Alternative A, but under Alternative C BLM would manage 23 ACECs on 168,000 acres (5.8 times more acres than under Alternative A).

The types of impacts from fish and wildlife management actions, with regards to wildlife emphasis areas, would be similar to those described under Alternative B but would occur over 145,400 acres (3 percent fewer acres than under Alternative B).

The types of impacts from special status species management actions would be same as those described under Alternative B but would occur over a larger area because of greater management emphasis on adjacent suitable habitat that would restrict the areas available for hazardous fuel reduction projects and the use of unplanned ignitions to meet resource benefits.

The types of impacts from cultural resources management actions would be the same as those described under Alternative A, but there would be additional restrictions in the form of NSO stipulations and management actions for the Allocation to Use category.

The types of impacts from visual resources management actions would be the same as those described under Alternative A.

The types of impacts from fluid minerals, coal, and lands and realty actions would be the same as those described under Alternative A, but over a smaller area than under any other alternative.

The types of impacts from forestry management actions would be the same as those described under Alternative A, but approximately 435,300 acres would be closed to wood product sales and/or harvest under Alternative C (20 percent fewer acres than under Alternative A).

The types of impacts from comprehensive travel and transportation management actions would be the same as those described under Effects Common to All Alternatives, but would occur over a smaller area because Alternative C includes the most acres closed to different uses or where uses are limited to designated routes.

Under Alternative C, the BLM would manage 171,200 acres for wilderness characteristics (7 times more acres than under Alternative B). The types of impacts would be the same as those described under Alternative B, but would occur over a larger area.

Alternative D

Alternative D allows less flexibility in the management of unplanned ignitions because more suppression would be required as a result of allowing increased resource extraction under this alternative than under Alternatives B and C. This reduction in using natural ignitions for resource benefit would result in potentially increased fire suppression costs, especially large fire costs, and increase risks to the firefighter over the long term. Fuels treatments would prioritize manual and mechanical treatments.

The types of impacts from soils and special status species management actions would be the same as those described under Alternative B.

The types of general vegetation impacts would be the same as those described under Alternative B, except Alternative D would emphasize forage-producing vegetation treatments, reducing large fire potential. Alternative D does not emphasize cheatgrass control treatments, meaning cheatgrass would continue to negatively alter fire regimes across a larger area than under Alternatives B. In addition, this alternative has few restrictions for hazardous fuels treatments in mountain shrub and pinyon/juniper.

Compared to Alternative B, there would be a greater reduction in fuel loading due to forage/habitat producing treatments in woodlands under Alternative D. This would lessen demands for wildland fire management resources in those areas unless the areas became infested with cheatgrass, in which case demands would rise.

The types of impacts from special status species management would be similar to those described under Effects Common to All Alternatives, but would occur over a smaller area than under Alternatives B and C because there would be fewer areas managed to promote special status species and therefore less potential for impacts on the wildland fire management program.

The types of impacts from cultural resources management actions would be the same as those described under Alternative A.

The types of impacts from visual resources management actions would be the same as those described under Alternative A but VRM Class I and II areas would be managed on 291,300 acres (2.1 times more acres than under Alternative A).

The impacts from fluid minerals actions would be the same as those described under Alternative A.

The types of impacts from coal and lands and realty actions would be the same as those described under Alternative A, but would occur over a smaller area.

The types of impacts from forestry management actions would be the same as those described under Alternative B, but only approximately 108,600 acres

would be closed to wood product sales and/or harvest under Alternative D, the least of all alternatives (80 percent fewer acres than under Alternative A).

Managing 33,200 acres (15 percent more acres than under Alternative A) in five ACECs would result in impacts similar to those described under Effects Common to All Alternatives.

The types of impacts from comprehensive travel and transportation management actions would be the same as those described under Effects Common to All Alternatives, but additional closures to different uses and areas where uses are limited to designated routes would limit impacts.

No lands with wilderness characteristics would be managed for wilderness characteristics under Alternative D. The types of impacts would be the same as those described under Alternative A.

Cumulative

The CIAA for Wildland Fire Management is delineated by the fourth-order watersheds that completely or partially overlap the planning area. Rather than following administrative boundaries, wildland fires burn based on fuels, weather, and topography. Because of continuous fuels, historic high fire occurrence, and many jurisdictional lines occurring at mid-slope, GJFO fire management activities could affect fire management and resources outside of the planning area. For example, there is a high likelihood of fires burning from BLM-administered lands to National Forest System lands on the Battlements, Grand Mesa slopes, and Uncompahgre Plateau. There is also the potential for wildland fires to impact adjacent BLM, private, and state lands, such as the Roan Cliffs fire in 2009, which burned onto public lands administered by the Moab Field Office.

Past and present management actions and natural events within the CIAA have altered the condition of vegetation and natural fire regimes across the landscape. These include fire suppression, vegetation treatments, grazing, timber harvesting, noxious and invasive weed spread, drought, and insect and disease outbreaks. In many cases, areas are now more prone to large, intense fires.

Urban development and recreational activities in the CIAA are expected to increase over the life of the RMP, creating additional potential ignition sources and the probability of wildland fire occurrence. Of these two factors, urbanization, and especially the expansion of residential areas, is expected to be the larger contributor to cumulative wildland fire impacts. The WUI is a high-priority suppression area, and suppression in the WUI can be more dangerous, time-consuming, and expensive than suppression in undeveloped areas. Additional WUI would increase the need for hazardous fuels projects to reduce the risk of wildland fires burning from BLM-administered lands into the WUI. Increased WUI can also increase costs associated with suppression and is more dangerous to firefighters and the public. Additional fire suppression resources could be needed, including federal, state, and local agency resources.

Increasing energy development on both BLM-administered lands and adjacent private property increases the probability of human-caused ignitions and can require costly suppression efforts to protect life, property, and infrastructure. Fluid minerals development creates safety issues during wildland fires, including evacuations, unknown hazardous materials, and hazards regarding pipelines and other flammable materials. These issues add to the suppression costs and complexity in areas of fluid mineral developments.

Changing land use patterns and increased recreation and visitation would also result in the modification of vegetative communities; both trends present new vectors for the introduction of noxious weeds and nonnative vegetation species. These introduced species could eventually alter the fire regime of certain areas and potentially increase the frequency, size, and intensity of wildland fires.

4.3.12 Lands with Wilderness Characteristics

This section discusses impacts on lands found to have wilderness characteristics from proposed management actions of other resources and resource uses. Existing conditions concerning lands with wilderness characteristics are described in **Section 3.2.14**, Lands with Wilderness Characteristics.

The GFJO is required to perform a wilderness inventory, per Manual 6300-2 (BLM 2011), and identify those lands that contain wilderness characteristics. Wilderness characteristics considered in this analysis include naturalness, and outstanding opportunities for solitude or a primitive and unconfined type of recreation. In the planning area, 12 areas with a total of 171,200 acres were found to have wilderness characteristics based on the BLM Wilderness Characteristics Assessment (**Appendix F**).

Methods of Analysis

Indicators of impacts on lands with wilderness characteristics include the degradation of wilderness characteristics to a level at which the value of the wilderness characteristic would no longer be present within the specific area.

Analysis for this section discusses the impacts of planning decisions on managing lands with wilderness characteristics. Only potentially significant impacts are discussed in detail in the following sections.

This section also analyzes impacts on lands with wilderness characteristics that are not managed to protect those characteristics. Quantitative impacts pertaining to those areas are displayed in **Table 4-50**, Acreage Impacts on Lands with Wilderness Characteristics Not Managed for Wilderness Characteristics, and discussed in the following analysis.

Table 4-50
Acreage Impacts on Lands With Wilderness Characteristics Not Managed for Wilderness Characteristics

Management Action	Alternative A	Alternative B	Alternative D
ROW Avoidance Areas	69,700	89,000	0
ROW Exclusion Areas	64,800	37,600	1,600
VRM Class II	50,100	66,300	59,200
Subject to NSO Stipulation	121,700	93,000	79,300
Subject to CSU Stipulation	5,000	65,000	93,600
Acceptable for Coal Leasing	81,800	71,700	71,600
ACEC	0	30,800	100

Source: BLM 2010a

Effects Common to All Alternatives

Each alternative would impact the wilderness characteristics of lands with wilderness characteristics to some degree. Generally, actions that create surface disturbance degrade the natural characteristics of these areas and the setting for experiences of solitude and primitive recreational activities.

Fluid mineral leasing can impact lands with wilderness characteristics by potentially leading to disturbance of the natural landscape surface for drilling and related development, including roads and pipelines. Within the 171,200 acres of lands with wilderness characteristics in the planning area, approximately 1,800 acres have been classified as having high potential for oil and gas development (all within the South Shale Ridge unit) and 29,300 acres have been classified as having moderate potential (within portions of the Hunter Canyon and South Shale Ridge units). The remaining 139,900 acres of lands with wilderness characteristics have been classified as having low, very low, or no potential for oil and gas development and would not likely be developed over the life of the plan. Additionally, 35,200 acres have been identified as having potential for geothermal resources which includes all of the Bangs Canyon unit and a portion of the South Shale Ridge unit (14,700 acres).

While there is low to no potential for fluid mineral development in most of the lands with wilderness characteristics units, the majority of the areas, totaling 101,000 acres (59 percent), are already leased for oil and gas development. While stipulations for fluid mineral development may apply to these leases under Alternative A, stipulations under Alternatives B, C, and D would not retroactively apply to the existing leases, just as closing the areas to fluid mineral leasing would not apply to existing leases. In other words, existing leases would be subject to terms and conditions attached to the original lease. Conditions of Approval similar to the stipulations may be applied to the drill permit at a later stage to protect other resources or stipulations may be applied if a lease expires and the land is leased again. Should any of the leases be developed, there would likely be impacts on wilderness characteristics to the degree that at least portions of the area would no longer meet the criteria for having wilderness

characteristics. Naturalness would be impacted primarily from increases in visual intrusions, human activity, and modifications to the landscape including indirect changes such as additional roads. Increased noise levels, visual impacts, presence of people, and associated traffic would impact opportunities for solitude and primitive recreation.

Coal development could impact lands with wilderness characteristics by leading to disturbance of the natural landscape surface for location of facilities and vents. East Demaree Canyon, East Salt Creek, Hunter Canyon, South Shale Ridge, Spink Canyon, and Spring Canyon are within the area of coal potential. Making these areas unsuitable for coal leasing would protect the naturalness of the areas.

Livestock grazing would be allowed under all alternatives. Impacts on lands with wilderness characteristics are possible from livestock grazing, particularly from fencing, which may lessen appearance of naturalness.

Management for wildland fire has the potential to impact lands with wilderness characteristics. In areas where suppression is a priority, there is the potential for fuels treatments that could result in vegetation modification and surface disturbance to prevent the spread of fires, potentially reducing the appearance of naturalness.

Management actions that protect resources would impact lands with wilderness characteristics by preserving or enhancing naturalness as well as opportunities for solitude and primitive recreation. For example, restrictions on soil and water resources management actions could preserve the naturalness of the landscape by preventing large-scale disturbances through the application of stipulations and other actions. Restrictions on surface use to protect cultural resources would limit visual impacts and habitat degradation, thereby protecting wilderness characteristics. Also, where lands with wilderness characteristics units overlap with wildlife emphasis areas, management actions to protect fish and wildlife would preserve wilderness characteristics by promoting a more natural landscape conducive to healthy vegetation, fish, and wildlife. Specific measures and impacts would vary by alternative and are discussed in the following sections.

Where such areas overlap or are adjacent to lands with wilderness characteristics, designation of special management areas such as ACECs and WSAs may also provide some protection of wilderness characteristics due to the protective measures proposed for special designation areas. These protective measures would include complementary management objectives where lands with wilderness characteristics units would be managed to protect their wilderness characteristics, and may offer some indirect protection of wilderness characteristics for units managed primarily for other resource considerations.

Implementing management for the following resources would have negligible or no impact on lands with wilderness characteristics and are therefore not discussed in detail: air; wild horses; paleontology; national trails; national, state, and BLM byways; and interpretation and environmental education.

Alternative A

The BLM would not manage any lands with wilderness characteristics to protect their wilderness characteristics under Alternative A. Management actions to protect other resources and special designation areas would offer some protection of wilderness characteristics, though surface-disturbing activities such as fluid mineral extraction and casual use (e.g., recreation) would have the potential to alter the natural setting as well as reduce opportunities for solitude or primitive recreation for all lands with wilderness characteristics units. Management under Alternative A has led to current conditions that include wilderness characteristics existing in 12 areas within the planning area. Wilderness characteristics would likely persist in many of these areas under Alternative A, however, degradation of wilderness characteristics in at least some areas that currently possess wilderness characteristics would be likely under this alternative.

Of the 171,200 acres of lands with wilderness characteristics, 50,100 acres (29 percent) would be managed as VRM Class II which would protect wilderness characteristics because activities altering the existing landscape character would be prohibited. Another 41,900 acres (26 percent) would be managed as VRM Class III, which would allow some modifications to the landscape that could impair the naturalness of the area. The remaining 79,100 acres (46 percent) would be undesignated. Undesignated areas are not managed for VRM objectives so activities could be permitted that modify the landscape and thus impact the naturalness of the areas.

Managing lands with wilderness characteristics as unsuitable for public utilities (i.e., ROW exclusion) would protect wilderness characteristics by prohibiting disturbance from transmission lines, roads, and other utility developments. Under Alternative A, 64,800 acres (38 percent of lands with wilderness characteristics) would continue to be managed as unsuitable for public utilities. An additional 69,700 acres (41 percent) would continue to be managed as sensitive to public utility development (i.e., ROW avoidance) providing a certain amount of awareness for sensitive resources in the area, although ROW location may still occur. ROWs could impact wilderness characteristics on the 36,500 acres not managed as unsuitable for or sensitive to ROW location.

All or a portion of each of the 12 lands with wilderness characteristics units totaling 121,700 acres (71 percent of lands with wilderness characteristics) would continue to be protected by NSO stipulations for fluid mineral development. The majority of areas with NSO stipulations, however, have low

to no potential for oil and gas so impacts from development would be unlikely, regardless.

Under Alternative A, a total of 81,800 acres (48 percent) of lands with wilderness characteristics in the area of coal potential would be available for coal leasing. While coal is largely mined subsurface in the GJFO, the location of facilities and vents could still impact the naturalness of these areas.

The BLM would designate five ACECs under Alternative A (Badger Wash, The Palisade, Pyramid Rock, Rough Canyon and Unaweep Seep). The West Creek (adjacent) unit overlaps the Unaweep Seep ACEC. Impacts are described under Effects Common to All Alternatives. Similarly, there are several areas where lands with wilderness characteristics units and eligible WSR stream segments overlap: Ute Creek with the Unaweep unit; Blue Creek and Dolores River with the Maverick unit; and North Fork West Creek with the West Creek (adjacent) unit. In these instances, and where East Creek and the Bangs Canyon unit are adjacent to each other, WSR management would complement wilderness characteristics.

Alternative B

The BLM would manage the Bangs, Maverick, and Unaweep lands with wilderness characteristics units (44,100 acres or 26 percent of lands with wilderness characteristics) to protect their wilderness characteristics. Closing these units to fluid mineral leasing, mineral material disposal, and non-energy leasable development and exploration would protect wilderness characteristics by prohibiting development and infrastructure related to those actions, subject to valid existing rights (see Effects Common to All Alternatives). In addition, the BLM would apply NSO stipulations, prohibiting other surface-disturbing activities (not related to fluid mineral leasing) that could damage wilderness characteristics. While these actions would prevent alteration of wilderness characteristics, the potential for impacts on other lands with wilderness characteristics units would remain. For example, those units with high and moderate potential for oil and gas development would not be managed for wilderness characteristics and would be managed for multiple use (i.e., for other uses that may be incompatible with protection of wilderness characteristics). Of the 127,200 acres (74 percent) not managed for wilderness characteristics, NSO stipulations would be applied on 93,000 acres (73 percent) and CSU stipulations would be applied on 65,000 acres (51 percent) of lands with wilderness characteristics not managed for wilderness characteristics. The types of impacts are the same as those described under Effects Common to All Alternatives. For those areas where stipulations would not be applied, mineral exploration and development would have the potential to impact both the areas' naturalness and opportunities for solitude and primitive recreation. Due to the scattered nature of the parcels available for development, and their relatively low potential for oil and gas, significant development and associated impacts would not likely occur.

The three areas managed for wilderness characteristics are outside of the area of coal potential, as are West Creek (adjacent), Kings Canyon, Lumsden Canyon, and the remainder of the Maverick unit that is not managed for wilderness characteristics. Of the lands with wilderness characteristics in the area of coal potential, approximately 71,700 acres (57 percent) would be available for coal leasing. Impacts are similar to those described under Alternative A, although facilities would be subject to stipulations for surface-disturbing activities, if applicable, and so may receive indirect protection from coal development.

Management of forestry resources has the potential to impact wilderness characteristics should forest product harvest be available in lands with wilderness characteristics. Under Alternative B, activity-level plans would be developed to direct forest product removal. These plans would take into account other resource constraints such as wildlife habitat, soil erosion potential, and water quality, thus reducing impacts on lands with wilderness characteristics. Areas managed to protect their wilderness characteristics would be closed to wood product sales and/or harvest (including Christmas tree harvest), minimizing impacts on wilderness characteristics.

Wildland fire management is not likely to impact lands managed to protect their wilderness characteristics but may impact other lands with wilderness characteristics. For example, more aggressive fire suppression would likely occur in areas adjacent to private land and/or where other values are at risk.

In addition, lands managed to protect their wilderness characteristics would be managed as VRM Class II, which would protect wilderness characteristics because activities altering the existing landscape character would be prohibited. Of the areas not managed to protect their wilderness characteristics, approximately 66,300 acres (52 percent) would also be managed as VRM Class II. Compared with Alternative A, 32 percent more acres of lands with wilderness characteristics would receive protection from VRM Class II management. The remaining area, 60,700 acres, would be managed as VRM Class III (45 percent more acres than under Alternative A). VRM Class III management would allow for noticeable changes to the landscape which could impact the naturalness and untrammeled nature of the areas.

All lands managed to protect their wilderness characteristics would be managed as ROW exclusion areas which would protect wilderness characteristics by prohibiting disturbance from transmission lines, roads, and other utility developments. On lands with wilderness characteristics not managed to protect their wilderness characteristics, 37,600 acres (30 percent) would be managed as ROW exclusion providing indirect protection to wilderness characteristics. Additionally, 89,000 acres (70 percent) of lands with wilderness characteristics would be managed as ROW avoidance areas. In total, 81,700 acres (48 percent)

of lands with wilderness characteristics would be protected by ROW exclusion (20 percent fewer acres than under Alternative A).

The Bangs and Unaweep lands with wilderness characteristics units would be closed to motorized travel and mechanized travel, but the BLM would limit motorized and mechanized travel to designated routes within the Maverick unit. In addition, no special recreation permits would be issued for competitive events. As such, visitor numbers and noise would likely remain at a low level in the Bangs and Unaweep units, retaining naturalness, solitude, and opportunities for primitive and unconfined recreation. Noise and visitation in the Maverick unit could increase over the life of the plan if this becomes a desirable destination. Administrative access to range improvements in the Unaweep and Bangs units would be allowed; because access would be needed infrequently, this would be unlikely to degrade wilderness characteristics. Other impacts from recreation would be negligible as any overlap of SRMAs and lands with wilderness characteristics would only occur in areas managed for non-motorized/non-mechanized recreation.

The mileages of routes are proposed to be designated administrative-only or closed based upon lands with wilderness characteristics planning criteria are shown in **Table 4-51**.

Table 4-51
Route Designations and Lands With Wilderness Characteristics Planning Criteria under Alternative B

Planning Criteria	Final Designation Administrative Use (miles)	Final Designation Closed (miles)	Total miles designated as Administrative Use or Closed
Inventoried lands with wilderness character	20.3	53.4	73.7
Managed lands with wilderness character	12.3	8.8	21.1
Total	**32.6**	**62.2**	**94.8**

Source: BLM 2010a

A number of measures designed to protect other resources would also aid in the preservation of wilderness qualities under Alternative B. For soil resources, management actions to promote meeting Standard 1 of BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado would allow adequate soil health to support more desirable plant communities, thus protecting naturalness in all lands with wilderness characteristics. For water resources, travel and mineral closures and NSO and CSU stipulations limit disturbances, which preserve wilderness qualities.

Vegetation treatments have the potential to result in a short term disturbance of lands and decrease in naturalness. Over the long term, treatments would

likely improve naturalness as native plant species return. Similarly, weed treatments would likely lead to an increase in naturalness in the long term.

Finally, 146,400 acres of lands with wilderness characteristics are in areas of high or medium sensitivity for cultural resources, raising the potential for the application of stipulations or other protections than under Alternative A if cultural resources are identified.

Designation of special management areas may provide complementary protection of lands with wilderness characteristics' qualities where these areas are contiguous or adjacent due to the protective measures established for these areas. While not managed to protect its wilderness characteristics, portions of the West Creek (adjacent) unit would be contiguous with The Palisade WSA, which would provide additional protection for wilderness characteristics. Where lands managed to protect their wilderness characteristics overlap ACECs, ACEC management would be designed to protect wilderness characteristics (e.g., the Dolores River Riparian and Juanita Arch ACECs overlap the Maverick unit). In addition, where the South Shale Ridge lands with wilderness characteristics unit and ACEC overlap, the ACEC offers some protection of wilderness characteristics (e.g., ROW exclusion and VRM Class II). Finally, managing a portion of the Dolores River as suitable for inclusion in the NWSRS would provide additional indirect protection of the Maverick unit's wilderness characteristics on the 400 acres where those two areas overlap.

Alternative C

The BLM would manage all 171,200 acres of lands with wilderness characteristics to protect their wilderness characteristics (7 times more acres than under Alternative B). All impacts as discussed under Alternative B are relevant to Alternative C. However, because 7 times more acres are managed to protect their wilderness characteristics under Alternative C, the impacts on lands with wilderness characteristics would occur over a greater area and protection of wilderness characteristics would be increased.

Under Alternative C, stipulations designed to protect special status plant and animal species would protect wilderness characteristics by prohibiting potentially damaging leasing and surface-disturbing activities. For example, where the South Shale Ridge unit overlaps with a population of the federally threatened plant DeBeque phacelia, an NSO stipulation and protective management actions associated with the South Shale Ridge ACEC would limit disturbances that could degrade wilderness characteristics.

Surface resource protection for cultural resources, as described under Alternative B, would offer complementary protection for 146,400 acres of lands managed to protect their wilderness characteristics.

As discussed under Alternative B, closing lands managed to protect their wilderness characteristics to fluid mineral leasing, mineral material disposal and

non-energy leasable development and exploration would protect wilderness characteristics by prohibiting development and infrastructure related to those actions, subject to valid existing rights (see Effects Common to All Alternatives). Impacts from coal development would be the same as those described under Alternative B.

As discussed under Alternative B, designation of special management areas may provide some additional protection of lands managed to protect their wilderness characteristics where these areas are contiguous or adjacent. As under Alternative B, the West Creek (adjacent) unit would be contiguous with The Palisade WSA and the Spink Canyon and Spring Canyon units would be contiguous with the East Demaree WSA, which would provide additional protection by prohibiting non-compatible uses along the border of the units. In addition, 36,300 acres of ACECs overlap with lands managed to protect their wilderness characteristics, including South Shale Ridge ACEC (overlaps with the South Shale Ridge unit) and portions of Dolores River Riparian ACEC (Maverick unit), providing additional protection through the use of complementary management actions in those ACECs. Similarly, there are several areas where lands managed to protect their wilderness characteristics and suitable WSR stream segments overlap: Ute Creek with the Unaweep unit; Blue Creek and Dolores River with the Maverick unit; and North Fork West Creek with the West Creek (adjacent) unit. In these instances, and where East Creek and the Bangs Canyon unit are adjacent to each other, WSR management would complement wilderness characteristics.

Alternative D

The BLM would not manage any lands with wilderness characteristics to protect their wilderness characteristics under Alternative D. As discussed under Alternative A, no special management would be enacted to preserve wilderness characteristics in inventoried lands with wilderness characteristics units. While some protection of these qualities may be provided by management actions for other resource programs, lack of management actions for lands with wilderness characteristics increases the potential for degradation of wilderness characteristics.

Of the 171,200 acres of lands with wilderness characteristics, approximately 59,200 acres (35 percent) would be managed as VRM Class II which would protect wilderness characteristics because activities altering the existing landscape character would be prohibited. Compared with under Alternative A, 18 percent more acres would be managed as VRM Class II under Alternative D. An additional 109,900 acres (64 percent) would be managed as VRM Class III which would allow some modifications to the landscape that could impair the naturalness of the area. The remaining one percent of lands with wilderness characteristics would be managed as VRM Class IV, which allows the most modification to the landscape and has the most potential to impact the

naturalness of the areas. Compared with Alternative A, 98 percent fewer acres would be managed as VRM Class III or IV.

Under Alternative D, only 1,600 acres in the Hunter Canyon and West Creek (adjacent) units would be managed as ROW exclusion areas, accounting for less than one percent of all lands with wilderness characteristics. Alternative D would provide the least amount of protection to lands with wilderness characteristics from ROW location, which could impact the naturalness and untrammeled nature of the areas. However, any ROWs would still have to meet VRM objectives, as previously described.

While no lands with wilderness characteristics would be managed to protect their wilderness characteristics, NSO stipulations to protect other resources would be applied on 79,300 acres (46 percent) of lands with wilderness characteristics, providing indirect protection to wilderness characteristics. Compared with Alternative A, 35 percent fewer acres would be protected by NSO stipulations. CSU stipulations would be applied on 93,600 acres (55 percent) of lands with wilderness characteristics. The type of impacts would be the same as those described under Effects Common to All Alternatives. For those areas where stipulations would not be applied, mineral exploration and development would have the potential to impact both the naturalness and opportunities for solitude and primitive recreation. Impacts from coal development would be the same as those described under Alternative B.

The BLM would designate 5 ACECs under Alternative D (Badger Wash, The Palisade, Pyramid Rock, Rough Canyon and Unaweep Seep). The West Creek (adjacent) unit overlaps the Unaweep Seep ACEC. Impacts are the same as those described under Effects Common to All Alternatives.

Cumulative

The CIAA used to analyze cumulative impacts on lands with wilderness characteristics includes the planning area and all adjacent BLM-identified lands with wilderness characteristics that are adjacent or overlap the planning area boundary. Adjacent and overlapping BLM-identified lands with wilderness characteristics include the Beaver Creek and Granite Creek units in the Moab Field Office and the proposed Grand Hogback unit in the Colorado River Valley Field Office.

Many past, present, and reasonably foreseeable actions have impacted or have the potential to impact the wilderness characteristics of lands with wilderness characteristics. For example, continued residential development in the Grand Valley and nearby communities would likely increase visitor use on BLM-administered lands including lands with wilderness characteristics, potentially impacting wilderness characteristics by reducing opportunities for solitude. Development of energy and minerals resources could introduce sights, noises, and infrastructure in or adjacent lands with wilderness characteristics, which could degrade their wilderness characteristics. In addition, vegetation

management activities on public and private lands may alter landscape appearance and setting in the short and long term, protecting or degrading wilderness characteristics depending on the activity. Impacts on lands with wilderness characteristics would be mitigated where those lands are managed to protect their wilderness characteristics and/or where management actions governing other resources complement wilderness characteristics.

4.4 RESOURCE USE CONDITIONS

This section contains a description of the human uses of resources in the GJFO planning area and follows the order of topics addressed in **Chapter 3**:

- Forestry
- Livestock grazing
- Recreation and visitor services
- Lands and realty
- Energy and minerals

4.4.1 Forestry

This section discusses impacts on forestry from proposed management actions of other resources and resource uses. Existing conditions concerning forestry are described in **Section 3.3.1**, Forestry.

Methods of Analysis

The analysis uses the following indicator of impacts on forestry resources: Loss and/or alteration of the quality and quantity of forest and woodland products available for harvest to the extent that demand cannot be met.

This analysis focuses on management actions with physical disturbance potential that result in changing the quantity or quality of forest and woodland habitat and/or products available for harvest. Forestry generally pertains to forest and woodland species, although areas of vegetation not classified as forests or woodlands could also contain forest products that are suitable for harvest. When possible, mitigation measures were incorporated in the analysis to reduce the effects of impacts on vegetation, rangelands, and riparian/wetland areas.

The analysis includes the following assumptions:

- Forest and woodland products and traditional woodland products (Christmas trees, pinyon nuts, post/poles, and wildings) could originate from other areas and habitat that are not dominated by forest and woodland vegetation.
- Improved forest health will likely increase quality and quantity of product available for harvest.

- Loss of harvestable acres through legislative or administrative designations (e.g., NCA or ACEC) will likely increase demand for forest products in other areas.

The quality and quantity of forest and woodland products available for harvest in the long term is directly tied to forest health and vegetation management. As discussed in **Chapter 3**, factors such as insect and disease outbreaks, age class structure diversity, and forest succession rate can impact forest health and products available for harvest. Forestry management under all alternatives would be undertaken with a goal of improving forest health. Impacts on vegetation management for forestry and woodlands are described in further detail in **Section 4.3.4**, Vegetation.

Effects Common to All Alternatives

Forest harvest is anticipated on a small portion of the decision area due to a lack of large-scale commercially harvestable timber. As discussed in **Chapter 3**, the majority of forestry products harvested from BLM-administered lands are from pinyon-juniper vegetation communities.

Actions that would affect forestry primarily include restrictions on surface-disturbing activities and other allowable uses such as limitations to protect sensitive resources and special designation areas. Applying NSO stipulations on steep slopes would impose limitations on treatment methods and harvest of forest and woodland products by reducing the area available for those practices. Over the life of the RMP, however, many of these restrictions would benefit the forestry program by stabilizing soils and improving stand quality. Similarly, areas used for drinking water have surface restrictions to reduce soil erosion and prevent water contamination that may conflict with forestry management objectives and limit forestry product development in these areas. Activity level plans would be developed with the needs of source water protection areas in mind; specific areas closed vary by alternative and are discussed below.

In general, vegetation management objectives would complement forestry management objectives, as both programs manage for healthy forests and woodlands. However, a CSU stipulation for plant communities in Alternative B and for old growth forests and woodlands in Alternatives C and D may prohibit removal of forestry materials from some areas.

Measures designed to protect special status species and fish and wildlife may also impose restrictions on forest product harvest in areas where sensitive habitat is co-located with areas potentially available for forestry harvest. Under current management, mitigation and minimization measures to protect wildlife are determined on a site-specific basis. Under all action alternatives (Alternatives B, C, and D), CSU stipulations would protect BLM sensitive species habitat, significant natural plant communities, and high-value or crucial wildlife habitat.

Impacts from cultural resources actions would occur in areas where NSO stipulations for allocated cultural resource sites are identified. Possible effects include restricting or relocating treatment boundaries and access roads away from cultural resources.

Wildland fire management has the potential to impact forestry by reducing lands available for harvest. However, with proper limitations and guidelines, fuels treatments would likely have long-term positive effects on forestry; useable forest byproducts such as biomass or fuelwood often result from treatment and restoration projects, such as hazardous fuels treatments, designed to improve forest health. Unplanned fire can burn forest products, affecting their availability and condition, however can improve stand health and open new areas for harvestable forest and woodland product. Specific impacts of wildfire treatment and management are discussed by alternative below.

Management of visual resources could have site-specific impacts, including mandated changes in treatment type, size, and location of allowable harvest to meet VRM class objectives. These impacts would be concentrated in VRM Class I and II areas where visual disturbance is more restricted. However, relatively little commercial forest harvest is forecasted for the next 15 to 20 years, and woodland harvest is unlikely to be significantly impacted by the management of visual resources.

Implementation of energy and minerals and ROW projects, such as pipelines, pads, and associated facilities, would have long term impacts on the forestry program by reducing the area available for harvest.

Management of the four WSAs would have direct, long-term impacts on forestry by prohibiting wood product sales and harvest, including Christmas tree harvest. As a result, closures may reduce the amount of forest product available for harvest and could affect forest health.

WSR management of Colorado River Segment 3 prohibits forestry practices. Impacts on forestry along this stretch of river are discussed in the Proposed RMP/Final EIS for the McInnis Canyons NCA [formerly Colorado Canyons NCA] and Black Ridge Canyons Wilderness (BLM 2004).

Under all alternatives, forestry and vegetation management treatments would generate woody biomass for production of various fuel types, in addition to traditional uses such as posts, poles, and firewood.

Implementing management actions for the following resources would have negligible or no impact on forestry and are therefore not discussed in detail: air; paleontology; livestock grazing; recreation and visitor services; comprehensive travel and transportation management; national trails; national, state, and BLM byways; and interpretation and environmental education.

Alternative A

Under Alternative A, the continued focus of the forestry program would be managing suitable pinyon-juniper woodlands and commercial forest land to maintain stand productivity and help meet fuelwood and saw-timber demands. Forestry zones would not be identified, and no management plans for forestry zones would be established. The delineation of areas for forest product development would be dictated by the lands determined to be suitable or unsuitable for harvest based on criteria established in the 1987 RMP, as described in **Chapter 3**. In total, approximately 542,700 acres are classified as unsuitable for harvest under this alternative.

Harvest of forest and woodland product would continue to be impacted by restrictions for cultural resources that limit or prohibit actions and treatments in areas where they would conflict with cultural resource protection. These restrictions reduce the availability of forest product if located in areas otherwise suitable for harvest.

Fuels treatments would continue to impact forestry where management actions reduce lands available for harvest. Under Alternative A, fuels treatments are proposed for fewer acres than under Alternatives B or C, preserving a greater quantity of forest products.

Biomass would be made available and collected in a manner consistent with existing direction, and implementation of Alternative A would have no impact on biomass utilization.

There is no management for wilderness characteristics within lands with wilderness characteristics under Alternative A; therefore, there would be no restrictions from this program on forestry practices. Management of some ACECs, including Unaweep Seep and the Palisade, would restrict forestry activities and limit the harvest of products from these areas. In the Palisade ACEC (23,600 acres), forestry cutting units would continue to be limited to 20 acres or less in the pinyon-juniper woodlands, and the Unaweep Seep ACEC (80 acres) is closed to commercial wood product sales, forest product harvest, and Christmas tree cutting.

Management of the 14 WSR study segments (not including Colorado River Segment 3) would allow for removal of forest products from eligible segments when forestry harvest does not conflict with the protection of ORVs, free-flowing nature, or tentative classification (i.e., wild, scenic, recreational) of the segments. Development of new roads and trails would be limited in the study corridor of segments tentatively classified as wild or scenic, which may result in additional costs or restrictions on harvest because of reduced access.

Alternative B

Activity level plans would be developed for each established forestry management zone as needed (see **Table 2-2**) taking into account site-specific

conditions and resource concerns. The activity level plans would determine specific areas that are suitable or unsuitable for forest product harvest and would establish allowable harvest levels based on site-specific resource conditions and on vegetation management objectives to improve forest health. Therefore, the long-term impact would be an improvement in forest and woodland health.

Compared with current management, management actions for other resources under Alternative B place additional limitations on forestry product development. There would be approximately 239,400 acres closed to wood product sales and/or harvest (not including Christmas tree harvest), including WSAs, lands managed for wilderness characteristics, ACECs (unless harvests meet ACEC objectives), the Palisade municipal watershed, VRM Class I areas, and known lynx habitat. These closures would lead to a decrease in the amount of forestry product available for harvest to the public. However, forest management activities and product harvest would be allowed for habitat improvement to meet resource objectives. Therefore, forest health could be improved in these areas.

The designation of 123,000 acres of ACECs (4.2 times more than under Alternative A) and management of 44,100 acres for wilderness characteristics would have direct, long-term impacts on forestry by reducing the area available for harvest. Under Alternative B, ACECs would be closed to forestry harvest. In addition, forestry activities and Christmas tree harvest would be prohibited in lands managed for wilderness characteristics to preserve the wilderness characteristics of landscape naturalness and solitude and primitive recreation opportunities. Christmas tree sales would be allowed in these areas unless they are identified as over harvested. For all special area closures, wood product sales and/or harvest would be allowed when implemented as habitat improvement projects to meet desired resource conditions. As a result, closures may reduce the amount of forest product available for harvest but should improve forest health.

As discussed under Effects Common to All Alternatives, drinking water protection may impose restrictions on forestry. Restrictions to protect municipal source water from erosion and pollution under this alternative include an NSO stipulation for Grand Junction and Palisade municipal watersheds and a CSU stipulation for Collbran and Mesa/Powderhorn Source Water Protection Areas and Jerry Creek Watersheds. Although these site-specific restrictions are not specific to forestry, forestry product harvest would be prohibited or limited in those areas, potentially decreasing the amount of forestry product available for harvest.

Under Alternative B, increased fuels treatments have the potential to impose additional limits on forest harvest by reducing the quantity of forest products available for harvest. However, properly implemented fire plans and prescribed

burning could improve forestry and woodland health as well as the quality and quantity of harvestable products.

Under Alternative B, tamarisk and Russian olive would be targeted for removal, and the woody biomass of these species would be made available for biomass use. Biomass can also be made available in conjunction with forestry and fuels projects depending on project resource objectives. Making biomass available represents a direct impact on the regional ability for biomass resources to be utilized.

Impacts would result from the 2,400 acres of NSO stipulations specific to cultural resources and on areas where the NSO stipulation for Use Allocations is applied.

Impacts from WSR management would be similar to those described under Alternative A, but would apply only to the portion of the Dolores River determined suitable for inclusion in the NWSRS.

There would be no unique impacts on forestry from implementation of the Shale Ridges and Canyons MLP because there are no forestry-related COAs identified for use only in the MLP.

Alternative C

Under Alternative C, approximately 435,300 acres (20 percent fewer acres than under Alternative A) would be closed to wood product sales or harvest (not including Christmas tree harvest). As under Alternative B, activity level plans would be developed for each established forestry management zone. Impacts from activity level plans would be the same as those described under Alternative B. Categorical closures under Alternative C include those described under Alternative B and SRMAs. The types of impacts from these closures would be similar to those described under Alternative B. As such, the quantity of wood product available for harvest would likely be further decreased.

Site-specific restrictions to protect municipal source water under this alternative include an NSO stipulation for Grand Junction and Palisade municipal watersheds, as well as for Collbran and Mesa/Powderhorn Source Water Protection Areas and Jerry Creek Watersheds. As under Alternative B, there is the potential for a decrease in the amount of forestry product available for harvest due to these restrictions.

Under Alternative C, increased fuels treatments have the potential to impose additional limits on forest harvest by reducing the quantity of forest products available for harvest. However, properly implemented fire plans and prescribed burning could improve forestry and woodland health as well as quality and quantity of harvestable products.

Under Alternative C, tamarisk and Russian olive would be targeted for removal, with the same types of impacts on biomass resource development as described under Alternative B.

Impacts from ACECs and lands with wilderness characteristics would be the same as those described under Alternative B, but would occur on 168,000 acres (5.8 times more than under Alternative A) and 171,200 acres (7 times more than under Alternative B), respectively.

Impacts would result from the 2,400 acres of NSO stipulations specific to cultural resources and on areas where the NSO stipulation for Use Allocations is applied.

Restrictions from WSRs would be the same as those described under Alternative A.

Alternative D

Under Alternative D, commodity uses would be emphasized and approximately 106,800 acres (81 percent fewer acres than under Alternative A) would be closed to wood product sales or harvest (not including Christmas tree harvest), the fewest acres of any alternative. As under Alternatives B and C, activity level plans would be developed for each established forestry management zone. As under Alternatives B and C, categorical closures have the potential to limit availability of forest products. Due to the closure of fewer acres under Alternative D, significant impacts on forestry product harvest would be less likely than under other Alternatives. Categorical closures under this alternative include the Palisade Municipal Watershed, Gunnison River Bluffs SRMA, and all ACECs. However, forest management activities and product harvest would be allowed for habitat improvement to meet resource objectives including forest health.

Restrictions to protect municipal source water under this alternative also include a CSU stipulation for Collbran and Mesa/Powderhorn Source Water Protection Areas and Jerry Creek Watersheds. Types of impacts would be similar to those described under Alternatives B and C.

Impacts would result specifically from the 2,400 acres of NSO stipulations specific to cultural resources and on areas where the NSO stipulation for Use Allocations is applied.

This alternative proposes to use manual and mechanical fuels treatments over the fewest acres of any alternative, thereby protecting the quantity of forest products. However, fewer treatments would also limit the potential for improving forest and woodland product quantity and quality.

Under Alternative D, tamarisk and Russian olive would be targeted for removal, with the same types of impacts on biomass resource development as described under Alternative B.

There is no management for lands managed for wilderness characteristics or WSRs under Alternative D, and, as such, there would be no restrictions from these two programs on forestry management or harvest. Types of impacts from ACEC management would be similar to those described for Alternative A but would occur on 33,200 acres (15 percent more than under Alternative A).

Cumulative

The CIAA used to analyze cumulative impacts on forest management follows fourth-order watershed boundaries that completely or partially overlap with the planning area. The fourth-order watersheds are used as the basic unit of analysis because the scope of cumulative influence would be at the watershed scale and is not expected to extend beyond this scale.

Reasonably foreseeable past, present, and future actions that may impact forestry management include actions by the BLM within the planning area, actions by other land owners on private land, and natural causes. In addition to the current forestry practices discussed in **Chapter 3**, human actions that may impact forestry include mechanical treatments of vegetation on public and private rangelands, as well as conversion of land for agricultural or development purposes, particularly due to increasing residential development in the WUI. Forestry products would continue to be impacted by natural events, including insect epidemics, which are likely to diminish forest health and the quality and quantity of available harvest products. Expansion and increased diversity in previously open areas is likely to continue due to fire suppression, decreased acres available for harvest, and climate change, which may result in increased available harvest products. Forest management activities on public, private, and other federal land would continue to be implemented to reduce the size and intensity of existing and imminent disease and insect epidemics and to reduce the hazard of large-scale high-intensity wildfires. All action alternatives (B, C, and D) are thus likely to contribute to the cumulative improvement of forest health in the long term.

4.4.2 Livestock Grazing

This section discusses impacts on livestock grazing from proposed management actions of other resources and resource uses. Existing conditions concerning livestock grazing are described in **Section 3.3.2**, Livestock Grazing. Socioeconomic impacts resulting from livestock grazing allocations are described in **Section 4.6.3**, Socioeconomics and Environmental Justice.

Impacts on livestock grazing are generally the result of activities that affect forage levels, areas open to grazing, the type of livestock, the season of use, the ability to construct range improvements, and human disturbance or harassment of livestock within grazing allotments.

Methods of Analysis

Indicators of impacts on livestock grazing include the following:

- A reduction in forage levels, which leads to a decrease in permitted AUMs in areas that are open to livestock grazing due to various resource issues or conflicts, or leads to cumulative management actions that affect operations to the degree considered vital to an individual operation
- An increase in forage levels that leads to an increase in permitted AUMs across the decision area
- RMP management actions that prohibit the ability to construct range improvements and conduct treatments (infrastructure and vegetation)
- Restrictions in season of use and type of livestock allowed on an allotment
- RMP management actions that result in areas being closed to livestock grazing

The analysis includes the following assumptions:

- All existing leases and permits will be subject to terms and conditions by the authorizing officer.
- Livestock will be managed to achieve the BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado (BLM 1997a; **Appendix E**, BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado) on all grazing allotments.
- Range improvements (e.g., fences, pipelines, water wells, troughs, and reservoirs) will result in a localized loss of vegetation cover throughout their useful life. However, range improvements generally lead to better livestock distribution and could benefit the overall forage base and rangeland health.
- Vegetation will be reestablished through reclamation practices along water pipelines within 5 to 10 years in sagebrush/grass communities and 15 to 20 years in cold desert communities; areas with fences, water wells, troughs, and reservoirs would remain disturbed during their useful life and would be revegetated upon abandonment.
- Range improvements will continue to be constructed and maintained in the decision area.
- Although livestock grazing is not considered a surface-disturbing activity, grazing could affect the surface in areas where livestock concentrate.

- Livestock grazing on public lands is tied to permittee-owned or -controlled base property on private land.
- Allotment Management Plans and/or grazing use agreements may be necessary to make changes in grazing management to address resource issues or concerns.
- Increases in forage availability could increase permitted AUMs for livestock operators.

Effects Common to All Alternatives

Requiring implementation of particular livestock grazing management actions to improve rangeland conditions could affect livestock grazing operators by increasing their time and costs associated with grazing on public lands. Long-term benefits to operators include a stabilized operation based on sustainable forage production. Grazing management actions could include range improvements, modified grazing periods, growing season rest, modified grazing systems, use of riparian pastures, construction of exclosures, implementation of forage utilization levels, conversions of livestock types, or other approaches. These actions would help enhance rangeland conditions and increase long-term forage production.

Maintenance of range improvements is not considered a surface-disturbing activity and is not subject to restrictions imposed by the stipulations described in Appendix B.

Properly managed soils generally provide healthy plant communities, which can benefit livestock grazing by increasing the forage base.

Managing for healthy watersheds provides for necessary water sources and improved forage conditions for livestock grazing in the long term. Protecting water quality and watershed health could require changes in livestock management, such as deferred or shortened grazing periods, additional range improvements, exclusion, establishing riparian pastures, and increased cattle herding.

In general, managing riparian habitat in compliance with Land Health Standard 2, Riparian Areas, could directly impact livestock grazing through increased herding, additional range improvements, season of use and livestock numbers adjustment, or site-specific exclosures. Allowing riparian habitat to maintain proper functioning condition would benefit grazing livestock by indirectly providing cleaner and more reliable water sources and more dependable forage availability.

Under all alternatives, there would be potential short-term, localized, grazing restrictions due to herbicide treatment of weeds. However, long-term ecological condition of the preferred forage for livestock would be improved. This is true for vegetation treatments and fire rehabilitation projects that

require rest from grazing. In certain areas, drought restrictions could also cause short-term restrictions on grazing permittees relying on public land forage.

Protecting special status plants and special status species habitat could directly affect livestock grazing by limiting grazing areas, seasons of use, and concentration. Special status species habitats also would directly influence location, type, and cost of range improvements. Conversely, intensively managing riparian areas that support special status species from grazing animals could provide cleaner and more dependable water sources for livestock in the long term.

Wildlife species (e.g., bighorn sheep) could compete with livestock for forage, water, and cover when they occupy the same area. Big game species such as elk compete for similar forage as cattle, sheep, and horses. During the fall, deer prefer the same browse species as sheep and cattle, creating an intensified competition for forage. Uneven distribution of big game would cause some grazing allotments to receive a disproportionate amount of wildlife use, thereby increasing competition for forage within those allotments. Achieving wildlife population objectives would help reduce these effects. Fish and wildlife habitat management would directly affect livestock grazing in the short term through restrictions on grazing management, such as increased rotation, timing or season of use changes, or temporary rest from grazing. In the long term, management actions that enhance fish and wildlife habitat would likely improve vegetation conditions and increase forage production.

Construction of range improvements could improve livestock distribution and allow livestock to use more of the rangeland, which would consequently enhance rangeland conditions. However, stipulations (i.e., NSO, CSU, or TL) could impact the construction of range improvements if the range improvement in question were not to meet the exemption criteria, which could negatively affect livestock operations. For example, NSO or CSU stipulations could make it difficult to build a stock pond and could result in a reduction of AUMs where capacity is limited by water distribution.

Under all alternatives, livestock grazing would be prohibited within the LBCWHR.

In general, information provided by cultural resource inventories can limit or eliminate livestock management (specifically the presence or location of range improvements) on a case-by-case basis. Grazing management would change if inventory or monitoring reveals adverse effects that threaten NRHP eligibility or use allocation. For example, fencing cultural sites and excluding grazing from these sites could be necessary.

Livestock and their handling facilities may be authorized under all VRM classes; however, the design and placement of new range improvements in VRM Class I and II areas would have to be constructed in such a way as to repeat the basic

elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape (see BLM Handbook H-8410-1). This could increase costs for permittees. In general, VRM classes that restrict surface-disturbing activities because of their potential effect on visual resources would indirectly help maintain forage levels by reducing activities from public land uses that could reduce forage, harass livestock, and increase the potential for noxious or invasive weeds.

Wildland fire would have varying effects on livestock grazing, depending on fire size, intensity, timing, and fuel moisture content. Initially, wildland fire would likely displace livestock, and, depending on the proximity to the fire, livestock could be stressed, injured, or killed. Wildland fire would remove vegetation and forage over the short term.

Over the long term, wildland fire could improve forage production, especially when post-fire management, such as seeding, is implemented. ES and BAR practices would close areas to livestock grazing to protect seeded species and increase success. These practices protect the seeded species from being overgrazed in the short term in order to ensure the site is stabilized. In addition to site stabilization, successful establishment of seeded species often also provides the added benefit of establishing a stable forage base in the long term. Restoring natural disturbance regimes, such as fire, and using vegetative treatments to accomplish biodiversity objectives to improve plant community resilience would also benefit livestock grazing by maintaining a balance of seral stages.

In general, removing woodland species benefits livestock grazing by creating more grass and forb species for forage.

Impacts from livestock grazing management actions on the livestock grazing program would primarily be related to annual forage removal. Implementing BMPs and grazing management systems that achieve land health standards would improve forage conditions over the long term, indirectly improving livestock health and production.

If monitoring data indicate livestock grazing is negatively impacting other resources, appropriate adjustments would be made to AUMs, seasons of use, and/or utilization levels. Adjusting AUMs could impact the permittee negatively or positively, depending on the situation. Adjusting grazing management could impact livestock permittees by limiting flexibility for season of use and reducing the amount of available forage in the short term. Livestock removal during times of drought and critical growth periods could limit where permittees put their livestock. Overall, any reductions in AUMs, amount of time allowed, and utilization levels would negatively impact economics of the permittee's grazing operation.

In the long term, meeting utilization levels could lead to attainment of standards for rangeland health, which would create a sustained forage yield.

Short-term impacts of recreation on livestock grazing include degradation of rangelands, injury or death from collisions or shooting, and temporary displacement of livestock. Long-term impacts of recreation on livestock include loss of forage, reduced forage palatability because of dust on vegetation, and disturbance and harassment caused by increased levels of human activities, including harassment from vehicles. Impacts from vehicles are reduced when travel is closed or limited to designated trails within areas open to livestock grazing. Closing areas to motorized or other forms of recreational travel can benefit permittees, especially when administrative access is permitted. Fencing major recreation sites (e.g., 18 Road Campground) would lead to a long-term loss for grazing. SRMAs and ERMAs managed for motorized use and access would increase these impacts, and SRMAs and ERMAs managed for a quiet recreational experience would decrease them. While SRMAs and ERMAs create additional opportunity for impacts on livestock grazing from increased recreational use, they also provide for increased management and conflict control and may protect open space and forage from development through such protections as stipulations.

Short-term impacts from site-specific lands and realty actions, such as small land transfers and construction of power lines, pipelines, or other structures within ROWs, include temporary forage removal, livestock displacement, and an increased potential for noxious weed introduction and proliferation. The time-frame for short-term displacement of cattle from a ROW can vary from a few weeks to months during construction, or it could last as long as a few years following reclamation to allow vegetation to become established and soils to stabilize. Cattle can also be injured or killed during the construction and use of ROWs (open trenches and vehicle collisions) if proper mitigation measures are not in place. Long-term impacts on livestock from site-specific lands and realty actions include changes and loss in forage, reduced forage palatability because of dust on vegetation, and livestock disturbance and harassment from increased levels of human activities.

Forage and range improvement projects would be permanently lost as a result of land disposals or exchanges. Most disposal tracts, though, are small, isolated "C" category allotments that do not have range improvements, meaning disposals would not likely result in the loss of desirable allotments. The BLM would be required to notify the permittee two years before any land disposal (43 CFR, 4110.4-2[b]), except in an emergency, and to compensate the permittees for the range improvement projects constructed under a range improvement permit or cooperative agreement, in accordance with 43 CFR, 4120.3-6(c).

During the exploration and testing phase of mineral development, direct impacts on livestock grazing would be minimal due to the small amount of acreage affected. Most likely, AUMs would not be affected in small areas of development. Surface-disturbing activities associated with mineral development directly affect large areas of grazing in the short term during construction of well pads, roads, pipelines, and other facilities. Impacts include changes in available forage, reduced forage palatability because of dust on vegetation, restriction of livestock movement, harassment, temporary displacement of livestock, and an increased potential for the introduction and proliferation of noxious weeds, thereby causing a loss of livestock forage and associated AUMs. In the long term, a smaller amount of grazing acreage is permanently lost from mining operations following rehabilitation and minimal to no AUM loss. Improvement of roads associated with mineral development could facilitate livestock management operations by maintaining or improving access to remote locations within allotments. Properly implemented BMPs and reclamation mitigation measures would likely improve rangeland health and forage levels for livestock. Impacts from coal development would be largely confined to aboveground mine facilities because current mining occurs underground, and future applications are expected to be for underground mines.

The construction of new range improvements must meet stipulation exemption criteria before they can be allowed in areas where stipulations are applied. This could result in fewer new range improvements being constructed, limiting the ability to distribute livestock, increase permitted capacity, or locate livestock handling facilities where convenient to the permittee.

Most ACECs within the decision area would be designated to protect sensitive plant and wildlife habitat and significant cultural resources. Grazing availability depends on the designated ACEC management objectives.

Managing WSAs would have direct and indirect effects on livestock grazing. In general, restrictions on surface-disturbing and other disruptive activities would likely reduce harassment of grazing animals and maintain or improve vegetation conditions, thereby maintaining or improving the forage for livestock. Existing range improvements are considered valid existing rights and may be maintained in the same manner and degree to which they have been in the past. The construction of new range improvements may be limited, depending on their impact on wilderness values.

In general, transportation routes provide better access for permittees and allow for expedited checking and moving of livestock. Transportation routes also provide important access to livestock improvements such as stock ponds, springs, fences, etc. Maintaining these types of facilities can be difficult without motorized access. The cattle also use transportation routes to move from pasture to pasture. Short-term impacts of road construction and temporary road closures include forage loss, temporary harassment, livestock

displacement, and permittees being prevented from accessing their cattle in a timely fashion. Long-term direct and indirect impacts on cattle from newly developed transportation routes include forage loss, reduced forage palatability because of dust on vegetation, and disturbance and harassment caused by increased levels of human activities.

Total number of acres and AUMs within allotments opened to livestock grazing that are potentially affected by various described impacts are displayed in **Table 4-52**, Impacts within Open Grazing Allotments.

Table 4-52
Impacts within Open Grazing Allotments

Management Action	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Allotments open to grazing	978,600	960,500	586,600	977,200
Permitted AUMs	*61,360*	*60,716*	*32,689*	*61,360*
Open allotments with seasonal limitations	*0*	*176,800*		*Case by case*
IRMAs[4] and SRMAs	358,300	87,200	60,000	79,000
Open to intensive (cross-country) motorized use	12,500	10,200	0	10,200
Motorized use subject to seasonal limitations	105,000	102,000	32,400	52,000
Motorized use limited to designated routes	192,700	744,100	299,800	818,100
Closed to motorized use	13,500	74,800	226,700	69,100
Available for disposal	12,800	7,200	400	15,000
ROW avoidance areas	392,100	714,300	332,800	64,000
ROW exclusion areas	206,400	164,400	203,400	64,600
Acceptable for coal leasing	281,400	241,100	194,600	252,000
Open to fluid mineral leasing	894,400	714,400	259,500	887,800
Acres with NSO stipulation	*467,000*	*328,800*	*180,100*	*383,600*
Open to non-energy leasable mineral development	No similar action	281,300	120,000	856,300
Open for mineral material disposal	740,300	712,100	323,900	837,900

Source: BLM 2010a

Implementing management for the following resources would have negligible or no impacts on livestock grazing and are therefore not discussed in detail: air; paleontology; interpretation and environmental education; national trails;

[4] IRMAs under Alternative A only.

national, state, and BLM byways; Native American tribal uses; and public health and safety.

Alternative A

This alternative includes the largest area open to livestock grazing; there would be no net change in the 978,600 acres available for livestock grazing or the assigned AUMs. Allowing for domestic sheep grazing in allotments on a case-by-case basis would also continue to allow permittees the flexibility of grazing varying livestock in areas adjacent to bighorn sheep populations. Not providing grass banks, especially when allotments are closed due to emergency situations, would result in a financial impact on those permittees affected by temporary closures.

Under Alternative A, stipulations would apply only to fluid minerals instead of all surface-disturbing activities, meaning they would not limit the construction of range improvements. In total, NSO stipulations would be applied on 467,000 acres of allotments.

Managing 358,300 acres as SRMAs and IRMAs (**Table 4-52**) would further encourage the use of BLM-administered lands within those parts of the decision area for recreational purposes, reduce forage availability, and potentially increase livestock displacement, harassment, injury, or mortality. This acreage represents the greatest area identified for management under SRMA status, providing for the greatest impacts on livestock grazing.

Table 4-52 displays quantitative (acres of potential) impacts of motorized use, lands available for disposal, ROW exclusion and avoidance areas, and non-energy leasable mineral development on livestock grazing under Alternative A. Types of impacts for these public land uses would be the same as those identified under Effects Common to All Alternatives.

Acres of allotments open to grazing that would be acceptable for coal leasing and development, open to fluid mineral leasing, and open to mineral material sales under Alternative A represent the greatest potential impact on livestock grazing practices of any alternative. Types of impacts would be the same as those identified under Effects Common to All Alternatives.

ACECs would continue to be open to livestock grazing, with the exception of the permanent exclosures (186 acres) in the Badger Wash ACEC.

Under Alternative A, 59 miles of river segments that overlay open grazing allotments are eligible for inclusion in the NWSRS. This may require livestock permittees along these segments to change livestock management, including maintaining and constructing range improvements to protect ORVs, their free-flowing nature, and tentative classification.

Alternative B

This alternative would provide the third-largest area open to grazing, approximately 960,500 acres of allotments (2 percent fewer acres than under Alternative A), with 176,800 (18 percent) of those acres open with seasonal limitations. (See **Appendix J** for changes in acres per allotment per alternative.) Total AUMs would be reduced to 60,716, a reduction of 1 percent from Alternative A. The types of impacts would be the same as those described under Effects Common to All Alternatives but would occur over a smaller area than under Alternatives A and D. Prohibiting domestic sheep grazing on allotments within occupied bighorn sheep habitat would restrict the area available for domestic sheep grazing and may force permittees to graze their sheep elsewhere. Domestic sheep grazing outside of occupied bighorn sheep habitat would be permitted on a case-by-case basis using a defined set of criteria; this is more restrictive than current management and may also force permittees to relocate their sheep grazing activities. Overall, the impact on domestic sheep grazing should be minimal, as there is very little domestic sheep grazing in the decision area.

By reducing AUMs under Alternative B, the permittee would be burdened with grazing more livestock on their base ranches or reducing the livestock they graze altogether, thereby indirectly affecting the permittee's income. Economic impacts from reducing AUMs are discussed further in the socioeconomic impact section.

Closing a portion of the Palisade municipal watershed (450 acres) to livestock grazing would eliminate 450 acres of open grazing in the Lloyd allotment.

Adjusting grazing allotment boundaries would increase or decrease the amount of acreage within an allotment. This could correspond to an increase or decrease in AUMs, thereby benefitting or impacting a permittee financially. The ability to make adjustments in allotment boundaries would result in more accurate representation of allotments and would allow for changes due to adjustments in management. In addition, an increase in acreage could allow for more flexibility in the grazing rotation. Resting an allotment for a minimum of two growing seasons following fire rehabilitation or vegetation treatments could allow for forage to be restored following a disturbing event.

Grass banks would be permitted under Alternative B, which would allow permittees to continue grazing their livestock on public lands when their own allotment is closed due to an emergency, thus limiting financial impacts.

Specifically limiting grazing in order to promote the delisting of impaired (303[d]-listed) water bodies would impact grazing management and practices on a case-by-case basis. Short-term effects could include loss of acres available for grazing, while long-term effects could include an increase in forage production as areas are rehabilitated. Securing adequate water rights for point sources on BLM-administered lands would protect federal water for livestock grazing.

Managing woodland communities toward a mixture of seral stages would benefit livestock grazing by providing for an optimal forage base. Loss of allowable acres for harvest would likely promote the encroachment of pinyon-juniper and other forest/woodland species into sagebrush-grassland habitat. This could result in a long-term reduction of allowable forage for grazing livestock.

Implementing adaptive drought management would require additional management actions by permittees in the short term, including coordination with the BLM and base changes in livestock use on allotments affected by drought (depending on the drought severity classification). These actions would accelerate restoration of drought-stricken lands and would improve forage resources in the long term.

In general, grazing timing and intensity could be altered to protect special status plants and fish in areas. Locations of range improvement projects and maintenance activities could be restricted. In areas where grazing overlaps with Sage-Grouse habitat, permittees would have to install fences and make other range improvements that would not threaten the bird or its habitat or enable predation. If this would not be possible, range improvements would need to be moved or taken down. Either way, the Sage-Grouse decisions would result in additional management and costs by the permittee to continue to graze on public lands. As species are added to the special status species list, consultation with the USFWS could determine that livestock grazing is impacting a particular species. If so, changes to livestock grazing, including removal of livestock, could be considered.

The types of impacts from applying NSO stipulations on 328,800 acres open to grazing (30 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives. Range improvements may be allowed under exception criteria.

The types of impacts from managing 87,200 acres as SRMAs (75 percent fewer acres than under Alternative A) and 217,400 acres as ERMAs would be the same as those described under Alternative A, but recreation would be focused on fewer acres, thereby concentrating such impacts in those areas.

Under Alternative B, 10,200 acres of open grazing allotments (18 percent fewer acres than under Alternative A) would be managed as open to intensive cross-country motorized use, 744,100 acres (3.7 times more than under Alternative A) would be managed as limited to designated roads and trails, 102,000 acres (3 percent fewer acres than under Alternative A) would be open with seasonal closures, and 76,400 acres (8.5 times more than under Alternative A) would be closed to motorized use. The types of impacts from these travel management actions would be the same as those described under Effects Common to All Alternatives, but greater travel restrictions under Alternative B than under Alternative A would reduce impacts on livestock grazing. Closing and rehabilitating routes may impact permittees' access, although nearly all routes

with known range improvements would be left either open to motorized use or open to administrative use, thereby preserving access. The reduction in routes from Alternative B over Alternative A would reduce impacts on livestock from harassment by humans, but it may impact permittees' ability to more efficiently manage livestock (e.g., animal husbandry, facility maintenance, etc.).

The types of impacts from managing 7,200 acres of open grazing allotments as available for disposal (44 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over a smaller area.

The types of impacts from managing 714,300 acres of open grazing allotments as ROW avoidance areas (82 percent more acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over a greater area.

The types of impacts from managing 164,400 acres of open grazing allotments as ROW exclusion acres (20 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over a smaller area.

The types of impacts from managing 241,100 acres of open grazing allotments as acceptable for coal leasing and development (15 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over a smaller area.

The types of impacts from managing 714,400 acres of open grazing allotments as open to fluid mineral leasing (20 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over a smaller area.

The types of impacts from managing 281,300 acres of open grazing allotments as open to non-energy leasable mineral development would be the same as those described under Effects Common to All Alternatives.

The types of impacts from managing 712,100 acres of open grazing allotments as open to mineral material sales (4 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over a smaller area.

Of the 13 ACECs that would be designated under Alternative B, 8 (110,800 acres) are entirely open to livestock grazing, four (4,400 acres) include closures in a portion of the ACEC, and one (1,300 acres) are closed to grazing. The types of impacts from managing the ACECs partially or entirely open to livestock grazing would be the same as those described under Effects Common to All Alternatives but would occur over a larger area.

Implementing the Shale Ridges and Canyons MLP may reduce impacts on livestock grazing when COAs applied to new and existing leases in the MLP analysis area reduce surface-disturbing activities and the potential for disturbing grazing activities.

Alternative C

This alternative would provide the smallest area open to grazing and the greatest decrease in grazing availability. Approximately 586,600 acres of allotments (40 percent fewer acres than under Alternative A) would be open to grazing. (See **Appendix J** for changes in acres per allotment per alternative.) Total AUMs would be reduced to 32,689 (a reduction of 47 percent from Alternative A). The types of impacts would be the same as those described under Effects Common to All Alternatives but would occur over a smaller area than under any other alternative.

The types of impacts from adjusting allotment boundaries, resting allotments for a two-year growing season, and using adaptive drought and cultural resource management would be the same as those identified under Alternative B.

Types of impacts on livestock grazing from pursuing the use of grass banks, as well as promoting the delisting of impaired water bodies and securing adequate water rights, would also be the same as those described under Alternative B.

Closing the Grand Junction municipal watershed to livestock grazing would eliminate 21,900 acres of currently open grazing in the Whitewater Common allotment and 1,000 acres of open grazing in the North Fork Kannah allotment. Closing the Palisade Municipal Watershed to livestock grazing would eliminate 2,400 acres of open grazing in the Lower Rapid Cottonwood allotment, 200 acres of open grazing in the Chalk Mountain allotment, and 1,700 acres of open grazing in the Lloyd allotment. Closing these areas to livestock grazing would impact grazing operations the same as identified under Effects Common to All Alternatives.

Managing vegetation resources with an emphasis on maintaining or enhancing special status species habitat could result in increased grazing, such as changes in season of use, livestock distribution, or livestock exclusion.

Managing for pinyon and juniper with an emphasis on old-growth retention would not provide the necessary mixed seral stage plant communities that would provide optimal forage for livestock grazing.

The types of impacts from management actions, including stipulations, to protect special status plants and wildlife (including Sage-Grouse habitat) would be the same as those described under Alternative B. However, stipulations would cover a larger area under Alternative C. Prohibiting domestic sheep grazing on allotments within historic, occupied, and potential bighorn sheep habitat would restrict permittees' ability to graze domestic sheep in portions of

the decision area. This would have a minor impact on domestic sheep grazing because other portions of the decision area would remain open and there is little domestic sheep grazing in the decision area.

The types of impacts from applying NSO stipulations on 180,100 open to grazing (61 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives. Range improvements may be allowed under exception criteria.

Managing 60,000 acres (84 percent fewer acres than under Alternative A) of SRMAs would result in the same types of impacts as Alternative A but would occur over a smaller area.

Under Alternative C, 0 acres of open grazing allotments (100 percent fewer acres than under Alternative A) would be managed as open to cross-country motorized use, 299,800 acres (1.6 times more acres than under Alternative A) would be managed as limited to designated roads and trails, 32,400 acres (69 percent fewer acres than under Alternative A) would be open with seasonal motorized and mechanized closures, and 226,700 acres (18 times more acres than under Alternative A) would be closed to motorized use, although administrative use may be allowed. Increasing the acreage closed to travel would reduce impacts on livestock grazing.

The types of impacts from managing 400 acres of open grazing allotments as available for disposal under Alternative C (97 percent fewer acres than under Alternative A) would be the same as those described under Alternative A but would occur over a smaller area. The open grazing allotments available for disposal under Alternative C would be the least of any alternative, which would result in the least impact on livestock grazing.

The types of impacts from managing 332,800 acres of open grazing allotments as ROW avoidance areas (15 percent less than under Alternative A) would be the same as those described under Alternative A but would occur over a smaller area. Impacts would be less than under Alternative A.

The types of impacts from managing 203,400 acres of open grazing allotments as ROW exclusion areas (one percent less than under Alternative A) would be the same as those described under Alternative A but would occur over a slightly smaller area.

The types of impacts from managing 194,600 acres of open grazing allotments as acceptable for coal leasing and development (31 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over the smallest area of any alternative, representing the least impact on livestock grazing.

The types of impacts from managing 259,500 acres of open grazing allotments as open to fluid mineral leasing (71 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over the smallest area of any alternative, representing the least impact on livestock grazing.

The types of impacts from managing 120,000 acres of open grazing allotments as open to non-energy leasable mineral development would be the same as those described under Effects Common to All Alternatives but would occur over the smallest area of any alternative, representing the least impact on livestock grazing.

The types of impacts from managing 323,900 acres of open grazing allotments as open to mineral material sales (66 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives but would occur over the smallest area of any alternative, representing the least impact on livestock grazing.

Within the 23 ACECs that would be designated under Alternative C, 75,800 acres would be open to livestock grazing and 74,300 acres, including all acres under 6,000 feet in elevation, would be closed to livestock grazing. The types of impacts from managing 75,800 acres as open to livestock grazing would be the same as those described under Alternative A but would occur over a smaller area.

Alternative D

This alternative would provide the second-largest area open to grazing. Approximately 977,200 acres of allotments (one percent fewer acres than under Alternative A) would be open to grazing, with seasonal limitations applied on a case-by-case basis. (See **Appendix J** for changes in acres per allotment per alternative.) Even though available grazing acreage would be reduced by one percent, the total allotted amount of AUMs would remain the same. Types of impacts would be the same as those described under Alternative A but would occur over a slightly smaller area. The BLM would permit domestic sheep grazing on allotments outside of occupied bighorn sheep habitat. (Domestic sheep grazing in occupied habitat would be avoided.) This would result in very few restrictions on domestic sheep grazing compared to current management and would have a negligible impact on domestic sheep grazing in the decision area.

Types of impacts from water resource management, adjusting allotment boundaries, adaptive drought management, resting allotments for a two-year period, and cultural resource management would be the same as those identified under Alternative B.

Managing vegetation resources with an emphasis on grazing and implementing vegetation treatments to increase forage production would result in improved grazing opportunities under Alternative D, as compared to other alternatives.

The types of impacts from management actions, including stipulations, to protect special status plants and wildlife would be the same as those described under Alternative B, but stipulations would cover a smaller area.

Determining rest periods on a case-by-case basis to meet standards for rangeland health provides the best opportunity for permittees to graze livestock with the least amount of impacts on their operation. Constructing range improvement projects on all categorized allotment provides the greatest flexibility (i.e., least amount of restrictions) to permittees.

As under Alternatives B and C, grass banks would be permitted under Alternative D, which would allow permittees to continue grazing their livestock on public lands when their own allotment is closed due to an emergency, thus limiting financial impacts.

The types of impacts from applying NSO stipulations on 383,600 acres open to grazing (8 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives. Range improvements may be allowed under exception criteria.

Managing 79,000 acres (88 percent fewer acres than under Alternative A) of SRMAs and 61,900 acres (91 percent fewer than under Alternative A) as ERMAs, in combination with increased visitation as a result of intensive marketing efforts, would result in impacts similar to those described under Alternative A; however, increased visitation would be focused in a smaller area, thereby intensifying impacts in those areas.

Under Alternative D, 10,200 acres of open grazing allotments (12 percent fewer acres than under Alternative A) would be managed as open to cross-country motorized use, 818,100 acres (4.2 times more acres than under Alternative A) would be managed as limited to designated roads and trails, 52,000 acres (50 percent fewer acres than under Alternative A) would be open with seasonal closures, and 69,100 acres (5.5 times more acres than under Alternative A) would be closed to motorized use. Increasing closed areas over Alternative A would reduce impacts on livestock grazing, although there would be fewer closures under Alternative D than under Alternatives B and C.

The types of impacts from managing 15,000 acres of open grazing allotments as available for disposal under Alternative D (1.2 percent more acres than under Alternative A) would be the same as those described under Alternative A but would occur over a larger area. The open grazing allotments available for disposal under Alternative D would be the greatest of any alternative, which would result in the greatest impact on livestock grazing.

The types of impacts from managing 64,000 acres of open grazing allotments as ROW avoidance areas (84 percent fewer acres than under Alternative A) would be the same as those described under Alternative A but would occur over a smaller area. Impacts on grazing would be greater than under Alternative A.

Approximately 64,000 acres of open grazing allotments (69 percent fewer acres than under Alternative A) would be excluded from ROW development under Alternative D. The types of impacts would be the same as those described under Alternative A, but would be greater under Alterative D.

The types of impacts from managing 252,000 acres of open grazing allotments as acceptable for coal leasing and development (10 percent fewer acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives. Impacts on grazing would be less than under Alternative A.

The impacts from managing 887,800 acres of open grazing allotments as open to fluid mineral leasing (one percent fewer acres than under Alternative A) would be the same as those described under Alternative A.

The types of impacts from managing 856,300 acres of open grazing allotments as open to non-energy leasable mineral development would be the same as those described under Effects Common to All Alternatives, but the impacts would occur over the largest area of any alternative.

The types of impacts from managing 837,900 acres of open grazing allotments as open to mineral material sales (1.13 times more acres than under Alternative A) would be the same as those described under Effects Common to All Alternatives. Impacts on grazing would be greater than under Alternative A.

Impacts on livestock grazing operations from ACEC management would be the same as those identified under Alternative A.

Cumulative

The CIAA used to analyze cumulative impacts on livestock grazing includes actions that occur on or next to all allotments located entirely or partially within the planning area. Past actions that have affected livestock grazing include human-caused surface disturbances (mineral development, recreation, prescribed burning, and historic grazing practices) and wildland fires that have contributed to current ecological conditions. Present actions affecting livestock grazing are mainly those that reduce available grazing acreage or the level of forage production in those areas. Key examples include wildland fires, land disposals, motorized vehicle use, oil and gas development, habitat restoration, and special designations that restrict grazing. Future actions affecting livestock grazing would be similar to present actions, including any restriction associated with future species listings under the ESA. The presence and potential expansion of bighorn sheep populations and management to protect bighorn sheep from

disease could affect the ability of local livestock operators to convert from cattle use to domestic sheep use on specific allotments.

As stated in **Table 4-1**, grazing on private lands surrounding public lands is either stable or declining. In order to graze successfully on public lands, grazing operators require a stable base ranch on private lands from which to run their grazing programs. With population growth and the status of the economy, more and more ranches are changing to other uses, which could lead to a reduction in grazing on public lands if permits are not transferred to other operators and consolidated.

The cumulative impacts under each alternative would parallel the impacts of the alternatives in the general impact analysis, above. In general, management actions under every alternative would result in short-term forage reduction due to treatment activities, other surface-disturbing and disruptive activities, human disturbance, and the presence of grazing wildlife. Forage would increase over the long term as treated vegetation communities reach potential productivity.

Cumulative projects that increase human disturbance in grazing areas (e.g., mineral or renewable energy development) could also indirectly impact grazing by increasing weeds and invasive species. As stated above, weed invasion can reduce preferred livestock forage and increase the chance of weeds being dispersed by roaming cattle. Cumulative projects that increase human disturbance in grazing areas could also directly impact grazing by displacing, injuring, or killing animals.

Cumulative impacts from each resource or resource use would be greater on livestock grazing if the cumulative projects were to occur simultaneously. However, standard mitigation identified in BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado would be implemented across all alternatives and any other cumulative projects on BLM-administered lands, thereby reducing or minimizing cumulative impacts on decision area lands.

4.4.3 Recreation and Visitor Services

This section discusses impacts on recreation and visitor services from proposed management actions of other resources and resource uses. Existing conditions concerning recreation and visitor services are described in **Section 3.3.4**, Recreation and Visitor Services. Existing conditions concerning comprehensive travel and transportation management are discussed in **Section 3.3.5**, Comprehensive Travel and Transportation Management; however, based on the level of recreational travel in certain parts of the planning area, some references to travel have been used in this section.

Recreational experiences and the potential attainment of a variety of outcomes-focused objectives are vulnerable to any management action that would alter the settings and opportunities in a particular area. Recreation settings are based

on a variety of attributes, such as remoteness, the amount of human modification in the natural environment, evidence of other users, and restrictions and controls (see **Appendix K** for a description of recreation settings). Management actions that greatly alter such features within a particular portion of the planning area could affect the capacity of that landscape to support appropriate recreation opportunities and corresponding outcomes-focused objectives.

Methods of Analysis

Indicators of impacts on recreation and visitor services include the following:

- Changes to the essential recreation opportunities and recreation setting characteristics (RSCs) in SRMAs
- Impediments to defined recreation activities and the associated qualities and conditions in ERMAs
- Management actions result in long-term elimination or reduction of basic recreation and visitor services and resource stewardship needs

In SRMAs, impacts could occur through changes to management focus (activities, experiences, and benefits) or RSCs (physical, social, operational). For example, changes in recreation settings could result in corresponding changes in the opportunities to achieve desired recreation experiences and associated benefits.

In ERMAs, impacts could occur through changes to the principle recreation activities and the associated qualities and conditions of the ERMA. Management of recreation in ERMAs is in balance with the management of other resources and resource uses.

The analysis includes the following assumptions:

- Substantial increases in recreational activity could create risks to public health and safety.
- Traditional recreational uses within the planning area will continue, and an anticipated increase would occur in motorized recreation, wildlife viewing, hiking, mountain biking, camping, driving for pleasure, heritage appreciation, and new technology-based recreation activities.
- The potential for resource damage and user interactions between all types of users will increase with increasing use.
- Demand for SRPs will increase during the life of the plan.
- Shooting restrictions will only restrict target/projectile shooting. Shooting restrictions will not affect the lawful taking of game.

- Recreation planning guidance and the definitions for recreation management areas (e.g., SRMAs, ERMAs, IRMAs) have changed since the 1987 GJFO RMP. Alternative A nomenclature conforms to the old definitions and guidance, while the RMA allocations in the action alternatives conform to the current definitions and guidance.
- In the action alternatives, areas not managed as SRMAs or ERMAs allow recreation activities to occur, but recreation is not emphasized. These areas are managed to allow recreation uses that are not in conflict with the primary uses for these lands.
- In the action alternatives, individual SRMAs are managed to protect and enhance a targeted set of activities, experiences, benefits, and desired RSCs.
- In the action alternatives, individual ERMAs are managed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA. Management of ERMAs is in balance with the management of other resources and resource uses.

The analysis in this section is structured under three subheadings: SRMAs, ERMAs, and the decision area. First, management actions for each SRMA (or SMA or IRMA under Alternative A) are analyzed to determine whether they 1) sustain or enhance recreation objectives, 2) protect the desired recreation setting characteristics, and 3) constrain uses, including non-compatible recreation activities that are detrimental to meeting recreation or other critical resource objectives (e.g., cultural or threatened and endangered species).

Second, management actions for individual ERMAs are analyzed to determine whether they facilitate the visitors' ability to participate in outdoor recreation activities and protect the associated qualities and conditions.

Finally, the decision area discussion provides a broader analysis of impacts on recreation arising from implementing management for other resource programs that may occur over the entire decision area, including those areas managed as SRMAs or ERMAs.

Effects Common to All Alternatives

Recreation activity-focused objectives in ERMAs are not purposefully protected by stipulations or rules prohibiting mineral materials sales, development of non-energy leasable minerals, or other uses incongruous with stated ERMA objectives. The ability to support and sustain the qualities and conditions of each ERMA could be challenged in areas where those protections do not exist. Consumptive uses could also pose visitor health and safety and resource protection risks, both of which could impact activity-focused objectives.

Impacts from management actions associated with paleontological surveys in Class 4 and 5 paleontological areas would not vary by alternative. Requiring

these surveys in highly sensitive areas could limit actions such as facility construction, resulting in the diminished potential for new recreation amenities in certain areas.

Wildland fire could result in minor short-term impacts through temporary closures or evacuations that restrict recreation activities or the attainment of recreation-focused objectives. Likewise, weed treatments involving herbicides in or near developed and dispersed recreation sites could result in short-term impacts from temporary re-entry closures (usually less than 24 hours).

Designating routes for certain uses would provide route-based recreational experiences and opportunities designed to minimize negative user interactions.

Implementing BMPs to minimize noise from compressor buildings and other motorized equipment, and to comply with COGCC standards for noise, would decrease noise intrusion that may degrade recreational experiences and opportunities. Likewise, the designation of areas where motorized equipment is limited or prohibited (e.g., Lands with Wilderness Characteristics, ACECs, and/or Wildlife Emphasis Areas) would have similar impacts on recreation. The magnitude of these impacts would be dependent upon the number of acres where noise-producing equipment is limited or prohibited. Impacts would be greatest in settings that are dependent upon a quiet soundscape, such as certain SRMAs that are managed to protect mechanized and/or non-motorized recreational experiences.

Implementing management for the following resources would have negligible or no impact on recreation and are therefore not discussed in detail: wild horses and WSAs.

Alternative A

Impacts would be expected where management plans for popular areas like the Grand Valley IRMA fail to provide adequate management direction for emerging recreation trends and increased visitation. These impacts would likely become significant in localized areas over the life of the plan.

Grand Junction ERMA

The remainder of the decision area is considered the Grand Junction ERMA (703,100 acres). Certain areas of the ERMA, such as Palisade Rim and Castle Rock, are expected to receive concentrated recreation use over the life of the plan. The ERMA is managed under old BLM policy and, as such, no focused recreation management would be provided for these areas, likely depriving recreationist of desired opportunities, experiences, and outcomes, and could result in user and resource conflicts. But without management direction regarding principal activities and associated qualities and conditions of the ERMA, the Grand Junction ERMA would be insufficient to facilitate desired recreational outcomes.

Special Management Areas

Under Alternative A, recreation would continue to be managed to provide recreation opportunities in four special management areas.

Management of the Bangs Canyon SRMA (54,700 acres) would continue to be governed by its namesake 2006 implementation plan. This plan has generally helped facilitate beneficial recreation outcomes, though demand for mountain biking, trail running, and dog walking would continue to increase and may, over the life of the plan, outstrip the ability of current management actions to provide positive experiences. As the level of use continues to rise, some physical and social setting prescriptions could be degraded, potentially impacting attainment of prescribed recreation outcomes. Localized impacts would continue to occur in some areas of the SRMA. For example, the management of RMZ 6 for motorized recreation is in conflict with some of the heritage appreciation opportunities available in that area, leading to potential for negative user interactions and resource degradation.

The North Fruita Desert SMA (63,300 acres), managed under a 2004 implementation plan, would continue to contain a mountain bike emphasis area, an area for foot and horse users, and a motorized area that includes a 400-acre OHV open area. This SMA was developed to serve both a local and regional customer base, and mountain biking has become a very popular activity in spring and fall. This demand for mountain biking has exceeded the levels planned for in the 2004 implementation plan. At the same time, demand for foot and horse riding opportunities has not materialized, leading to a discrepancy between management objectives and actual use. This would continue to result in unfulfilled recreation experiences and inefficient use of BLM resources because the SMA is being managed for uses that are not occurring at a significant level.

Recreation experiences could also be diminished or eliminated in the portion of the North Fruita Desert SMA that overlaps those areas acceptable for further coal leasing and development within the coal development potential area. This could lead to the inability to carry out stated management objectives in the SMA, interfering with recreation outcomes.

Management for the Gateway IRMA (120,700 acres) does not identify the relationship between scenic settings and desired recreational experiences and outcomes, depriving the BLM of management tools necessary to achieve outcomes-focused objectives. While the area does not currently receive heavy use, visitation is expected to grow over the life of the plan. Without specific management actions and facility investments to support desired experiences and outcomes, growth in visitation would lead to negative user interactions, resource damage, and users dispersing to other areas perhaps less capable of facilitating recreation.

The Grand Valley IRMA (119,600 acres) contains the Grand Valley OHV Open Area (11,400 acres) which is popular for a wide variety of OHV recreation

activities. There is only minor recreation facility development to support those activities, leading to public safety concerns, unclear management and user expectations, and a greater potential for resource damage.

Decision Area

There would continue to be comprehensive travel designations for motorized use across the entire decision area but not for mechanized or non-motorized travel. Limiting motorized use to designated roads and trails on 225,500 acres and to existing roads and trails on 342,700 acres, would maintain opportunities for trail-based recreation. However, route proliferation in areas where travel is limited to existing roads and trails, or open to cross-country travel could degrade other users' experiences, especially those seeking a backcountry setting. Managing 12,500 acres as open for intensive motorized use would focus "play area" opportunities in appropriate areas and provide those users with designated areas to obtain those experiences. There would be few routes designated for specific uses, resulting in lower-quality user experiences and increased potential for negative user interactions. While managing 2,969 miles of routes as undesignated (i.e., open to all uses) would provide a wide range of recreational opportunities throughout the decision area, the potential for negative user interactions would continue to grow as these undesignated routes receive more use.

Limiting foot and equestrian travel to designated routes in Bangs Canyon SRMA (RMZs 1-3) would reduce negative user interactions and facilitate desired trail-based experiences. High-use areas where cross-country travel is allowed would continue to be at risk for negative user interactions where those concerns exist, such as North Fruita Desert SMA (RMZ 1).

The impacts from limiting mechanized travel to designated routes in all of Bangs Canyon SRMA and North Fruita Desert SMA would be similar to those described for foot and equestrian travel.

Continuing to prohibit target shooting along Little Park Road in the Bangs Canyon SRMA, portions of the North Fruita Desert SMA (the bicycle emphasis area and the OHV open area only), designated OHV open areas in the Grand Valley, and the Mt. Garfield area would reduce safety risks and the potential for negative user interactions in these popular areas.

Existing developed recreation sites would often meet the current level of recreational demand in the planning area. However, seasonal crowding in the North Fruita Desert campground may diminish user enjoyment of the area because use exceeds management capability. Similarly, the anticipated increase in recreation over the lifespan of the RMP could result in demand for additional or expanded developed recreation sites because of negative user interactions and degraded recreation experiences.

The BLM would continue to manage 159,200 acres as VRM Class I and II, areas where outcomes-focused objectives would be protected by maintaining the scenic quality of those lands. There would continue to be limitations on how and where routes are constructed in VRM Class I and II areas because any new routes must be constructed to meet the VRM objectives. Managing 206,100 acres as VRM Class III would not likely affect the type or amount of recreation use in these areas because the construction of facilities or routes to support recreation would be permitted. The 696,100 acres without a designated VRM class allow the potential for development that could degrade outcomes-focused objectives due to diminished scenic quality.

Because no management actions are in place to protect lands with wilderness characteristics, there is no guarantee that primitive and unconfined recreational opportunities would be preserved over time. However, prohibiting mineral material disposal and prohibiting or limiting motorized travel to designated routes in ACECs and WSAs would protect primitive and unconfined recreation opportunities in special designation areas similar to the management prescriptions for lands with wilderness characteristics. Conversely, continuing to restrict motorized use in these areas would limit the types of experiences available to motorized enthusiasts.

The BLM would continue to manage 234,900 acres as unsuitable for public utilities (i.e., ROW exclusion areas), protecting recreation experiences by preserving opportunities for primitive and unconfined recreation. Continuing to manage 441,400 acres as sensitive to public utilities (i.e., ROW avoidance areas) would present the potential for development that could conflict with desired recreational opportunities.

Valuable recreation areas would continue to be prioritized for acquisition, which would enhance recreational opportunities on public land and reduce conflicts between recreationists and private landowners within the planning area.

The Little Book Cliffs and Demaree Canyon WSAs would be managed as unacceptable for coal leasing and development, protecting opportunities for primitive and unconfined recreation in those areas.

The BLM would continue to apply NSO stipulations on 545,100 acres, preserving the natural character of the landscape while maintaining existing recreation opportunities. Areas protected by an NSO stipulation for recreational resources include the following: the Palisade ONA, established recreation sites such as Island Acres State Park, Vega State Park, Highline State Park, Rough Canyon ACEC, Hunter/Garvey backcountry area, Granite Creek Canyons/Cliffs, Bangs Canyon, the Dolores River, and the Gunnison River.

Applying CSU stipulations to 74,100 acres, including the recreation resources at Bangs Benches, Granite Creek Benches, Hunter/Garvey Benches, and Lower Gunnison River, has the potential to inhibit outcomes-focused objectives by

altering the physical RSCs. Well pads and roads created for mineral exploration and development could displace users to less developed areas or eliminate some recreational opportunities.

Several management actions would result in seasonal restrictions on recreation. For example, applying timing limitation stipulations on 233,000 acres and seasonal motorized travel limitations on 113,500 acres would benefit non-consumptive wildlife enjoyment opportunities, particularly within the LBCWHR, where wild horse winter range and foaling areas are protected seasonally, and within bighorn sheep seasonal habitat and elk calving areas. Seasonal motorized travel limitations, though, would temporarily reduce the area available for motorized recreation experiences. Over the long term, seasonal travel limitations would protect outcomes-focused objectives because they would prevent trail degradation in areas with fragile soils during seasonally wet periods.

Avoiding disturbance to raptors and other special status species birds during breeding seasons would seasonally reduce recreation opportunities in areas that are closed to public access. Protection of these species would, however, benefit wildlife viewing during other times of the year.

Temporary closure of recreation areas and routes could also occur as the result of natural and human-caused ignitions, fire suppression activities, and restoration actions. Recreation experiences could be enhanced over the long-term, as settings are restored to a more desirable condition complementary to recreational activities.

In the WSR suitability analysis, recreation is identified as an ORV for Colorado River Segment 3 and the Dolores River, meaning recreational boating opportunities and experiences may be enhanced as a result of protecting that ORV. Recreation activities may be restricted if found to adversely impact ORVs, the free-flowing nature, or the tentative classification of the affected segment. Only a limited number of trail crossings would be allowed in scenic segments, reducing future potential for expanded recreation opportunities. Recreation would not be restricted in recreational segments, so long as ORVs are protected.

Recreation opportunities would continue to be affected as a result of limiting surface disturbances to protect soils. This could result in short term road closures or limit new road developments. Also, where slopes exceed 40 percent, special design practices may be necessary to mitigate impacts on soil, water, and vegetation. Although unlikely that recreation facilities would be sited on slopes exceeding 40 percent, any facility proposals could be subject to higher costs as a result of mitigation.

Stream stabilization work along 63 miles of critically eroding streams and rivers could temporarily or permanently reduce recreational access to those areas. Similarly, riparian areas could be closed for rehabilitation, temporarily reducing

recreation opportunities in those areas. If allowed to resume after stabilization and rehabilitation work, recreation opportunities in these areas could be improved.

Continuing to manage recreation areas, WSAs, wildlife areas, and special status species habitat as unsuitable for commercial timber harvest would protect recreation experiences by improving the opportunity and experience for both consumptive and non-consumptive recreational enjoyment of wildlife.

Range improvements could help to reduce conflicts with recreationists by preventing animals from wandering onto roads, trails, or developed recreation sites like campgrounds. Effects to physical RSCs from grazing include trampling and pocking of trails and campsites, livestock feces on trails and campsites, and decreased naturalness due to the presence of livestock. Direct encounters with livestock can also pose safety hazards to recreationists

The Old Spanish Trail within the Gunnison River Bluffs area would continue to attract users, but a lack of supporting management objectives and actions would limit effective management and potentially allow for increased conflict between recreation and competing uses along the trail. (The congressionally designated Old Spanish National Historic Trail in the planning area, a different route than what traverses the Gunnison River Bluffs, is believed to be under a paved road and users seeking to experience the history and culture of the route use a nearby historic trail in the Gunnison River Bluffs area.)

Cultural resource management plans for six sites would continue to preserve significant archaeological sites, but only one is appropriate for heritage appreciation opportunities. NSO stipulations would further protect four of these areas and the opportunity to appreciate them from a recreation standpoint.

Management actions would not close backcountry airstrips to recreational aircraft, thereby protecting the recreational experiences of aircraft users who utilize these backcountry airstrips.

This alternative would continue to be insufficient to meet recreationists' and visitors' need for improved interpretation and environmental education resources because it does not provide specific objectives or actions for improving these services.

Alternative B

Using feedback from the scoping process and the Draft RMP/EIS comment period, this alternative attempts to identify the areas most likely to require or continue to require management actions to support recreation activities and the attainment of outcome-focused objectives. The five SRMAs would be managed to protect and enhance a targeted set of activities, experiences, and outcomes. Impacts by RMZ are discussed below. Across all SRMAs, management actions

from other resource programs generally facilitate SRMA objectives. This alternative also proposes six ERMAs to support principal recreation activities and where recreation would be managed in balance with other resources.

ERMAs

As described in **Section 3.3.4**, ERMAs would receive specific management consideration in order to address recreation use, demand or recreation and visitor service program investments. ERMAs would be managed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA. Management of ERMA areas would be in balance with the management of other resources and resource uses.

The Gateway ERMA (78,100 acres), designed to target motorized exploration, scenic touring, and heritage tourism, overlaps all or portions of the following three special designation areas: Sinbad Valley ACEC, Juanita Arch ACEC, and Maverick lands with wilderness characteristics unit. Motorized touring would be prohibited in the overlapping ACECs , limiting the area available for this activity, though heritage tourism involving travel by foot or horse would be allowed. Managing portions of the ERMA outside the Maverick lands with wilderness characteristics unit as open to leasing would introduce the potential for development that conflicts with BLM's ability to support and sustain principal recreation activities and the associated qualities and conditions of the ERMA. Issuing Class I, II, and III Commercial and Organized Group SRPs that are consistent with ERMA objectives would allow for increased scenic touring and heritage tourism opportunities in the area. Issuing Class I, II, and III Competitive SRPs would allow for events that temporarily restrict other users' ability to access certain areas of the ERMA.

The Grand Valley Shooting Ranges ERMA (750 acres) is designed to serve pistol and rifle shooters from the Grand Junction area by providing the freedom to participate in a variety of close-to-home, day-use recreation target shooting activities. This ERMA is managed as a ROW avoidance area and is covered by a CSU stipulation, leaving open the potential for surface-disturbing activities associated with land use authorizations, permits, and leases. These activities would be incompatible with target shooting due to health and safety risks and could result in the displacement of shooters to other locations in the planning area where recreational shooting is less desirable. Due to the small size of the ERMA it is likely that proposed ROWs and leases could be sited in a manner that does not conflict with the ERMA's objectives.

The North Desert ERMA (107,900 acres) would cover a broad area, providing visitors with opportunities to participate in motorized recreation (motorcycle, ATV, UTV, full-sized 4x4 vehicles) on a variety of routes designated for different motorized uses (e.g., motorcycle, ATV/UTV, full-size vehicles) that link the desert terrain on the north side of the Grand Valley from Grand Junction and Fruita to Rabbit Valley and the Utah Rims trails and provides multiple long-

distance motorized loop opportunities. By fulfilling this objective, the ERMA would be a unique resource in the planning area, helping to focus these activities in the appropriate areas and providing a true regional destination for visitors. The ERMA's setting is that of a moderately altered natural landscape and managing it primarily as VRM Class IV and ROW avoidance would not preclude future development. The use of BMPs to minimize impacts on targeted recreation activities would allow for long-term fulfillment of the ERMA's objective.

The Gunnison River Bluffs ERMA (800 acres) would adequately support trail experiences for hikers, mountain bikers, and equestrians through complementary management actions, including a closure to mineral material disposal, non-energy leasables, and fluid mineral leasing. The ERMA would be closed to recreational target shooting, reducing opportunities for that activity, but improving public safety.

Impediments to recreation management objectives along the congressionally designated Old Spanish National Historic Trail would be negligible because public use primarily occurs on an adjacent historic trail (known as the Old Spanish Trail) within this ERMA and not the congressionally designated trail, which is a paved road located outside the ERMA. Management actions, as described above, would facilitate users' understanding of the history and culture of the Old Spanish National Historic Trail experience.

The Horse Mountain ERMA RMZ 1 would be managed to feature opportunities to participate in mountain biking, hiking, trail running, motorcycle riding, ATV riding, and 4x4 vehicle driving. Managing the RMZ as a mix of VRM Class III and IV may allow for development that conflicts with these activities, but BMPs would be used to balance targeted recreation activities with other resource uses. Issuing Class I, II, and III Commercial, Competitive, and Organized Group SRPs that are consistent with RMZ objectives (i.e., support partnership efforts) would enhance recreation opportunities, but may adversely impact local residences due to increased noise and dust. Closing the RMZ to overnight camping and campfires would eliminate a popular activity, but would also reduce noise impacts on private residences. Closing the portion of the RMZ west of Sink Creek to recreational target shooting would also eliminate a popular destination for this activity. However, target shooting would be promoted in RMZ 3 (described below).

The area encompassed by the proposed Horse Mountain ERMA RMZs 2 and 3 is currently open to both cross-country motorized travel and target shooting and increasing use has resulted in public safety risks. Separating this portion of the ERMA into two zones would address these risks and provide better opportunities for the recreating public. The OHV Open Area zone (RMZ 2) would provide participants with an alternative to the Grand Valley OHV Open Area and would not be targeted for large, competitive events, thereby

preserving an area for more casual, family-oriented (i.e., non-competitive) cross-country motorized use. Providing a formal shooting area (RMZ 3) in a WUI setting would alleviate issues associated with non-designated shooting areas (e.g., public safety, trash, etc.) near residential areas.

Management actions associated with the Barrel Springs ERMA (24,700 acres) would adequately facilitate hunting and long distance motorized riding and touring activities except in cases where VRM Class III management may allow development that conflicts with those two activities. While implementing a seasonal limitation for motorized travel (December 1 to May 1) would not conflict with CPW big game hunting seasons, the ERMA would only seasonally achieve its objective to provide visitors with long distance motorized activities. Allowing Class I and II commercial SRPs would benefit hunting outfitters in the area. Prohibiting competitive SRPs would limit certain types of motorized opportunities but would prevent activities that are incompatible with the ERMAs prescribed activities and settings.

Bangs SRMA (47,800 acres)

Under Alternative B, the Bangs SRMA would be similar in size to the existing SRMA and would be split into four RMZs, each with a specific targeted experiences and outcomes-focused objective. RMZ 1 (3,900 acres) would target mountain bikers, trail runners, dog walkers, and hikers primarily from Grand Junction and the surrounding area. Closing the RMZ to motorized use would provide a quiet recreation experience for these users. Closing the RMZ to fluid mineral leasing, non-energy leasable mineral exploration and development, and mineral material sales (with an exception for the community bentonite pit on Little Park Road) would help protect physical setting characteristics by greatly limiting the amount of new development in the RMZ. Managing the RMZ as VRM Class II would allow for new recreation facilities to enhance operational setting characteristics over the life of the plan. Class I, II, and III Commercial, Competitive, and Organized Group SRPs would provide a greater variety of experiences in the RMZ and would only be issued if they are consistent with zone objectives, thereby limiting impacts on other users and the desired social setting characteristics. Closing the SRMA to wilding permits would force those users to look elsewhere for similar opportunities, but it would also protect physical setting characteristics by eliminating disturbances from this activity.

RMZ 2 (10,600 acres) would provide a broad range of motorized trail opportunities while accommodating a range of skill levels for varying distances, including route connections that create long-distance motorized recreation opportunities. Management in this RMZ would be similar to RMZ 1 except that motorized travel would be allowed on designated routes and the desired physical and social setting characteristics would be more remote in nature. By closing the RMZ to fluid mineral leasing, non-energy leasable mineral exploration and development, and mineral material sales, desired physical setting characteristics should be maintained. By targeting a local and regional market

(i.e., not a national market) desired social setting characteristics should be maintained. This RMZ would provide a unique opportunity for long-distance motorized travel, likely spreading users out and reducing the potential for crowding on designated routes.

RMZ 3 (1,100 acres) would provide hiking and educational outdoor classroom learning opportunities consistent with Rough Canyon ACEC management objectives to enhance the appreciation and protection of those relevant and important values (e.g., geology, wildlife habitat, sensitive plants, and cultural resources). Partnering with other service providers would help promote communication tools that allow users to achieve RMZ objectives, especially an increased awareness and protection of natural landscapes and cultural resources on a community-wide basis. Trail development would be more limited than in RMZs 1 and 2, focused on promoting the desired educational/interpretive outcomes over recreation activity outcomes. Closing the Mica Mine Trail and Rough Canyon Trail to equestrian use would limit equestrians to other parts of the RMZ and/or SRMA.

RMZ 4 (32,200 acres) would be managed as a primitive backcountry zone, providing primitive backcountry hiking, horseback riding hunting, and wildlife viewing opportunities in a largely undeveloped natural setting. Allowing motorized travel on the Tabeguache Trail may diminish the experiences of those users seeking a quiet experience. Elsewhere in the RMZ, though, natural landscape features would enhance quiet experiences by limiting noise incursions, especially in that part of the RMZ overlapping the Bangs lands with wilderness characteristics unit. Issuing Class I and II Commercial and Organized Group SRPs only if they are consistent with zone objectives would promote attainment of desired recreation outcomes by limiting the type and intensity of events in the RMZ.

North Fruita Desert SRMA (11,600 acres)

This SRMA focuses on protecting outcomes and experiences associated with the 18 road-area singletrack trail network that has gained international attention as a mountain bike riding destination. A suite of restrictions on leasing and development measures would promote attainment of desired recreation outcomes by limiting future alterations to the landscape from fluid mineral leasing, non-energy minerals leasing and development, and mineral material sales. Managing the SRMA under VRM Class II objectives with an exception for recreation facilities would help achieve SRMA objectives by allowing construction of new facilities that benefit the targeted users. Issuing Class I through IV Commercial, Competitive, and Organized Group SRPs that are consistent with SRMA objectives would facilitate attainment of desired recreation outcomes by providing for a wide variety of mountain biking opportunities and experiences. Future increases in use would be accommodated by the construction of new system trails, access points or facilities identified as necessary for achievement of SRMA objectives. While livestock grazing does not

often conflict with desired settings for mountain biking, trampling can degrade trail facilities when soils are wet, and animals may pose a safety risk with certain activities. Desired recreation outcomes may be compromised due to impacts on physical RSCs from grazing, which include trampling and pocking of trails and campsites, livestock feces on trails and campsites, and decreased naturalness due to the presence of livestock. Direct encounters with livestock can also pose safety hazards to recreationists. BMPs would be implemented to reduce impacts from grazing on recreation and vice versa. Closing the SRMA to wilding permits would force those users to look elsewhere for similar opportunities, but it would also protect physical setting characteristics by eliminating disturbances from this activity.

Grand Valley OHV SRMA (9,700 acres)

This area, already popular with local and regional visitors, would benefit from being managed as an SRMA where motorized recreation is recognized as the predominant land use planning focus and specific recreation opportunities and outcomes are managed and protected on a long-term basis. By developing event and vendor venues, trailheads, and restrooms, the SRMA would be well-suited to accommodate large competitive events and the intensive, cross-country motorized use proposed for the area. Trailhead signage would help minimize negative user interactions by educating users, but a dramatic increase in use could result in greater potential for conflict and safety issues.

The SRMA would be closed to recreational target shooting, reducing opportunities for that activity but improving the safety of motorized users.

Dolores River Canyon SRMA (16,100 acres)

Management actions would largely support the desired recreation activities, experiences and outcomes, and associated RSCs. For example, managing the SRMA as VRM Class II with an exception for recreation facilities would allow future development of trailheads and interpretive sites. Limiting SRPs to Class I and II would protect scenic touring and educational opportunities in the SRMA by limiting large group events.

Closing the SRMA to fluid mineral leasing would protect the physical setting by prohibiting development and infrastructure that could conflict with visitors' desired activities and experiences. Limiting the SRMA boundary to a fairly narrow river and highway corridor could limit recreation management options for adjacent BLM-administered lands if this area becomes more popular over the life of the plan.

The portion of the SRMA that overlaps the Dolores River Riparian ACEC would be closed to recreational placer mining, except on valid existing claims, resulting in a loss of opportunity for users seeking to engage in that activity.

Managing the SRMA as a ROW avoidance area would limit development and consequently protect physical RSCs.

Including the Lumsden Canyon trail system within the SRMA boundaries would protect desired user experiences on those trails by limiting resource development and structuring management to meet the desired SRMA objectives.

Palisade Rim SRMA (2,000 acres)
Designating the SRMA as a ROW avoidance area with the exception of one ROW corridor would limit development that could conflict with targeted recreation activities. Limiting SRPs to Class I and II Commercial, Competitive, and Organized Group SRPs, including only those that support and celebrate Grand Valley communities, would be consistent with the SRMA objective to provide a community-based recreation area. Implementing a seasonal winter closure for mechanized use in a portion of the SRMA would limit access during the winter, but demand during that time of year is generally low due to often muddy trail conditions. Users would have year-round access to the lower rim area with a loop trail opportunity.

Decision Area
There would be no ERMA in the Castle Rock area due to the presence of sensitive cultural resources and listed plant species. In 2011 and 2012, a rare plant survey/inventory was completed on 58 miles of trail in the Castle Rock area. Additional survey and inventory is needed on the remaining portions of the trail system to identify areas occupied by rare plants, ensure accurate impact analysis, and develop adequate mitigation measures to protect and conserve special status plants and sensitive cultural resources. Consequently, popular motorcycling and mountain biking opportunities would be eliminated in the immediate Castle Rock vicinity. The DeBeque Area recreation objective and associated actions would provide an opportunity to identify and analyze potential recreation opportunities that could be developed in the DeBeque area, potentially replacing the opportunities eliminated in the Castle Rock area.

Managing all types of recreation under a comprehensive designated routes system would greatly reduce negative user interactions while enhancing trail-based experiences. All route designations, including those for motorized, mechanized, and non-motorized use, were designed to support management objectives for SRMAs and ERMAs. Intensive cross-country use would be allowed on 10,200 acres (21 percent less than under Alternative A), in areas where such use is compatible with resource objectives. However, these areas could be closed if monitoring indicates the need for efforts to limit erosion and sedimentation/salt loading to the Colorado River. Closure of OHV open areas would impact the GJFO's ability to accommodate this type of experience, and users in search of similar experiences could be tempted to drive off-trail in more sensitive areas.

Seasonal travel limitations for motorized and mechanized travel on 105,200 acres (6 percent fewer acres than under Alternative A) would have the same

types of impacts as described under Alternative A, but would occur over a smaller area.

Implementing a comprehensive designated routes system would reduce the number of routes open to all uses, but route designations would be aimed at improving the quality of recreational opportunities in the decision area and promoting positive user interactions. For example, managing 1,111 miles of routes designated for full-size vehicles, UTVs, ATVs, and/or motorcycles would preserve route-based motorized opportunities while reducing duplicate routes that provide little unique recreational opportunity, and often contribute to user confusion when navigating a route system. However, closing and rehabilitating 954 miles of routes would result in a net loss of routes available for motorized and mechanized use in the decision area. Seasonal limitations for motorized and mechanized use on 238 miles would reduce year-long, route-based motorized recreation opportunities, but would improve the quality of those opportunities by focusing use on times of year when routes are in better condition.

Continuing to limit foot and equestrian travel to designated routes in Bangs SRMA RMZ 1 (3,800 acres) would have the same type of impacts as described under Alternative A. Under Alternative B, Pyramid Rock ACEC (1,300 acres) would be closed to horse and foot travel, reducing the area available for cross-country travel experiences. The types of impacts from allowing cross-country foot and horse travel on 1,053,700 acres would be the same as those described under Alternative A.

Under Alternative B, the BLM would implement comprehensive route designations for mechanized travel across the entire decision area. Mechanized travel would be limited to designated routes on 931,900 acres, the impacts of which would be the same as those described under Alternative A but would occur over a larger area. In addition, there would be 119,500 acres managed as closed to mechanized travel, limiting the area available for mechanized trail experiences. Intensive mechanized travel would be allowed on 10,200 acres of OHV open areas (shared with motorized vehicles), though this experience is not currently popular with mechanized users.

Limiting over-snow motorized travel to designated routes could lead to a loss of, desirable experiences. Similar impacts would be expected as a result of limiting expansion of consistent snow compaction unless it serves to consolidate use and improve lynx habitat within the Lynx Analysis Unit. Experiences would also be lost through the closure of lands managed for wilderness characteristics (except for the Tabeguache trail within the Bangs Canyon unit being protected for wilderness characteristics; the Atwell Gulch, Mount Garfield, Pyramid Rock, and Unaweep Seep ACECs; and Bangs SRMA [RMZ 4]). In addition, the LBCWHR would be closed to over-snow motorized and mechanized travel and motorized vehicles would be faced with a seasonal closure of Coal Canyon. Both actions would further limit the areas available for those activities.

Closing areas to camping would restrict the area available for this activity, but may help focus use in more desirable areas, thereby improving the camping experience by reducing user and resource conflict.

All SRPs would be evaluated using Permit Evaluation Factors and Permit Classification System (see **Appendix L**), helping to ensure permitted activities would occur in areas that would facilitate desired outcomes.

Restricting recreation in areas where it adversely impacts riparian areas could result in the loss of popular water-based recreation opportunities. River-based recreation opportunities could be diminished through the use of fencing or bank protection features. Relocating trails and roads away from riparian areas would result in recreationists losing a specific opportunity and may interfere with desired outcomes in localized areas.

Management actions from water resources would impact recreation through the use of stipulations and efforts to delist impaired water bodies. Efforts to delist impaired water bodies (303[d] listed) could include limitations on recreational access to certain areas, resulting in temporary or long-term loss of opportunities. Recreation access could benefit if water bodies are delisted, when restrictions could be lifted.

Short-term impacts could arise from a number of management actions. When using prescribed fire, mechanical treatments, and natural ignitions to create openings in dense stands of mountain shrub, recreation opportunities could be temporarily restricted in those areas. Drought management would temporarily reduce recreation opportunities through the closure of OHV open areas during periods of extreme drought. During an exceptional drought, recreation opportunities would be lost if areas are closed to public entry. Timing limitations for raptors that seasonally prohibit human encroachment would result in the temporary loss of recreational opportunities in those areas. Seasonally limiting motorized and mechanized recreation in big game wintering areas and big game production areas would reduce the amount of land available for those recreation activities.

There would be 491,100 acres (3.1 times more than under Alternative A) managed as VRM Classes I and II. The types of impacts from these VRM classifications would be the same as those described under Alternative A, but would occur over 331,900 additional acres. There may be limitations on how and where routes may be constructed in VRM Class I and II areas because any new routes must be constructed to meet the VRM objectives.

There would be 44,100 acres managed for wilderness characteristics, increasing opportunities for primitive and unconfined recreation by way of restricting other resource uses and motorized recreation. Competitive events and motorized travel (including over-snow motorized travel) would be prohibited, reducing the area available for these events and activities. Cross-country

mechanized travel would also be prohibited, but this is a negligible impact because users typically prefer to engage in mechanized recreation activities on trails, not cross-country.

Closing the North Fruita Desert campground in the North Fruita Desert SRMA to livestock grazing would facilitate achievement of outcome-focused objectives by eliminating animals and their waste from camp sites. Similarly, other high intensity recreation areas and facilities could be closed to livestock grazing based on the results of monitoring. While grazing is generally compatible with dispersed recreation, closures for developed recreation sites would be instituted when necessary to reduce conflict.

Under Alternative B, a total of 210,000 acres would be managed as ROW exclusion areas (11 percent fewer acres than under Alternative A) and 789,400 acres would be managed as ROW avoidance areas (79 percent more acres than under Alternative A). The types of impacts from ROW actions would be the same as those described under Alternative A, but Alternative B would encourage new ROWs in existing corridors, such as major roads, power transmission lines, and oil and gas pipelines, and would site transmission facilities outside sensitive, high-value recreation areas, protecting the recreation-focused objectives in those areas. However, managing developed recreation sites and OHV open areas as ROW avoidance areas would introduce the potential for utility development possibly incompatible with recreational experiences sought in these areas.

The BLM would close 277,700 acres (1 percent more than under Alternative A) to mineral material disposal, protecting recreation experiences and opportunities by prohibiting facilities that could conflict with desired recreation-focused objectives. In addition, campgrounds, developed target shooting zones (e.g., the Grand Valley Shooting Ranges ERMA), and trailheads/picnic areas would be among the 20,600 acres petitioned for withdrawal from mineral entry. If withdrawn, recreation opportunities and experiences in these areas would be protected.

Under Alternative B, the BLM would apply NSO stipulations on 670,300 acres of federal mineral estate (55 percent more acres than under Alternative A, though Alternative A's acreage only includes NSO stipulations in areas open to leasing). Because those stipulations would prohibit all surface-disturbing activities, they would preserve more of the natural character of the landscape. CSU stipulations would be applied on 642,400 acres of federal mineral estate (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), which has the potential to reduce the potential for achieving recreation-focused objectives by permitting development that conflicts with desired recreational experiences. Well pads and roads created for mineral

exploration and development could displace users to less developed areas or eliminate some recreational opportunities.

Recreational boating opportunities and experiences may be enhanced as a result of protecting the recreational ORV along the portion of the Dolores River determined suitable for inclusion in the NWSRS. However, recreation activities may be restricted if they are found to adversely impact other identified ORVs, the free-flowing nature, or the tentative classification of the affected segment.

Because the BLM would not pursue designation of the Tabeguache Trail as a National Recreation Trail, there would be less potential for increasing use and less need for additional management measures to ensure negative user interactions or crowding is kept to a minimum.

Allocation of cultural resources to Public Use would protect resources of interest to the recreating public once management plans for the allocation have been completed. Delays in plan preparation could impact the accessibility of sites to the public. Allocation to other Use Categories or the application of NSO and CSU stipulations specific to cultural resources could impact the development of recreation facilities and opportunities. Management actions that develop interpretive signage, informative maps, and cultural resource plans would facilitate outcome-focused objectives through education. Some new recreational opportunities would be associated with sites allocated to Public Use (historical trails and roads, rock art sites, and other historic sites at uranium mesas).

Management actions from interpretation and environmental education would help GJFO better accommodate a continued increase in visitation and recreation. In particular, interpretive signs and facilities would improve visitor experiences by educating users and providing additional information to help them better structure their visits to the GJFO in a manner consistent with their desired experiences.

Similar to Alternative A, management actions would not close backcountry airstrips to recreational aircraft, thereby protecting the recreational experiences of aircraft users who depend on these backcountry airstrips. One airstrip would be located within the Blue Mesa Wildlife Emphasis Area, which is seasonally closed to motorized use (including aircraft), but the winter closure would have negligible impact on aircraft use because this use typically occurs in spring, summer, and fall.

The BLM would continue to manage the four WSAs totaling 96,500 acres as closed to fluid mineral leasing, protecting primitive and unconfined recreation in those areas.

Master Leasing Plan

Fluid minerals management in the Shale Ridges and Canyons MLP analysis area could have adverse impacts on recreation. Leasing and the potential future development of fluid minerals could have adverse impacts on highly valued, naturally appearing landscapes by changing the setting and user experiences. New access roads, drilling platforms, drilling and production equipment, and pipelines all would contribute to a moderate or high level of change in the existing landscape. Truck traffic needed to support development would produce dust, which would cause additional adverse impacts on the visual qualities of the landscape. Fluid mineral development could also cause a temporary population increase in local communities, which would increase demand for outdoor recreation opportunities. Areas that currently have few visitors could see increased activity, and visitors would be more likely to encounter other visitors or energy workers. The Barrel Springs ERMA, Grand Valley OHV SRMA, Grand Valley Shooting Range ERMA, and North Desert ERMA are within the MLP analysis area. Fluid mineral development in those RMAs would be constrained by a CSU leasing stipulation (covering 143,100 acres) to protect investments in infrastructure, and provide for the long-term recreation benefits. In addition, the North Fruita Desert SRMA (11,600 acres) would be protected by an NSO stipulation, with similar if not more pronounced, impacts. The activity associated with fluid mineral development (e.g., truck traffic, odors, noise), and the presence of related infrastructure, could negatively affect the recreation experience of visitors. Other special designations and restrictions may protect recreation experiences. For example, many of the proposed ACECs, WEAs, and VRM restrictions would protect the setting for various recreation opportunities and improve visitor experiences. The South Shale Ridge ACEC and VRM Class II designations are good examples of restrictions on development that would reduce impacts on user experiences. Because specific RMA management has not been defined for the DeBeque travel network, it would not be protected by recreation-specific stipulations. As such, it may experience more adverse impacts than areas with an RMA designation and accompanying stipulations (i.e., North Fruita Desert and Grand Valley OHV SRMAs).

Alternative C

Under Alternative C, more stringent resource protection and fewer RMAs would promote quiet, dispersed recreational activities, benefiting those visitors who value a quiet soundscape and less structured recreational opportunities. Likewise, those seeking cross-country motorized recreation experiences and those visitors looking for a structured setting would find fewer opportunities. With little emphasis on promotion of the GJFO as a recreation destination, users could eventually gravitate to other parts of the region, causing RSCs to gravitate towards back-country, away from some RMZ objectives.

Even with slightly reduced visitation, not identifying any ERMAs would restrict BLM's ability to provide program investments that adequately address

recreation use and user demand. This issue would be especially acute in the short-term under current or increased levels of visitation.

ERMAs

There would be no ERMAs under Alternative C. Areas that currently receive moderate or high levels of visitation are projected to see increased visitation, including Palisade Rim, Gunnison River Bluffs, and Dolores River Canyon. Without identifying any of these areas as an ERMA, the BLM's ability to address current and future recreation use and provide recreation and visitor services program investment would be inadequate to meet demand.

Bangs SRMA (17,300 acres)

Given the SRMA's proximity to Grand Junction and its popularity with local residents, encountering more than one small or medium social group (RMZs 1 and 2) or larger school groups (RMZ 3) would be likely. However, because of their close proximity to a majority of the planning area's population, if RMZs increase in popularity, strains would be placed on management of social and operational settings.

Proposed management actions would also be compatible with the desired operational RSCs. For example, providing simple visitor services and maintaining a low BLM presence away from trailheads would be adequate to support visitation by local residents.

Desired middle and backcountry physical RSCs would be preserved through management restrictions (e.g., VRM Class II, closure to mineral material disposal) that lessen the opportunity for development that would shift the SRMA towards front-country or rural RSCs. Additionally, the SRMA would be closed to oil, gas, and geothermal leasing, enhancing recreation by eliminating potential well pads, roads, and other leasing-related infrastructure that would conflict with desired recreational experiences.

While all RMZs would be managed as ROW avoidance (introducing the potential for some utility development potentially incompatible with recreational experiences sought in these areas), closing this SRMA to fluid mineral leasing and applying an NSO stipulation for surface-disturbing activities would help preserve desired physical RSCs.

North Fruita Desert SRMA (42,700 acres)

Proposed management actions would likely achieve mixed results in obtaining desired physical and social RSCs. On one hand, several management actions would protect and enhance users' experiences, including closing the SRMA to mineral material disposal and non-energy leasable exploration and development, managing the SRMA as unacceptable for coal leasing and development, and managing RMZ 1 as VRM Class II. On the other, a VRM Class III designation for RMZ 2 (18,900 acres or 44 percent of the SRMA) could be incongruous with the motorized activities occurring in that RMZ because development may pose

safety risks and has the potential to alter the desired physical RSCs towards front-country.

Additional actions that would impact the proposed physical RSCs include managing RMZ 1 (23,800 acres or 56 percent of the SRMA) as a ROW exclusion area and applying an NSO stipulation, which would protect physical RSCs by preventing surface occupancy and surface-disturbing activities. However, RMZ 2 would be managed as a ROW avoidance area and subject to a CSU stipulation, which has the potential to inhibit achievement of outcome-focused objectives by permitting development that alters the physical RSCs in a manner incompatible with the desired future condition.

Solar emphasis area overlap with the SRMA could lead to conflict and displacement of recreational opportunities via a shift in social and physical setting RSCs as a result of solar power developments.

Closing RMZ 1 to recreational target shooting would reduce opportunities for that activity while improving public safety.

Removing the Hunter Canyon area from the SRMA would limit the BLM's ability to manage for targeted outcomes for motorized recreation, and rock-crawling in particular.

Decision Area

The types of impacts from implementing decision area-wide comprehensive route designations would be the same as those described under Alternative B. Under Alternative C, intensive cross-country motorized and mechanized use would be prohibited, eliminating a popular activity and forcing users to look beyond the decision area for an OHV open area experience. Closure of all cross-country motorized opportunities could also prompt some users to go off-trail within the planning area, causing resource damage. Closing 379,500 acres to motorized use (10.8 times more than under Alternative A), including those areas currently open to intensive use, wildlife emphasis areas, critical habitat areas, lands managed for wilderness characteristics, some ACECs, and other areas, would have the same types of impacts on motorized and non-motorized users as described under Alternative A, but the closures would occur over a much larger area.

Through the proposed closure and rehabilitation of 1,593 miles of routes, Alternative C would implement the most restrictive route designation system for all types of use. Many closures would occur on duplicate or dead-end routes and would have little impact on the quality of route-based recreation in the decision area. Motorized recreation (allowed on up to 709 miles of routes, depending on the type of vehicle) would also be limited through management restrictions associated with lands managed for wilderness characteristics, wildlife emphasis areas, ACECs, and other resources and special designations proposed under Alternative C. These limitations would reduce route-based motorized

recreation opportunities as compared to other alternatives. Similar limitations and impacts would exist for mechanized travel and, to a much lesser extent, foot and horse travel. Seasonal motorized limitations would occur on 151 miles of routes, but that wouldn't correspond to greater year-round opportunities because of the higher number of routes closed under Alternative C.

Seasonal travel limitations for motorized and mechanized travel on 51,400 acres (2.1 times fewer acres than under Alternative A) would have the same types of impacts as described under Alternative A, but would occur over a smaller area. Many of the areas managed as a seasonal closure under Alternative A would be closed under Alternative C.

Cross-country mechanized travel would not be allowed, although this type of experience is not currently popular with mechanized users. The types of impacts from limiting mechanized use to designated routes on 694,400 acres would be the same as those described under Alternative A, but would occur over a larger area. The types of impacts from prohibiting mechanized travel on 367,000 acres (2.3 times more acres than under Alternative B; there is no similar action under Alternative A) would be the same as those described under Alternative B.

Similar to Alternative B, foot and horse travel would be prohibited in the Pyramid Rock ACEC (1,300 acres), slightly reducing the area available for hiking and horseback riding experiences compared to Alternative A. Otherwise, foot and horse travel would be managed similarly to Alternative A, and the types of impacts would be the same.

All SRPs would be evaluated using Permit Evaluation Factors and Permit Classification System (see **Appendix L**), helping to ensure permitted activities would occur in areas that would facilitate desired outcomes.

The types of impacts from WSR actions would be the same as those described under Alternative A.

The types of impacts from managing 654,000 acres (4.1 times more than under Alternative A) as VRM Class I and II would be the same as those described under Alternative A, but they would occur over a greater area, and there may be limitations on route construction in a greater portion of the decision area because any new routes must be constructed to meet the VRM objectives.

The types of impacts on recreation from lands managed to protect their wilderness characteristics would be the same as identified under Alternative B, except the impacts would be spread over 171,200 acres (7 times more than under Alternative B), ensuring the protection of a greater area for primitive and unconfined recreation over the life of the plan while further reducing the area available for motorized recreation.

Under Alternative C, a total of 365,800 acres would be managed as ROW exclusion areas (39 percent more acres than under Alternative A) and 627,000 acres would be managed as ROW avoidance areas (42 percent more acres than under Alternative A). The types of impacts from ROW management actions would be the same as those described under Alternative A, but they would occur over a larger area.

The types of impacts from cultural resources, livestock grazing, and interpretation and environmental education actions and from closing the Dolores River Riparian ACEC to recreational placer mining would be the same as those described under Alternative B. The impact of petitioning to withdraw campgrounds, developed target shooting zones, and trailheads/picnic areas from mineral entry would be the same as those described under Alternative B.

The types of impacts from closing 452,000 acres (57 percent more than under Alternative A) to mineral material disposal, including SRMAs, would be the same as those described under Alternative B, but would occur over a larger area.

The types of impacts from water resources actions would be the same as those described under Alternative B, except that additional areas would be covered by an NSO or CSU stipulation or closed to leasing.

Impacts on recreational aircraft use of backcountry airstrips would be the same as described under Alternative B.

A total of 554,700 acres (5.7 times more than under Alternative A) would be closed to fluid mineral leasing, including Bangs SRMA and RMZ 1 in the North Fruita Desert SRMA. This would enhance recreation in these areas by prohibiting well pads, roads, and other leasing-related infrastructure that would conflict with desired recreational experiences.

Alternative D

The BLM would place a greater emphasis on promoting recreation, likely resulting in an even larger increase in use than if current management objectives were carried forward (i.e., Alternative A). As a result, SRMAs in particular would become increasingly popular destinations. For example, the North Fruita Desert SRMA, which is already receiving heavy use in spring and fall, could see use levels that strain the GJFO's ability to preserve desired back- and middle-country social RSCs. This scenario would likely be replicated in other very popular areas of the field office.

ERMAs

As described in **Section 3.3.4**, ERMAs would receive specific management consideration in order to address recreation use, demand or recreation and visitor service program investments. ERMAs would be managed to support and sustain the principal recreation activities and the associated qualities and

conditions of the ERMA. Management of ERMA areas would be in balance with the management of other resources and resource uses.

An increase in population around Gateway would cause use to continue to grow in the Dolores River Canyon ERMA (16,800 acres), creating a demand for improved facilities and services. Proposed partnerships to develop new trail-based opportunities, identify interpretive pullouts and highway crossings, and reroute unsustainable trails would help support and sustain mountain biking, hiking, motorized touring, and other principal activities. These actions would also benefit the associated qualities and conditions of the ERMA, especially where the ERMA overlaps with the Palisade WSA and ACEC, Sewemup Mesa WSA, and Unaweep Seep ACEC.

Supporting management actions would largely support and sustain the ERMA, except that there is no NSO stipulation in non-WSA portions of the ERMA, presenting the opportunity for surface-disturbing activities that could conflict with visitors' ability to participate in outdoor recreation activities.

The Dolores River corridor area would not be closed to recreational target shooting, posing a risk to user safety.

Managing the Timber Ridge ERMA (11,900 acres) for a variety of non-motorized activities may conflict with allowing mineral material disposal in the ERMA, not applying stipulations for fluid minerals or surface-disturbing activities, and managing the area as suitable for consideration of public utilities. All of these management actions have the potential to introduce types of development incompatible with a primitive recreation experience that is dependent upon the qualities and conditions of the ERMA.

The 34 and C Road ERMA (550 acres) would be split into two zones: a target shooting zone (220 acres or 40 percent of the ERMA) and an OHV Open Area zone (330 acres or 60 percent of the ERMA). Management and administration BMPs would support recreational target shooting and cross-country use by providing facilities and signage needed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA. Providing a structured recreation setting would also help address urban interface issues including conflicts between users and homeowners and shooting safety concerns with adjacent private property. Moving the current OHV open area to a location with better opportunities and easier access would help concentrate use. The ERMA, providing more focused management, would also aid BLM's ability to address trash dumping and the area's night-time party scene.

The Grand Valley Target Shooting ERMA (800 acres) would provide visitors close-to-home, day-use recreational target shooting. By constructing appropriate facilities for the attainment of the recreation objective (e.g., backstops, shade shelters, and shooting benches), this ERMA would sustain the principal recreational activity and provide a setting conducive to target shooting.

Both the Barrel Springs (10,300 acres) and South Shale Ridge (21,600 acres) ERMAs would offer visitors the freedom to participate in a variety of recreation activities in a relatively unchanged, natural-appearing landscape. Both ERMAs would be managed as VRM Class III, which introduces the potential for moderate change to the characteristic landscape. However, much of these areas are covered by NSO stipulations for steep slopes, limiting the potential for surface-disturbing activities that would decrease BLM's ability to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMAs.

Bangs SRMA (17,300 acres)

RMZ 2 (9,500 acres or 56 percent of the SRMA) could see increased use levels that strain the GJFO's ability to preserve desired back-country social RSCs. In addition, if RMZ 3 (3,500 acres or 20 percent of the SRMA) increases in popularity with users from beyond the immediate region, the social RSC could quickly exceed middle-country. This level of use would also place demands on operational RSCs by introducing a need for more than simple visitor services and a low BLM presence beyond trailheads. Management for RMZ 1 (4,200 acres or 24 percent of the SRMA) would be best equipped to accommodate a substantial increase in use because its social RSCs plan for participants to encounter a season average of up to 15 encounters per day with occasional large groups of cyclists.

The Little Park Road corridor would continue to be closed to target shooting, consistent with desired RSCs for that area, but also resulting in continued displacement of shooting activities to other areas within the planning area.

By applying an NSO stipulation in the entire SRMA, physical RSCs would be adequately preserved in the same manner as described under Alternative B.

North Fruita Desert SRMA (44,100 acres)

Physical RSCs in RMZ 1 (25,000 acres or 57 percent of the SRMA) would be protected through management as VRM Class II and the application of an NSO stipulation, restricting many types of development. However, the desired physical RSCs in RMZ 2 (19,100 acres or 43 percent of the SRMA) could be impacted by management as VRM Class III and open to mineral material disposal, which introduces the possibility for development incompatible with a middle-country setting. In addition, RMZ 2 would be subject to a CSU stipulation, the impacts of which are the same as those described under Alternative B.

The impacts from managing part of the SRMA as acceptable for further coal leasing and development are the same as those described under Alternative B.

By prohibiting recreational target shooting in the OHV open area and identifying no shooting areas in the remainder of the SRMA, opportunities for shooting would be maintained and risks to public safety would be minimized.

Castle Rock SRMA (4,400 acres)
The Castle Rock SRMA is designed to provide intermediate to expert level motorcycle riding and mountain biking. Expanses of exposed rock provide a durable surface for this activity, but the area is also rich in sensitive cultural resources and special status plant species. Any routes or motorcycle trials areas would require appropriate surveys and consultation with the Colorado State Historic Preservation Office, Native American Tribes, and USFWS before they could be designated to recreational use and in areas where significant data recovery could not be completed to mitigate adverse effects to cultural resources trails could be closed or redesigned. Developing unique motorcycling and mountain biking opportunities in this area would be consistent with the SRMA's objectives and proposed implementation decisions. However, riders traveling off-route or creating social routes could damage cultural resources and special status plant species. The potential for such damage could strain the SRMA's operational RSCs by requiring inordinate amounts of recreation program and staff resources towards protecting and mitigating effects to cultural and natural resources.

Gunnison River Bluffs SRMA (800 acres)
Proposed management actions would help the BLM achieve desired RSCs. For example, limiting mechanized travel to designated routes would provide adequate opportunities for bicyclists and would reduce resource conflicts and negative user interactions with day hikers. Closing the SRMA to mineral material disposal, non-energy leasables, and fluid mineral leasing, and applying an NSO stipulation for surface-disturbing activities would preserve the natural landscape and enhance the recreational experiences for which the SRMA is managed.

The entire SRMA would be open to recreational target shooting, improving opportunities for that activity but compromising public safety.

Palisade Rim SRMA (2,700 acres)
Proposed management actions would largely support the desired physical RSCs. For example, closure to non-energy leasable exploration and development, closure to mineral material disposal, an NSO stipulation, and classification as ROW avoidance area (with the exception of the existing power corridor) would limit development that could conflict with user experiences. Even a large increase in visitation resulting in a congested trail system would be accommodated by the proposed operational RSCs, which include directional signage at trail intersections.

The SRMA would be open to recreational target shooting, improving opportunities for that activity but compromising public safety.

Grand Valley SRMA (9,700 acres)
This area, already popular with local and regional visitors, would benefit from being managed as an SRMA, where recreation is recognized as the predominant land use planning focus and specific recreation opportunities and RSCs are

managed and protected on a long-term basis. By developing portals, trailheads, and restrooms, the SRMA would be well-suited to accommodate large competitive events and intensive, cross-country motorized use proposed for the area. Trailhead signage would help minimize negative user interactions by educating users, but a dramatic increase in use could result in greater potential for conflict and safety issues.

The SRMA boundary could be modified to accommodate solar development upon receipt of application for development and subsequent approval. This would result in a long-term loss of area available for cross-country travel.

The portion of the SRMA that overlaps the OHV open area in Alternative A would continue to be closed to recreational target shooting, reducing opportunities for that activity but improving public safety.

Decision Area

The types of impacts from motorized route designations would be the same as those described under Alternative A. Managing 10,200 acres as open to cross-country motorized use (18 percent fewer acres than under Alternative A) would slightly reduce the area available for cross-country experiences. The types of impacts from prohibiting motorized use on 111,300 acres (3.2 times more than under Alternative A) would be the same as those described under Alternative A. The types of impacts from implementing seasonal travel limitations for motorized travel on 54,700 acres (2 times fewer acres than under Alternative A) would be the same as those described under Alternative A.

The types of impacts from route designations, including closures and rehabilitations and limitations on route-based motorized recreation, would be the same as described under Alternatives B and C, but would occur over a smaller number of miles of routes. For example, motorized use, depending on the type of vehicle, would be allowed on 2,268 miles of routes, providing the most opportunities for route-based motorized recreation in a comprehensive designated routes system. Users preferring mechanized travel would experience similar impacts. Foot travel would be allowed on all routes designated for public use, resulting in greater freedom for this mode of travel. Horse travel would be prohibited on only seven miles of routes (the same as Alternative B), resulting in negligible restrictions on users seeking this type of opportunity. Seasonal limitations for motorized use on 183 miles of routes would result in impacts similar to those described under Alternative B.

The types of impacts from mechanized travel designations would be the same as those described under Alternative A, but there would be 10,200 acres open to intensive use (the same as under Alternative B; there is no similar action under Alternative A), seasonal limitations would be applied on 54,700 acres (2 times fewer acres than under Alternative A), and closures would be applied on 98,000

acres (38 percent fewer acres than under Alternative B; there is no similar action under Alternative A).

The types of impacts from foot and horse travel designations would be the same as those described under Alternative A, except that the Pyramid Rock ACEC (1,300 acres) would be closed to horse travel (0 acres would continue to be closed to horse travel under Alternative A) and 17,700 acres in Bangs (RMZs 1 and 3), Castle Rock, and Palisade Rim SRMAs would be limited to designated routes for foot and horse travel (2.9 times more than under Alternative A).

All SRPs would be evaluated using Permit Evaluation Factors and Permit Classification System (see **Appendix L**), helping to ensure permitted activities would occur in areas that would facilitate desired outcomes.

The types of impacts from lands with wilderness characteristics actions would be the same as those described under Alternative A.

The types of impacts from cultural resources; paleontological resources; livestock grazing; locatable minerals; interpretation and environmental education; and national, scenic, and historic trails actions would be the same as those identified under Alternative B.

Under Alternative D, a total of 104,100 acres would be managed as ROW exclusion areas (56 percent fewer acres than under Alternative A), and 80,500 acres would be managed as ROW avoidance areas (82 percent fewer acres than under Alternative A). While the types of impacts from ROW management actions would be the same as those described under Alternative A, the area available to activities potentially in conflict with desired recreational experiences would be larger. For example, Bangs SRMA (except for a 100-meter corridor along Little Park Road and Monument Road) and Palisade Rim SRMA would be managed as ROW avoidance areas under Alternative D.

The BLM would manage 291,300 acres (2.1 times more acres than under Alternative A) as VRM Class I and II would have the same impacts as described under Alternative A, but over a larger area. There may be limitations on how and where routes may be constructed in VRM Class I and II areas because any new routes must be constructed to meet the VRM objectives, but these limitations would occur over a smaller area than under the other action alternatives. The types of impacts from managing 727,500 acres (19 percent fewer acres than under Alternative A) as VRM Class III and IV would be the same as under Alternative A, but would occur over a larger area than in the other alternatives.

Closing 100,500 acres of federal mineral estate (4 percent more acres than under Alternative A) to fluid mineral leasing would have the same types of impacts as described under Alternative A, but those impacts would occur over 4,000 additional acres.

The types of impacts from closing 155,300 acres to mineral material disposal (40 percent fewer acres than under Alternative A), including Bangs, Gunnison River Bluffs, North Fruita Desert (RMZ 1), and Palisade Rim SRMAs would be the same as those described under Alternative A, but would occur over a larger area.

Recommending designation of the Land's End, John Brown Canyon, and Niche to Blue Mesa (Uranium Trail) byways would have the potential for attracting additional users to those resources. Recreational use of the byways is not expected to hamper the desired experiences of those users, and corridor management plans would identify facilities and management actions necessary to preserve experiences and promote desired outcomes.

Similar to Alternative A, management actions would not close backcountry airstrips to recreational aircraft, thereby protecting the recreational experiences of aircraft users who depend on these backcountry airstrips.

There would be no impacts on recreation from WSR actions under this alternative because no stream segments would be determined suitable for inclusion in the NWSRS.

Cumulative

The CIAA used to analyze cumulative impacts on recreation resources includes the planning area, all big game herd units that intersect the planning area, and the CIAA for Greater Sage-Grouse. Any activities that affect game populations would in turn impact the potential for realizing recreation benefits (e.g., wildlife viewing and hunting) because of the loss or gain of the number of animals. The CIAA also extends along major roads, trails, and rivers where management inside the planning area could impact use outside the planning area boundary.

At the broadest level, the physical, social, and operational recreation character of BLM public lands is quickly changing from natural to more developed, from less crowded to more contacts with others, and from less restrictive to more rules and regulations. These changes would impact the activity opportunities that can be offered and the recreation experience and benefit opportunities that can be produced by land managers and partners.

Past and present actions that have had, and continue to have cumulative impacts, on recreation include surrounding BLM and US Forest Service management plans, increased visitation (especially from residents within the planning area and those from the surrounding region), urbanization of the Grand Valley, advances in outdoor recreation equipment, management in existing SRMAs and ERMAs, and energy development.

Forest plans for adjacent National Forest System lands and RMPs for adjacent BLM-administered lands have closed areas and routes to motorized recreation, causing users to move to BLM-administered lands in the planning area.

Increasing urban and suburban populations proximate to the planning area have greatly increased the level of recreational use on BLM-administered lands. There is a strong correlation between population growth, visitation, and recreation in large part because many new residents have moved to the area specifically because of easy access to recreation opportunities on BLM-administered lands. The expanding suburban development footprint has also placed many new neighborhoods directly adjacent to BLM property boundaries, resulting in increased trespass onto private property and resource impacts from private property owners accessing public lands from adjoining private land (e.g., social trailing, etc.).

The combination of the region's growing population, the GJFO planning area's longer season of use in comparison to many Colorado destinations, and the bounty of desirable recreation opportunities have combined to greatly increase use in the planning area.

Advances in technology are at least partly responsible for increased recreation across the planning area. Motorized vehicles are more capable of accessing previously remote areas of the GJFO, improvements in mountain biking have made that activity increasingly popular, and enhancements in equipment and clothing have made day hiking and camping more accessible to more people.

Increased oil, gas, and locatable and salable mineral exploration and development have altered physical RSCs through the construction of well pads, roads, and related infrastructure. As a result, many areas have trended away from a more natural setting and users seeking a back-country or primitive experience have been displaced.

Past and present management of ERMAs and SMAs focused primarily on providing activity opportunities. For example, management of the North Fruita Desert SMA focused on mountain biking and motorized activities. This area has not been managed for a long-term commitment to specific settings, or outcome opportunities. As a result, settings changed and opportunities have been lost. In another example, the Grand Junction ERMA has been managed for a variety of activities in a variety of settings. There has been an incremental change to the settings as increased motorized participation caused more landscapes to be segmented by user-created routes, and more areas to be dominated by motorized use.

Motorized recreation opportunities within the CIAA would be affected by travel management plans recently implemented, currently being implemented, or expected in the near future. Recently implemented plans include the Colorado River Valley Field Office and Moab Field Office. The Little Snake Field Office, Dominguez-Escalante NCA, and White River National Forest are either in the process of designating routes for motorized recreation, or are planning to undertake that effort in the near future. These plans would alter motorized recreation opportunities by limiting the number of routes available for this

activity. Cumulatively, motorized recreation opportunities across the CIAA would consist of fewer miles of routes available for use, but higher-quality experiences due to targeted planning efforts that seek to improve travel networks.

Under Alternatives B and D, adopting a designated route system for motorized users would result in the loss of some cross-country opportunities and a reduction in the number of routes where motorized use is allowed. These two alternatives seek to maintain unique motorized opportunities and experiences through the proposed designation of SRMAs and ERMAs that more closely match current and projected use patterns, promote positive user interactions, and enhance public safety. Although there would be a loss in the number of miles of routes open to motorized use, the designated travel system was designed with recreation as one criterion, focusing on promoting loop trails and other routes that improve the recreational experience. Where cross-country travel would be eliminated under Alternative C, motorized users would be forced to look elsewhere for recreational opportunities and there would be no intensive cross-country motorized areas in the cumulative impact analysis area. This would result in the loss of a unique recreational opportunity.

Reasonably foreseeable trends that would result in cumulative impacts on recreation include continued growth patterns in demand for all recreation experiences, increased demand for close-to-home recreation opportunities for local residents, continued and increased visitation from a growing regional population, and increased popularity of adjacent public lands and private resorts.

4.4.4 Lands and Realty

This section discusses impacts on lands and realty from proposed management actions of other resources and resource uses. Existing conditions concerning lands and realty are described in **Section 3.3.6**, Lands and Realty.

Impacts on lands and realty would result from actions that increase the demand for or restrict the number or location of ROWs and other land use authorizations or that would impact land tenure objectives.

Methods of Analysis

Indicators of impacts on lands and realty include the following:

- Ability to accommodate the demand for ROW authorizations based on the number and total size of ROW corridors
- Ability to accommodate preferred routes for ROW corridors based on the acres and location of ROW exclusion and avoidance areas
- Ability to accommodate preferred locations for communication sites based on available locations

- Ability to accommodate preferred routes or locations for all ROWs, including, but not limited to, renewable energy development, transportation systems, pipelines, and transmission lines, based on available locations
- A substantial reduction in areas open for ROW applications for solar and wind projects
- Ability to accommodate land tenure adjustments necessary to meet resource and community needs based on the acres and location of lands identified for disposal, retention, or acquisition

The mandate to manage land for multiple uses requires the BLM to consider the potential impacts of management actions on lands and realty, including ROWs and land tenure. Because lands and realty is a resource use rather than an environmental component, impacts on lands and realty are a direct result of actions from other resource programs and resource uses. The discussion of the effects on lands and realty under each alternative is limited to the effects on permitted or authorized uses and land tenure, including restrictions, costs, and issuance or denial of proposals. Management actions of other resources were assessed to determine restrictions or limitations to land use authorizations (including ROWs) and land tenure.

The analysis includes the following assumptions:

- Existing ROWs and communication sites will be managed to protect valid existing rights.
- Existing ROWs may be modified upon their renewal, assignment, or amendment if the requested actions meet the objectives of the RMP.
- ROW holders may continue their authorized use as long as they are in compliance with the terms and conditions of their grant.
- The BLM will continue to process land tenure adjustments.
- The demand for communication sites and ROWs will increase over the life of this RMP.
- Maintenance and upgrading of existing utilities and other ROWs will occur before the construction of new facilities in the decision area.
- One hundred percent of the identified renewable energy emphasis areas will be developed over time.
- Demand for small distribution facilities to extend and upgrade services, such as power and telephone, is expected to remain at current growth rates as rural development continues.
- Demand for land tenure adjustments to accommodate community expansions is expected to remain at current levels but could

fluctuate depending on the degree of economic growth and development occurring within and adjacent to the planning area.

- Retention areas will include all decision area lands (the BLM-administered lands within the planning area) that are not managed as disposal or cooperative management tracts, unless on a case by case analysis the lands meet the disposal criteria outlined.
- The BLM will continue to manage approximately 23,300 acres as withdrawn from locatable mineral entry.
- Withdrawals will be reviewed, as needed, and recommended for renewal, continuation, or termination. Existing withdrawals initiated by other agencies will continue unless the initiating agency requests that the withdrawal be terminated.
- Although exceptions, modifications, and waivers may be obtained to address some of the stipulations outlined in **Appendix B**, it is assumed that the stipulations specified for each alternative will be applied to all proposed surface-disturbing activities on decision area public lands.
- Renewable energy resources include solar and wind. (Biomass resources are part of the forestry program and are discussed in **Section 4.4.1**, Forestry; geothermal resources are part of the fluid minerals program and are discussed in **Section 4.4.5**, Energy and Minerals.)

Effects Common to All Alternatives

Isolated tracts of BLM-administered lands that become known in the future and that are not required to meet other resource objectives would be identified for disposal under all alternatives, thus leading to increased public land management efficiency. These lands would be managed as ROW avoidance and only ROW applications that would not unduly depreciate the tracts' appraised value would be approved on disposal tracts. Public access would be reserved in land patents where it would benefit the public, which would ensure access to public lands for recreation opportunities and other resources uses. Land exchanges would be considered in retention areas on a case-by-case basis in order to meet resource objectives if the exchange is in the public interest and would improve management efficiency or would result in the acquisition of private property with high resource values. Applications would be considered in retention areas to meet community or organization needs under the Recreation and Public Purposes Act in accordance with resource objectives. These actions could result in land tenure adjustments to meet community needs. Lands or interests in acquired lands would be managed in a manner consistent with other public lands in the surrounding area.

Resources and resource uses affecting lands and realty (e.g., water, vegetation, and soils) prescribe ROW exclusion and avoidance areas and stipulations (as

outlined in **Appendix B**). ROW exclusion areas would reduce route options in the region. ROW applications could be submitted in ROW avoidance areas; however, a project proposed in these areas would be subject to additional requirements such as resource surveys and reports, construction and reclamation engineering, long-term monitoring, special design features, and re-routing. As a result of special surveys and reports, alternative routes may need to be identified and selected to protect sensitive resources.

Managing BLM-administered lands as ROW avoidance areas and applying stipulations could result in increased application processing time and costs due to the need to relocate facilities or due to greater design and siting requirements. The increased processing time, costs, and requirements may affect new ROWs or renewed ROWs at existing sites.

Areas with TL stipulations would be closed to ROW construction and maintenance, surface-disturbing activities, and intensive human activity during identified time frames. All TL stipulations would be applied within ROW avoidance areas.

Under all alternatives, WSAs are managed as ROW exclusion areas. If any WSAs are released from wilderness study by Congress, the area would still be managed as a ROW exclusion area, and no facilities could be located in the area without amending the RMP. Impacts associated with development activities in the planning area are discussed under the appropriate resource section (e.g., impacts on soils and vegetation are discussed in **Section 4.3.2**, Soil Resources, and **Section 4.3.4**, Vegetation, respectively).

Solar and wind ROW applications may only occur on any lands that are not managed as ROW exclusion areas. The acreages of lands with ROW exclusions vary across alternatives. Alternatives with greater ROW exclusion acreages are considered to have long-term direct impacts on the ability for solar and wind resources to be developed. The acreages under each alternative that are not within exclusion areas are provided in **Table 4-53**, Acreage Impacts on Renewable Energy. This table shows the acreages that are proposed as renewable energy emphasis areas and that are also open for the development of other ROWs.

As discussed above, ROW applications may be filed for ROW avoidance areas; however, projects proposed in such areas would be subject to restrictions that would add time and cost. Alternatives with greater ROW avoidance areas are considered to have short-term direct impacts (e.g., special surveys, reports, and construction and reclamation BMPs) and long-term direct impacts (e.g., potential maintenance actions) on the economic feasibility of the development of solar and wind resources. The acreages under each alternative that are within ROW avoidance areas are provided in **Table 4-53**, Acreage Impacts on Renewable Energy.

Table 4-53
Acreage Impacts on Renewable Energy

	Alternative A	Alternative B	Alternative C	Alternative D
Solar emphasis areas	0	8,700	5,300	36,300
Solar emphasis areas with ROW avoidance	N/A	8,700	4,500	2,100
Solar emphasis areas without ROW avoidance	N/A	1,700	800	34,200
Solar Energy Zones	0	0	0	9,200
Solar Energy Zones with ROW Avoidance	N/A	N/A	N/A	0
Solar Energy Zones without ROW Avoidance	N/A	N/A	N/A	9,200
Wind emphasis areas	0	2,400	2,600	3,700
Wind emphasis areas with ROW avoidance	N/A	2,400	1,800	0
Wind emphasis areas without ROW avoidance	N/A	0	800	3,700

Source: BLM 2010a

Identifying solar and wind emphasis areas and SEZs would have long-term, direct impacts on the utilization of solar and wind resources because applicants would be directed to the most suitable locations for development. These areas have been screened for sensitive resources, and no major resource concerns have been identified. The degree of impact would be in direct proportion to the acreages identified.

Emphasis areas and portions of emphasis areas that are closer to existing transmission lines and access routes would be more likely to be developed than emphasis areas and portions of emphasis areas that are farther from such features. This is because proximity to transmission and access reduce costs and the likelihood for environmental constraints associated with construction and interconnection.

Implementing management for the following resources or resource uses would have negligible or no impact on lands and realty and are therefore not discussed in detail: livestock grazing, wildland fire management, interpretation and environmental education, Native American tribal uses, public health and safety, socioeconomics, and environmental justice.

Alternative A

Managing 234,900 acres as unsuitable for utilities (i.e., ROW exclusion areas) would prohibit the placement of ROWs in these areas, thereby reducing options for ROW placement in the decision area.

Areas managed as sensitive for utility development (i.e., ROW avoidance areas) would cover 441,400 acres. These areas could impose design and siting

requirements and associated costs on new ROWs or assigned, amended, or renewed ROWs at existing sites. Such requirements could restrict placement, limit future access, delay availability of energy supply (by restricting pipelines, transmission lines, and wind and solar projects), create dead zones, or delay communications service availability. Such requirements could also require ROWs to be installed in areas with more restrictions on accessibility or construction. In addition, in ROW avoidance areas, the potential for denying requests for new or amended and renewed ROWs at existing sites would increase.

Applications for communications facilities would be considered for sites that meet resource program objectives. Co-location of communication site facilities and use of existing sites would be encouraged.

A total of five corridors encompassing 88,600 acres would be delineated for large-scale linear facilities such as public utilities; utility companies would be encouraged to use these corridors. Co-location of facilities within the corridors would reduce impacts on resources in other planning area locations, clarify the preferred locations for facilities, streamline construction and maintenance of the facilities, and simplify planning for new facilities. However, delineation of corridors would limit options for ROW/facility design and selection of more-preferable locations. The remainder of BLM-administered lands outside of ROW exclusion and ROW avoidance areas would be available for ROW development (including transmission lines, pipelines, and communication sites), which would accommodate desired placement of facilities, accommodate access and efficient energy supply, and minimize additional costs.

Under Alternative A, there would continue to be no identified solar or wind emphasis areas. ROW applications for solar and wind facilities would be processed on a case-by-case basis. Without emphasis areas that have been screened for potential conflicts, the processing of solar and wind applications would be slowed.

Under Alternative A, 126 tracts totaling 16,100 acres would remain classified as for available for disposal. Land disposals proximate to cities or towns would accommodate community expansion needs by enabling lands suitable for agricultural use, commercial development, or industrial development to be used for the highest use or most appropriate use. Disposal efforts would also reduce isolated tracts, thus increasing public lands management efficiency. The BLM would also continue working with the Federal Aviation Administration and the Grand Junction Regional Airport Authority on the potential airport expansion involving up to 2,100 acres of public land. Disposal areas would remain managed as ROW avoidance areas; only ROW applications that would not unduly depreciate a tract's appraised value would be approved on disposal tracts. Limitations on the use of disposal areas for land use authorizations could increase demand for authorizations and associated impacts in retention areas.

Identifying five cooperative management agreement tracts totaling 240 acres would provide opportunities for qualified agencies or entities to manage or acquire these isolated tracts through exchange, administrative transfer, or other appropriate means.

Under Alternative A, 7,800 acres would be identified within the Grand Mesa Slopes SMA (**Figure 2-30, Appendix A**) as available for land exchanges limited to the Grand Mesa Slopes SMA to improve resource management of this area.

Acquisition of lands that meet the criteria outlined in **Chapter 2** (e.g., areas with potential to be managed as SMAs, that are historically significant, that contain sensitive habitat, or that have valuable recreation areas) would protect sensitive resources and accommodate resource management.

New ROW grants would continue to be required to conform to VRM classification requirements; areas managed as VRM Class I or II (159,200 acres) may limit the type and location of ROW facility development.

Alternative B

ROW exclusion and avoidance areas would have the same types of impacts as those described under Alternative A, except that there would be 210,000 acres managed as ROW exclusion areas (11 percent fewer acres than under Alternative A) and 789,400 acres managed as ROW avoidance areas (79 percent more acres than under Alternative A).

Under Alternative B, the BLM would work with applicants to prioritize co-locating communication site facilities and use existing sites, as feasible. Co-location of facilities would have the same effects as those described under Alternative A. If the communication site cannot be co-located in one of the delineated areas, a new site could be considered.

A total of 6 corridors including 96,000 acres would be delineated for public utilities and other facilities, which cover an additional 7,400 acres (7 percent more) than under Alternative A. Placement of new facilities or upgrades to existing facilities would be encouraged in these corridors or in other areas with previous disturbance and existing facilities. Placement of facilities within the corridors and areas of existing disturbance would have the same effects as co-locating facilities, as described under Alternative A. Delineation of corridors and placement of facilities in previous disturbance areas could limit options for ROW/facility design. The remainder of BLM-administered lands outside of ROW exclusion or ROW avoidance areas would be available for ROW development, which would have the same effects as those described under Alternative A.

Site facilities and commercial filming authorized under 2920 leases, permits, and easements would be restricted in ROW avoidance and exclusion areas. In addition, applications for filming permits and still photography for mechanized or

motorized uses would be restricted to existing highways and pull-outs, and designated routes, roads, and trails. Limiting activities to previously disturbed or cleared areas would also limit impacts.

Trespass actions would be monitored and managed through ROW authorization or trespass procedure for removal and site restoration, which would result in improved management of lands and resources.

Under Alternative B, there would be 8,700 acres of solar emphasis areas and 2,400 acres of wind emphasis areas. These areas have been screened for potential resource conflicts and, as a result, would likely make the processing of solar and wind applications more efficient. Applications would be encouraged in these emphasis areas.

Alternative B identifies 10,200 acres for land disposal (37 percent fewer acres than Alternative A). This classification would enable disposal of lands suitable for public purposes, which would accommodate community expansion or economic development. Disposal efforts would also reduce isolated tracts, thus increasing public lands management efficiency. Additional lands may be identified for disposal in urbanizing areas on a case-by-case basis to meet community expansion needs and where the public interest would be well served. Parcels containing or integral to significant habitat for species of concern would not be disposed of unless the habitat can be maintained and if USFWS and CPW concur. Disposal tracts would be managed as ROW avoidance areas and be subject to a CSU stipulation. Only ROW applications that would not unduly depreciate the tracts appraised value would be approved on disposal tracts, and site-specific relocations would apply under the CSU. Many of the disposal tracts would be small and remote, and managing these tracts as ROW avoidance areas would not have a measurable impact on other retention lands.

Delineating 20 cooperative management agreement tracts on 5,200 acres would have impacts similar to those described under Alternative A, but impacts would affect 15 more tracts and 5,000 more acres, 21 times more than Alternative A. Tracts that do not have an agreement in place within 10 years could be identified for disposal to relieve BLM management of these isolated or difficult to manage tracts.

The mileages of routes are proposed to be designated administrative-only or closed based upon lands and realty planning criteria are shown in **Table 4-54**.

Areas considered for acquisition would be similar to those described under Alternative A, except that Alternative B would include additional acquisition criteria not listed under Alternative A, which could result in additional areas being acquired.

Table 4-54
Route Designations and Lands and Realty Planning Criteria under Alternative B

Planning Criteria	Final Designation Administrative Use (miles)	Final Designation Closed (miles)	Total miles designated as Administrative Use or Closed
Route Through Cooperative Management Parcel	1.7	0.6	2.3
Route Through Disposal Parcel	7.3	1	8.3
Total	9	1.6	10.6

Source: BLM 2010a

A petition to withdraw 20,600 acres from locatable mineral entry would be made for all or a portion of 6 ACECs, 3 types of recreation sites, Calamity Camp, and the Logan Wash Mine Site, which would promote resource protection but also limit the location of mineral activities and associated facilities and potentially increase resource impacts in other areas.

The type and location of new ROWs granted in areas managed as VRM Class I or II could be limited because they would have to meet more stringent VRM objectives than new ROWs in areas managed as VRM Class III and IV. These impacts would occur over 491,100 acres managed as VRM Class I and II.

Fluid mineral development in the Shale Ridges and Canyons MLP may impact future land tenure adjustments by creating encumbrances on the land. This development could also conflict with and reduce future opportunities for siting renewable energy development, especially in emphasis areas.

Alternative C

Types of impacts of ROW exclusion and avoidance areas would be the same as those described under Alternative A, except that Alternative C would identify 365,800 acres as ROW exclusion (39 percent more acres than under Alternative A), and 627,000 acres as ROW avoidance areas (42 percent more acres than under Alternative A). Effects of the BLM working with applicants to prioritize co-locating communication site facilities and using existing sites, as feasible, would be the same as those described under Alternative A.

A total of 6 corridors including 92,100 acres would be delineated for large-scale linear ROWs, such as public utilities and other facilities, which is 1 more corridor on 3,500 acres (4 percent) more than under Alternative A. Impacts of delineating corridors for large-scale linear ROWs and other facilities would be similar to those described under Alternative B. However, placement of new major facilities or upgrades to these types of facilities would be required in these corridors or in other areas with previous disturbance and existing facilities as determined practical. This would result in greater concentration of facilities and less impacts on other areas.

Impacts of site facilities and commercial filming authorized under 2920 leases, permits, and easements, as well as monitoring and managing trespass actions, would be the same as those described under Alternative B.

Under Alternative C, there would be 5,300 acres of solar emphasis areas (57 percent fewer acres than under Alternative B; there is no similar action under Alternative A) and 2,600 acres of wind emphasis areas (the same as Alternative B; there is no similar action under Alternative A). Special mitigation would be required during development of the 2 Road solar emphasis area such that projects there would be compatible with the Prairie Canyon Wildlife Emphasis Area. This management action would be a long-term, direct impact on solar resource development because it would add development time and cost.

Alternative C identifies 2,600 acres for land disposals, which is 13,500 acres (84 percent) fewer than Alternative A. Identifying lands for disposal would have impacts similar to those described under Alternative B. However, under Alternative C, lands with occupied or potential special status species habitat and other resources values of interest, such as big game critical and severe winter range, would be retained.

Delineating 12 cooperative management agreement tracts totaling 3,000 acres would have impacts similar to those described under Alternative A, but impacts would affect 7 more tracts totaling 2,800 acres, over 12 times more than Alternative A. Tracts that do not have an agreement in place within ten years would be identified for disposal to relieve BLM management of these isolated or difficult to manage tracts.

Areas considered for acquisition would be similar to those described under Alternative B, except that Alternative C includes five additional criteria focused on habitat and wildlife range, riparian areas, and recreation areas that are not listed under Alternative B, which could result in additional areas being acquired.

A petition to withdraw 45,100 acres from locatable mineral entry (2.2 times more than under Alternative B) would be made for 10 ACECs, 3 types of recreation sites (the same as Alternative B), and municipal watersheds, resulting in the same type of impacts as those described under Alternative B, but occurring over a larger area.

The type and location of new ROWs granted in areas managed as VRM Class I or II could be limited because they would have to meet more stringent VRM objectives than new ROWs in areas managed as VRM Class III and IV. These impacts would occur over 656,700 acres managed as VRM Class I and II, the most of any alternative.

Alternative D

ROW exclusion and avoidance areas would have similar impacts as those described under Alternative A, except that there would be 104,100 acres

managed as ROW exclusion areas (56 percent fewer than Alternative A), and 80,500 acres managed as ROW avoidance areas (82 percent less than under Alternative A).

Effects of the BLM working with applicants to prioritize co-locating communication site facilities and using existing sites, as feasible, would be the same as those described under Alternative A. However, if the communication site cannot be co-located in one of the delineated areas, a new site may be considered, which may lead to additional disturbance and impacts in other areas.

A total of 7 corridors including 119,100 acres would be delineated for large-scale linear ROWs, such as public utilities and other facilities, which is 3 more corridors on 30,500 acres (35 percent) more than under Alternative A. Delineating corridors would have similar impacts as those described under Alternative B, except that placement of new facilities or upgrades to existing facilities would be determined on a case-by-case basis and would not be required to co-locate in the delineated corridors. If facilities were co-located within the corridors, it would reduce impacts on resources in other locations within the planning area, streamline construction and maintenance of the facilities, and simplify planning for new facilities. However, interactions between certain types of ROWs (e.g., natural gas pipelines and transmission lines due to corrosion problems or two large transmission lines due to decreased reliability rating) may make placement within corridors difficult. Alternative D would provide the greatest number of options for ROW/facility design and selection of applicants' preferred locations.

Impacts of site facilities and commercial filming authorized under 2920 leases, permits, and easements, as well as monitoring and managing trespass actions, would be the same as those described under Alternative B.

Under Alternative D, there would be 36,300 acres of solar emphasis areas, 3,700 acres of wind emphasis areas, and 9,200 acres of SEZs that are entirely within the solar emphasis boundary; there are no similar actions under Alternative A. This would promote orderly development of solar and wind resources in these areas. The boundary of the Grand Valley OHV Open Area could be modified to accommodate solar development upon receipt of application for development and subsequent approval. This would make more land in the decision area available for solar development and is a long-term, direct effect on the utilization of solar resources.

Alternative D identifies 18,000 acres for land disposals, 1,900 acres (12 percent) more acres than under Alternative A. Lands identified for disposal would have impacts similar to those described under Alternative B. Criteria for disposal would be the same as under Alternative B but would also include lands proximate to cities or towns, lands without legal public access, and lands identified for future industrial growth north of the Grand Junction Regional Airport expansion area.

Delineating 13 cooperative management agreement tracts totaling 2,700 acres would have impacts similar to those described under Alternative A, but impacts would affect 8 more tracts totaling 2,460 acres, almost 10 times more than Alternative A. Tracts that do not have an agreement in place within ten years would be identified for disposal to relieve BLM management of these isolated or difficult to manage tracts.

Areas considered for acquisition would include only lands within or adjacent to WSAs and ACECs.

A petition to withdraw 1,300 acres from locatable mineral entry (94 percent fewer acres than under Alternative B) would be made for the Pyramid Rock ACEC and 3 types of developed recreation sites (the same as Alternative B), resulting in the same type of impacts as described under Alternative B, but occurring over a smaller area.

The type and location of new ROWs granted in areas managed as VRM Class I or II could be limited because they would have to meet more stringent VRM objectives than new ROWs in areas managed as VRM Class III and IV. These impacts would occur over 291,300 acres managed as VRM Class I and II, the least of any action alternative.

Cumulative

The CIAA used to analyze cumulative impacts on the uses administered by the lands and realty program is composed of fourth-order watersheds that completely or partially overlap the planning area. Fourth-order watersheds were used as the basic unit of analysis because impacts from most management actions proposed under the RMP and other existing activity plans are not expected to have cumulative influence beyond this scale. Past, present, and reasonably foreseeable projects, plans, or actions that make up the cumulative impact scenario for lands and realty include the following:

- Amended Land and Resource Management Plan for Grand Mesa, Uncompahgre, and Gunnison National Forests (1991). This plan sets management, protection, and use goals and guidelines for the Grand Mesa, Uncompahgre, and Gunnison National Forests.
- Bangs Canyon Land Acquisitions. Completed in 2011.
- Colorado Canyons National Conservation Area and Black Ridge Canyons Wilderness (2004). This plan sets management, protection, and use goals and guidelines for the McInnis Canyons National Conservation Area.
- Colorado National Monument General Management Plan Final Environmental Impact Statement (2005). This plan sets management, protection, and use goals and guidelines for the Colorado National Monument.

- Dominguez-Escalante National Conservation Area Land Acquisitions. Decisions expected in 2012 and 2013.
- Energy Gateway South 500kV interstate transmission project with one alternative in northwest corner of Mesa County. Decision expected 2014.
- Final Environmental Impact Statement for White River National Forest (2002). This plan sets management, protection, and use goals and guidelines for the White River National Forest.
- Interim Management Policy for Dominguez-Escalante National Conservation Area and Dominguez Canyon Wilderness (2010). This plan sets management, protection, and use goals and guidelines for the Dominguez-Escalante National Conservation Area. A new RMP is being prepared and is expected to be implemented in 2012.
- Moab Field Office RMP (2008). This plan sets management, protection, and use goals and guidelines for the BLM Moab Field Office.
- Proposed Colorado Mesa University Recreation and Public Purposes Act Land transfer. Completed in 2012.
- Proposed Grand Junction Regional Airport Land Transfer. Decision expected 2014.
- TransWest Express 600kV interstate transmission project with one alternative in northwest corner of Mesa County. Decision expected 2014.
- Uncompahgre Basin (1989) and San Juan/San Miguel (1985) RMPs. These plans set management, protection, and use goals and guidelines for the BLM Uncompahgre Field Office.
- Zephyr 500kV interstate transmission project with multiple alternatives through the Grand Junction FO. Decision time frame unknown.

Increasing demand for disposal lands for community development and increasing interest in utility, mineral, and renewable energy development in the CIAA places a greater demand on lands and realty actions. These demands create the need for land tenure adjustments and additional ROWs for pipelines, transmission lines, and other facilities supporting development. One land tenure actions is pending a decision. Restrictions on ROWs outlined in the RMP alternatives, combined with restrictions from other management plans in the area, would have a minor cumulative effect by reducing routing options and possibly increasing project construction or implementation costs.

Roadway development activities, the Designation of Energy Corridors on Federal Lands in the 11 Western States PEIS, and ongoing climate changes and

anticipated associated changes in the regulation of greenhouse gases would contribute direct and indirect long-term impacts on the utilization of solar and wind resources in the CIAA. The drought that has been experienced across the Western US for the seven or eight years leading up to this RMP revision, if it continues, could indirectly impact the ability for certain water-consuming solar technologies to be implemented in the CIAA.

4.4.5 Energy and Minerals

This section discusses impacts on leasable, locatable, and mineral materials from proposed management actions for other resources and resource uses. Existing conditions concerning energy and minerals are described in **Section 3.3.3**, Energy and Minerals.

Methods of Analysis

This section presents potential impacts on leasable, locatable, and salable mineral (mineral material) resources from management actions for other resource and resource use programs. Leasable minerals include coal, potash, oil and gas, geothermal resources, oil shale, and uranium. Locatable minerals include uranium, vanadium, gold, alabaster, copper, silver, tungsten, gem minerals (e.g., amethyst and fluorite), high-calcium limestone, and zeolite. Salable minerals, also referred to as mineral materials, include sand and gravel, common variety limestone aggregate, building stone, moss rock, cinders (clinker), clay, decorative rock, and petrified wood.

Indicators for impacts on mineral resources are the following:

- The amount of land made unavailable for mineral resource activities
- The restrictions that may be placed on mineral claiming, leasing, or development
- The potential for the presence of mineral resources on these lands

When an area is withdrawn or closed to mining development, mineral resources can no longer be accessed and extracted. This represents an impact on the potential discovery, development, and use of those resources by decreasing the availability of mineral resources. Where information is available, consideration is given to the development potential for mineral resources within the lands withdrawn or closed. For example, an indicator of a significant impact on mineral resources is if there were a substantial reduction in either of the following:

- Federal leasing and development of oil and gas, coal, salable minerals, or potash in areas with development potential
- Areas available for development of locatable minerals

In areas that are open to mineral development, factors that affect mineral extraction and prospecting include permitting, regulatory policy, public

perception and concerns, travel management, transportation, proximity to sensitive areas, low commodity prices, taxes, and housing and other necessities for workers.

The amount of area that would fall under restrictions outlined in **Chapter 2** and the impact of those restrictions on mineral development are presented in **Table 4-55**, Quantitative Impacts on Mineral Resources, and are discussed below in the analysis of each alternative.

Table 4-55
Quantitative Impacts on Mineral Resources

	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
Leasable Minerals (Fluid) [1]				
Closed to fluid mineral leasing and geophysical exploration	96,500	295,600	623,600	100,500
Closed to leasing—BLM surface/federal minerals	96,500	270,700	554,700	100,000
Closed to leasing—Private or state surface/federal minerals	0	24,900	68,900	500
Open to fluid mineral leasing and geophysical exploration	1,134,600	935,600	607,600	1,130,700
BLM surface/federal minerals	964,800	790,700	506,700	961,400
Private or state surface/federal minerals	169,800	144,900	100,900	169,300
Open to fluid mineral leasing and geophysical exploration subject to standard lease terms (*not subject* to additional lease stipulations [i.e., NSO, CSU and TL])	524,500	73,300	49,100	186,000
BLM surface/federal minerals	354,700	19,500	21,100	104,900
Private or state surface/federal minerals	169,800	53,800	28,000	81,100
Open to leasing with NSO or surface-disturbing activities stipulation[2]	433,000	422,400	302,900	400,900
BLM surface/federal minerals	433,000	371,500	266,300	349,700
Private or state surface/federal minerals	0	50,900	36,600	51,200
Open to leasing with CSU stipulation[2]	74,100	500,900	326,800	445,800

Table 4-55
Quantitative Impacts on Mineral Resources

	Alternative A (acres)	Alternative B (acres)	Alternative C (acres)	Alternative D (acres)
BLM surface/federal minerals	74,100	481,800	303,500	433,000
Private or state surface/federal minerals	0	19,100	23,300	12,800
Open to leasing with TL stipulation[2]	233,000	372,100	241,600	438,700
BLM surface/federal minerals	233,000	332,400	197,600	405,900
Private or state surface/federal minerals	no data	39,700	44,000	32,800
Salable Minerals				
Closed to salable minerals	274,300	277,700	452,000	155,300
Open to salable minerals	787,100	783,800	609,400	906,100
Open to salable minerals with NSO or surface-disturbing activities stipulation	n/a	332,800	365,600	307,500
Locatable Minerals				
Mining claims within areas withdrawn	1,300	1,300	1,300	1,300
Mining claims within areas petitioned for withdrawal	0	2,400	6,000	0

[1]Total acreage for stipulations is greater than the total acreage within the GJFO boundary because stipulations (NSO, CSU, and TL) may overlap.
[2]Total acreage for individual stipulations are not additive; where overlapping occurs, acres are accounted for only once in the total.
Source: BLM 2010a

The analysis for energy and minerals includes the following assumptions:

- Existing leases and claims will not be affected by the closures or withdrawals proposed under this RMP.
- The Mineral Leasing Act of 1920, as amended, and the Mineral Leasing Act for Acquired Lands of 1947, as amended, will govern the BLM's management of oil and gas leasing on about 570 million acres of BLM-administered, National Forest System, and other federal lands, as well as private lands where the federal government has retained mineral rights. The BLM works to ensure that development of mineral resources is in the best interests of the nation.
- Oil and gas operations on existing leases would be subject to COAs by the authorizing officer.
- Valid existing leases will be managed under the stipulations in effect when the leases were issued; new stipulations proposed under this RMP will apply on new leases.

- Leasing and drilling could occur only where the management actions described in **Chapter 2** would reasonably allow.
- If an area is leased, it could be developed; however, not all leases will be developed within the life of this RMP.
- As the demand for energy increases, so will the demand for energy resources.
- Stipulations apply to fluid mineral leasing on lands overlying federal mineral estate, which includes federal mineral estate underlying BLM-administered lands, privately owned lands, and state-owned lands. There are 1,231,200 acres of federal mineral estate within the decision area.
- Development potential is broken into six categories based on the GJFO's RFD (BLM 2012a). Areas with potential are characterized as very high, high, moderate, or low; areas with no potential are characterized as very low or no potential.

Effects Common to All Alternatives

Stipulations, while not directly withdrawing or closing areas, impact the availability of fluid mineral resources by restricting the location of surface facilities and methods of development. Under the action alternatives (Alternative B, C and D), the definition of a stipulation has been expanded to include all surface-disturbing activities (and occupancy) associated with land use authorizations, permits, and leases issued on BLM-administered lands. Therefore, under the action alternatives, NSO, CSU, and TL stipulations would restrict the locations of all surface-disturbing activities associated with land use authorizations, permits, and leases issued on BLM-administered lands. They also would restrict the manner in which the activities may be implemented and when they may occur in areas where they are applied. Most methods of mineral extraction require surface disturbance, such as the construction of roads, well pads, and pipelines. As a result, any stipulation would likely affect the availability of mineral resources. Stipulations would not apply to locatable mineral development.

In areas where NSO stipulations are applied, drilling would need to be done by directional or horizontal methods in order to reach subsurface targets. However, these drilling methods are more expensive, and the target area where they could reach is limited. This means that some minerals may be inaccessible in areas where an NSO stipulation covers a large area or where no leasing is allowed on surrounding lands. Salable minerals are extracted by surface mining, which would be precluded in areas with NSO stipulations. In general, these restrictions could make the extraction of the mineral resources impossible.

In ROW exclusion areas off lease, the placement of ROWs would also be prohibited for new leases. ROWs that serve leases issued under the 1987 RMP and that do not have NSO stipulations may be allowed. During development of

oil and gas leases issued under the 1987 RMP most of the lands within those leases that are proposed as ROW exclusion would be managed as ROW avoidance.

CSU stipulations allow some use and occupancy in areas where they are applied. While less restrictive than an NSO, a CSU stipulation allows the BLM to require special operational constraints, to shift the surface-disturbing activity more than 200 meters (656 feet), or to require additional protective measures to protect the specified resource or value, such as special construction techniques for preventing erosion in sensitive soils. While not prohibiting surface-disturbing activities, a CSU stipulation does influence the location and level of operations within the subject area.

Areas where TL stipulations are applied are closed to fluid mineral exploration and development, surface-disturbing activities, and intensive human activity during identified time frames, usually based on seasons or species' breeding times. While some operations would be allowed at all times (e.g., vehicle travel and maintenance), construction, drilling, completions, and other intensive operations would not be allowed during the restricted time frame. Most activities, however, can be initiated and completed outside of the restricted dates specified in the TL stipulation.

Existing mineral leases are not subject to the terms or stipulations of these RMP alternatives. New leases of federal mineral estate with development restrictions, such as overlapping or numerous lease stipulations, may be difficult or uneconomical to develop, depending on the alternative (see **Appendix A**, Figures, and **Appendix B**, Stipulations).

Potential lessees should take into account the possibility that such a lease may not allow for maximum extraction and transport of the mineral resources. Potential lessees considering development of leases should consider whether the restrictions can be dealt with through technical or special engineering means. These would both protect the resource or value of concern for a given stipulation and would economically and efficiently produce the mineral resource. Portions of restricted leases may be more costly to develop and produce and in some cases may not be feasible to develop. Where NSO stipulations would be applied, generally production would come from the edges of NSO blocks or from existing leases that do not have NSO stipulations. The use of directional or horizontal drilling to reach minerals under blocks of NSO could result in increased well densities in the areas where surface occupancy is allowed. Large quantities of oil and gas may not be recoverable from federal mineral estate, depending on the restrictions that apply to the alternative.

Solid Leasable Minerals – Coal

Under all alternatives, areas available for coal resources were refined using the four specific land use screening steps that are unique to developing land use planning decisions for federal coal lands (43 CFR 3420):

1. Identification of coal with potential for development
2. Determination of whether the lands are unsuitable for coal development
3. Consideration of multiple use conflicts
4. Consultation with surface owners

Different maximum depths of the coal resources were used between Alternative A (current management) and Alternatives B, C, and D to adjust for new technology that allows deeper coal to be mined. When screening against the criteria listed in 43 CFR 3420, those areas with coal resource potential that also pass the screening criteria are defined as potentially acceptable for coal leasing and development. Those that do not pass the screening criteria are defined as unacceptable for coal leasing and development. Refer to **Appendix N**, Coal Screen Criteria, for a complete description of the coal screening process carried out for the GJFO decision area. Due to the depths of coal resources within the decision area, it is anticipated that all coal would be mined by underground mining techniques.

The areas with high potential for coal development are near the McClane Canyon mine, the proposed Book Cliffs Lease by Application area, and along the Colorado River near the former Roadside Mine. Under all alternatives, the areas within the Demaree Canyon and Little Book Cliffs WSAs would be unacceptable for coal leasing and development; however, industry has not shown interest in these areas, so no impact on coal mining is anticipated.

Solid Leasable Minerals – Leasables, Potash

The potash potential area is centered on the Sinbad Valley in the southwest corner of the planning area. Under all alternatives, the Sewemup Mesa WSA would be closed to non-energy mineral leasing, making the eastern edge of the potash potential area unavailable. In 2008, the industry sought prospecting permits for potash, but BLM decisions on these permits have been deferred until completion of this RMP. This is because the current RMP is silent on decisions for non-energy mineral leasing. Management actions that would make areas unavailable to potash leasing would affect potash exploration and possible mining in the near future.

Fluid Leasable Minerals – Oil, Gas, and Geothermal Resources

The total federal mineral estate is 1,231,200 acres. Of this area, 826,300 acres (67 percent) have oil and gas development potential, 665,700 acres of which are leased. Approximately 398,000 acres (32 percent) of the total federal mineral estate has geothermal potential, and there are no geothermal leases within the GJFO decision area. The management actions being considered in this RMP would affect only future leases.

Under all alternatives, WSAs would be closed to oil, gas, and geothermal leasing. The Little Book Cliffs WSA is within the geothermal potential area that lies in the southeastern portion of the planning area. This portion of the potential area would be closed to geothermal leasing under all alternatives.

Wildland fire could affect fluid mineral operations by threatening and burning infrastructure, causing evacuations and interrupting production by shutting in wells and pipelines.

Fluid Leasable Minerals – Oil Shale

The oil shale potential is in the northern portion of the planning area, but there has not been much recent industry interest in developing these resources. Under all alternatives, leasing for underground mining of oil shale would be open on a case-by-case basis on the 560 acres identified in the *Approved Resource Management Plan Amendments/ROD for Oil Shale and Tar Sands Resources to Address Land Use Allocations in Colorado, Utah, and Wyoming and Final Programmatic Environmental Impact* (BLM 2008c). The BLM is reviewing its decisions in the aforementioned plan in a programmatic planning process; any additional decisions would be adopted by this RMP, as applicable. Because there is no current interest in the oil shale deposits in the GJFO decision area, and there is no difference among the alternatives specifically concerning oil shale leasing or extraction, oil shale resources are not discussed in further detail. In the future, any leasing would be evaluated through the BLM NEPA process.

Locatable Minerals

Mineral exploration and development of locatable minerals is allowed under the General Mining Law of 1872 on all BLM-administered lands unless it is withdrawn from mineral entry. Stipulations do not apply to locatable mineral development. To restrict locatable mineral development, the BLM must apply to the Secretary of the Interior for withdrawal actions, with subsequent valid existing rights reviews for existing claims.

Under all alternatives, approximately 1,038,100 acres (85 percent) of mineral estate underlying BLM-administered lands would be open to the location of mining claims; approximately 23,300 acres would remain withdrawn from the location of mining claims. Most of the decision area with high potential for locatable minerals has already been claimed, so the management actions being considered in this RMP would affect only future mining claims. As a result, RMP management actions would have limited effects on locatable minerals.

To date, there has been no large-scale exploration or mining for gold in the decision area. Since about 2007, there has been a dramatic increase in filed mining claims and small-scale prospecting and mining along the Dolores River. This is expected to continue if the price of gold continues to rise or remains similar to prices experienced between 2007 and 2012. There is low potential for large-scale mining, but small-scale prospecting and mining are expected to continue.

During past uranium price spikes, exploration and mining were very high in the planning area. Based on interest when uranium prices are high, there is potential for several uranium mines in the uranium high potential area in the southwest portion of the planning area. The Pup Tent (one acre) is the only uranium mine currently withdrawn, making this area unavailable to uranium exploration and mining. Under Alternatives B, C, and D, additional uranium mining sites could be withdrawn for bat roosting (including maternity roosts) and hibernacula. However, if these sites had mining or valid and existing rights, they would not be impacted unless mining claims were dropped or were to become inactive.

Under Alternatives B and C, the proposed Sinbad Valley ACEC would be adjacent to the uranium high potential area and could impact extraction by making resource extraction more controversial.

Salable Minerals

Most of the past and current demand for salable minerals in the decision area has been for sand and gravel. The potential for development is judged to be moderate on BLM-administered lands, as the best-quality deposits and those closest to the demand (for example, Grand Junction) lie on private land. Accelerated urban development in areas such as Whitewater and Grand Junction could lead to demands on sand and gravel deposits immediately outside the Grand Junction city limits. Moderate potential for dimension stone occurs in the southern half of the planning area. The area with moderate potential for clay occurs in a wide swath, from the area around Grand Junction and Whitewater northwest to the Utah border.

General

Public access on lands managed for wilderness characteristics would become more restricted, which would affect leasable and salable mineral development. Instead of having vehicle access into these areas, most access would be restricted to foot or horseback (valid existing rights may be excepted), reducing the amount of mineral exploration and development that could occur.

In conjunction with adjacent private lands, permission from landowners to cross private land to access public land is sometimes denied and could result in mineral resources not being discovered and developed on lands still available to mineral development. Mineral resources in other ownerships may not be developed if the adjacent public lands are withdrawn from mineral entry because the deposit may not be economically feasible to develop if it were to cross ownership and only a portion were available for development.

Visual resources management (e.g., VRM classes) would impact new leases under all alternatives because new leases would be required to meet VRM objectives. Limitations on the location and type of development would generally be most restrictive in areas managed as VRM Class I or II. Existing leases would retain their right to access the minerals in their lease, but any new facilities for existing leases would be required to meet VRM objectives. Continued operation

of existing facilities for existing leases would not be affected by a change in VRM class.

Alternative A

Solid Leasable Minerals – Coal

Under Alternative A, a maximum depth of 1,500 feet was used to calculate a coal potential area of 337,400 acres (Screen 1). Twenty criteria, based mostly on resource values, were then applied (Screen 2) to determine whether those lands identified as having development potential (Screen 1) were suitable for development. As a result, 11 percent of the decision area with coal potential would remain unacceptable for further coal leasing and development under Alternative A. No additional areas were found unacceptable for further coal leasing and development after multiple land use decisions were evaluated (Screen 3); private surface owners (Screen 4) were not consulted for this land use planning process. Refer to **Appendix N**, Coal Screen Criteria, for a complete description of the coal screening process for the GJFO decision area.

The impact from making lands unacceptable for further coal leasing and development would be the same as those described under Effects Common to All Alternatives. The areas with current and potential near-future coal mining activities would continue to be acceptable to coal mining under this alternative, so there would be no impact on current and potential near-future coal mining.

Solid Leasable Minerals – Non-Energy Leasables, Potash

Under Alternative A, the Sewemup Mesa WSA would remain closed to potash mining. This would impact the availability of leasing potash on the eastern edges of the Sinbad Valley potash potential area. None of the remaining potash potential area would be subject to NSO or CSU stipulations under this alternative, but the area would continue to be subject to TLs. This constraint would allow surface-disturbing activities only from May 1 to December 1. As a result, the timing of development would continue to be impacted, but the area where mining would be allowed would not.

Fluid Leasable Minerals – Oil, Gas, and Geothermal

Under Alternative A, 1,134,600 acres (92 percent) of mineral estate would remain open to oil, gas (including unconventional categories such as shale gas), and geothermal leasing and development. Approximately 96,500 acres (8 percent) would remain closed.

Of the 398,000 acres with geothermal potential in the GJFO decision area, approximately 372,200 acres (94 percent) would remain open to leasing. An NSO stipulation would continue to be applied to the Bangs Canyon area. Otherwise, the primary restrictions on geothermal development would continue to be TL stipulations that allow surface-disturbing activities from May 1 to December 1. As a result, the timing of development would continue to be impacted, but the area where development would be allowed would not.

Leasing decisions for oil and gas are presented in **Table 4-56**, Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative A.

Table 4-56
Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative A

Leasable Minerals (Fluid)	With Development Potential	Without Development Potential
Federal Mineral Estate Development Potential	*826,300*	*404,900*
Closed to leasing	52,000	44,500
Open to leasing	774,200	360,300
Open with no stipulations	344,300	180,100
Open with NSO stipulations[1]	281,500	151,500
Open with CSU stipulations[1]	59,300	14,800
Open with TL stipulations[1]	179,100	53,900

Source: BLM 2010a
[1]Total acreage for stipulations is greater than the total acreage within the GJFO boundary because stipulations may overlap.

Of the 1,134,600 acres of federal mineral estate that is currently open to leasing, 774,200 acres (68 percent) has development potential and would remain open under Alternative A. Approximately 344,300 acres (44 percent of lands with development potential) would remain open with no stipulations, providing the most flexibility for oil, gas, and geothermal leasing and development. The remaining 429,900 acres (56 percent of lands with development potential) would have some type of stipulation applied to the leases unless an exception or modification was granted (see **Appendix B**). The types of impacts from applying stipulations in areas with development potential would be the same as those described under Effects Common to All Alternatives.

Locatable Minerals

Under Alternative A, 23,300 acres (1 percent) of mineral estate underlying BLM-administered lands would remain withdrawn from the location of mining claims, and no additional areas would be recommended for withdrawal. Because no new areas would be petitioned for withdrawal, there would be no decrease in the area currently available to the claiming of locatable minerals. Within the area currently withdrawn from the location of mining claims, 1,300 acres remain of active mining claims that could be affected.

The area with high gold potential is in placer deposits along the Dolores River, where gold has been mined in the past. The small-scale prospecting and mining using motorized equipment currently requires a permit, not a mining claim. Under Alternative A, the areas with high gold potential along the Dolores River would continue to not be withdrawn from future claim staking, and permits for

motorized small-scale prospecting and mining would still need to be approved. Therefore, current mining would not be impacted.

Salable Minerals
Approximately 274,300 acres (22 percent) of mineral estate underlying BLM-administered lands would remain closed to the disposition of salable minerals, precluding future mining in these areas.

General
New leases would continue to be required to conform to VRM classification objectives; areas managed as VRM Class I or II (159,200 acres) may limit the type and location of new facility development.

Alternative B

Solid Leasable Minerals – Coal
The coal potential development area under Alternative B would be smaller than under Alternative A because of additional screening criteria requirements under 43 CFR 3420. Under Alternative B, 19 percent of the coal potential area would be managed as unacceptable for coal leasing and development due to screening criteria. This is based on resource values (**Appendix N**, Coal Screen Criteria), which are 7 percent more than under Alternative A. The increase in area unacceptable for coal leasing would not impact current and potential near-future coal mining activities. This is because the areas with current and potential near-future coal mining would be acceptable to coal mining under this alternative.

Under Alternative B, 252,100 acres would be acceptable to coal leasing, 10,100 acres (4 percent) of which would have no stipulations. Areas devoid of stipulations provide the most flexibility for placement of facilities and coal development.

Under Alternative B, 155,700 acres, or 62 percent, of the area acceptable for future coal leasing would be covered by NSO stipulations associated with soils, special status species habitats, wildlife emphasis areas, cultural resources, lands with wilderness characteristics, and ACECs. Other restrictions associated with paleontological resources and national trails also would be covered by these NSO stipulations. An NSO stipulation would restrict the locations and sizes of surface disturbance allowed for potential future exploration and mining and methane venting and capture. Efforts to maintain natural flows of surface waters could reduce the amount of water available for mining and could restrict the quantity or quality of any mine discharge water. Where mitigation would be required, these mitigations would increase costs and could also limit development options.

The NSO stipulation for steep slopes greater than or equal to 40 percent accounts for the greatest percentage of stipulated acreage. This NSO stipulation, however, has an exception for coal exploration and surface-

disturbing activities necessary for developing federally leased coal (e.g., mine portals, roads and pads associated with vent holes, methane capture). This would reduce the area where coal development would be stipulated and would minimize the impact on coal development.

In areas with moderate constraints, such as CSU and TL stipulations, coal could still be developed. However, activities would need to be modified to minimize impacts on the resource or value being protected by the stipulation; alternately, the activity could be shifted more than 200 meters (656 feet) to protect the specified resource or value.

Solid Leasable Minerals – Non-Energy Leasables, Potash

In the decision area, 542,800 acres (51 percent) would be closed to the leasing of non-energy minerals. The current RMP is silent on decisions for non-energy leasables, so a comparison to the baseline is not reasonable. Within the 2,800-acre potash development potential area, 1,900 acres would be closed (500 acres of which are in the Sewemup Mesa WSA). An additional 20 acres would be open to leasing with an NSO stipulation, resulting in approximately 850 acres available for exploration or development of potential potash resources in the decision area.

Fluid Leasable Minerals – Oil, Gas, and Geothermal

Under Alternative B, 935,600 acres (76 percent) of federal mineral estate would be open to oil, gas, and geothermal leasing and development, a 12 percent decrease from Alternative A. Approximately 295,600 acres (24 percent) of the federal mineral estate would be closed under Alternative B (2.4 times more than under Alternative A).

Of the 398,000 acres with geothermal potential in the GJFO decision area, 296,500 acres (74 percent) would remain open to leasing. Approximately 101,500 acres (26 percent) of the area with geothermal resource potential would be closed to geothermal leasing under this alternative, including the Bangs Canyon area and the Palisade municipal watershed area. Much of the geothermal potential area east of Palisade would be subject to NSO stipulations. The types of impacts would be the same as those described under Effects Common to All Alternatives.

Leasing decisions for oil and gas are presented in **Table 4-57**, Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative B.

Of the 935,600 acres of federal mineral estate that would be open to leasing, 754,200 acres (81 percent) would be open in areas with development potential. Approximately 43,400 acres (6 percent of federal mineral estate open to leasing with development potential) would be open with no stipulations. The remaining 710,800 acres (94 percent of federal mineral estate open to leasing with development potential) would have some type of stipulation applied to the

Table 4-57
Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative B

Leasable Minerals (Fluid)	With Development Potential	Without Development Potential
Federal Mineral Estate Development Potential	*826,300*	*404,900*
Closed to Leasing	72,100	167,400
Open to Leasing	754,200	237,600
Open with No Stipulations	43,400	29,900
Open with NSO Stipulations[1]	357,200	65,200
Open with CSU Stipulations[1]	417,100	83,800
Open with TL Stipulations[1]	296,200	75,900

Source: BLM 2010a
[1] NSO, CSU, and TL stipulations may overlap. As such, the total acreage of stipulations may be greater than the total area open to fluid mineral leasing.

leases unless an exception or modification was granted (see **Appendix B**, Stipulations). The types of impacts from applying stipulations in areas with development potential would be the same as those described under Effects Common to All Alternatives.

This alternative would increase restrictions on development when compared to Alternative A. Of the 754,200 acres of federal mineral estate that would be open to leasing and that have development potential, 357,200 acres (47 percent) would be subject to an NSO stipulation (25 percent more acres than under Alternative A), 417,100 acres (56 percent) would be subject to a CSU stipulation (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), and 296,200 acres (39 percent) would be subject to a TL stipulation (56 percent more acres than under Alternative A; see **Table 4-55**, Quantitative Impacts on Mineral Resources. These restrictions would result from management actions associated with soils, special status species habitats, wildlife emphasis areas, cultural resources, lands with wilderness characteristics, areas where coal and gas storage are incompatible with oil, gas, and geothermal leasing and development, ACECs, SRMAs, and other restrictions associated with paleontological resources and national trails. Stipulations would restrict the locations and sizes of surface disturbance allowed for oil, gas, and geothermal development in specific areas. As a result, the cost of extraction could increase, and the resource could be inaccessible in places due to technical reasons, such as if the resource were too far to reach with directional or horizontal drilling, thereby making some of the federal mineral estate effectively inaccessible.

Locatable Minerals

Under Alternative B, 20,600 acres would be recommended for withdrawal from the location of mining claims (preventing the location of future mining claims). Combined with the additional 23,300 acres previously withdrawn (Alternative

A), the availability of locatable minerals would be limited on 43,900 acres, or 4 percent of the mineral estate underlying BLM-administered lands (2.1 times more acres than under Alternative A). Lands recommended for withdrawal under this alternative could affect 2,400 acres of active mining claims. The types of impacts would be the same as those described under Effects Common to All Alternatives.

Under Alternative B, the center of the area with moderate copper and silver potential would be petitioned for withdrawal as part of the designation of the Sinbad Valley ACEC, reducing the potential for the development of a future copper/silver mine in the decision area.

The proposed Sinbad Valley ACEC would be outside of the uranium high potential area; nevertheless, this ACEC designation could impact extraction activities in the high potential area by making them more controversial.

Salable Minerals

Of the 1,061,400 acres in the decision area, 277,700 acres would be closed to the disposition of salable materials (mineral material), 1 percent more acres than under Alternative A. An additional 332,800 acres open to mineral material development would be subject to NSO stipulations under this alternative. Disposition of mineral materials requires surface mining, so NSO stipulations would effectively close these areas to mining mineral materials unless an exception were granted.

Certain CSU and TL stipulations would restrict the locations, sizes, and timing of surface disturbance allowed for potential future mining. These stipulations are associated with soils, special status species habitats, wildlife emphasis areas, cultural resources, lands with wilderness characteristics, and ACECs, as well as other restrictions associated with paleontological resources.

Master Leasing Plan

Under Alternative B, 631,600 acres of federal mineral estate with oil and gas development potential would be open for leasing. Only 183,400 of those acres (29 percent) are currently unleased. The remaining 454,800 acres (71 percent) that are already leased would not be subject to any proposed leasing stipulations in this RMP/EIS unless a lease expires and is resold. COAs may also be applied on existing leases at the APD stage, providing protection for sensitive resources while not prohibiting surface-disturbing activities associated with energy and mineral development.

Fluid mineral development in the MLP analysis area would be restricted primarily through the application of stipulations. Within the 176,800 unleased acres with development potential that would be open to fluid mineral leasing, surface-disturbing activities would be prohibited on 90,800 acres (51 percent) by a mapped NSO stipulation. Site-specific restrictions requiring relocation of surface-disturbing activities would be implemented on 94,600 acres (54 percent)

via mapped CSU stipulations. And surface-disturbing activities would be seasonally limited on 79,400 acres (45 percent) due to mapped TL stipulations. Existing leases that expire and are then issued during the life of this RMP would be subject to these restrictions.

In addition, unmapped stipulations (e.g., those for special status species) may apply to additional acres.

Figures 4-1 through **4-3** show the NSO, CSU, and TL stipulations that would be applied to BLM-administered surface land and split estate that is currently unleased and would be open to leasing under the Proposed RMP (Alternative B).

Table 4-58, Acres Managed with Conditions of Approval and Lease Stipulations within the Shale Ridges and Canyons MLP, displays, by alternative, the stipulations applied to currently leased and unleased acreage that is open to leasing within the externally recommended MLP boundary. Because some stipulations, including NSOs for cultural resources, definable streams, lentic riparian areas, TLs for special status species, and others, are not mapped, the actual acreages where stipulations are applied is higher than shown in the table.

Table 4-58
Acres Managed with Conditions of Approval and Lease Stipulations within the Shale Ridges and Canyons MLP

Alternative	Currently Unleased and Open to Leasing	NSO	CSU	TL
A	163,000	76,100	44,700	36,700
B	183,400	90,900	108,100	79,400
C	93,300	50,000	84,800	35,300
D	163,000	61,800	84,400	71,700
Alternative	**Currently Leased and Open to Leasing**	**NSO**	**CSU**	**TL**
A	464,200	184,900	33,600	114,100
B	462,600	237,800	254,400	158,100
C	293,700	181,300	145,200	95,700
D	464,200	176,700	174,200	145,500

In addition to stipulations, COAs would be analyzed and may be applied on new and existing leases in the MLP analysis area at the APD stage. These include COAs to protect air quality (e.g., dust abatement, VOC emission requirements), soil resources (steep slopes and soil erosions), water quality (water and riparian resource buffers), special status species (important habitat areas), and others. COAs that could apply to new leases in the MLP analysis area are denoted in Appendix H, Best Management Practices. Application of COAs in the MLP analysis area would restrict certain activities for fluid mineral leasing and

development, but would provide greater protection to important resource values where those values are present.

Compared to Alternative A, Alternative B would manage 20,400 more unleased acres in the MLP area as open to leasing, but would also apply NSO stipulations on 52,900 more acres. Alternative B would also analyze COAs that may be applied on new and existing leases in the MLP analysis area at the APD stage. As a result Alternative B would be more restrictive for fluid mineral leasing than Alternative A.

Special designations and other management allocations that would restrict leasing and development are shown in **Figures 4-4** through **4-6**. Combined, these areas would cover 88 percent of the MLP analysis area, including many of the most sensitive areas. As with stipulations, they would provide an additional layer of protection for important resource values while further restricting fluid minerals development.

Fluid mineral development within the MLP analysis area may be restricted due to the application of COAs and stipulations. The combination of COAs and stipulations, though, would benefit important resource values (e.g., wildlife emphasis areas, ACECs) in the MLP analysis area. Across the entire MLP analysis area, there would only be 7,200 acres of federal mineral estate open to fluid mineral leasing that are currently unleased and would not be subject to a mapped stipulation. Because stipulations are applied in areas with sensitive resources, these 7,200 acres are assumed to contain less sensitive resources (Operators would continue to be required to survey for and verify the absence of sensitive resources before stipulations would be omitted from new leases). Even if stipulations were not attached to a new lease, COAs would be analyzed and may be required, potentially providing an additional level of protection for resource values within the MLP analysis area that may not always be applied elsewhere in the decision area. COAs may also be applied to existing leases that are not currently developed to provide an additional protection to sensitive resources.

General

The type and location of new facilities in areas managed as VRM Class I or II could be limited because they would have to meet more stringent VRM objectives than new ROWs in areas managed as VRM Class III and IV. These impacts would occur over 491,100 acres managed as VRM Class I and II.

Alternative C

Solid Leasable Minerals – Coal

Under Alternative C, 19 percent of the area with coal potential would be managed as unacceptable for coal leasing due to screening criteria based on resource values (**Appendix N**). This is 8 percent more than under Alternative

A. The types of impacts would be the same as those described under Effects Common to All Alternatives.

Under Alternative C, 251,200 acres would be acceptable to coal leasing, 12,100 acres of which (less than one percent) would have no stipulations. Impacts would be similar to those described under Alternative B.

NSO stipulations associated with soils, special status species habitats, wildlife emphasis areas, cultural resources, lands with wilderness characteristics, and ACECs, as well as other restrictions associated with paleontological resources, would cover 225,500 acres, or 90 percent, of the area acceptable for coal leasing, thereby restricting the locations and sizes of areas of surface disturbance associated with coal development activities. Alternative C would be the most restrictive alternative with more NSO stipulations applied than any other alternative. Furthermore, no NSO exceptions for surface-disturbing activities necessary for federally leased coal would be granted under this alternative. As a result, impacts on coal mining could occur.

In areas with moderate constraints, such as CSU and TL stipulations, impacts on coal development activities would be similar to those described under Alternative B.

Solid Leasable Minerals – Non-Energy Leasables, Potash

In the decision area, 762,900 acres (72 percent) would be closed to the leasing of non-energy minerals. The current RMP is silent on decisions for non-energy leasables; therefore a comparison to the baseline is not reasonable. Within the 2,800-acre potash development potential area, 1,900 acres would be closed (500 acres of which are in the Sewemup Mesa WSA). An additional 20 acres would be open to leasing with an NSO stipulation, resulting in 880 acres available for exploration or development of potential potash resources in the decision area.

Fluid Leasable Minerals – Oil, Gas, and Geothermal

Under Alternative C, 607,600 acres (49 percent) of federal mineral estate would be open to oil, gas, and geothermal leasing and development, a 46 percent decrease from Alternative A. Approximately 623,600 acres (51 percent) of the federal mineral would be closed to leasing (6.5 times more than under Alternative A).

Of the 398,000 acres with geothermal potential in the GJFO decision area, 187,400 acres (47 percent) would remain open to leasing. Approximately 210,100 acres (53 percent) of the area with potential for geothermal resources would be closed to geothermal leasing, the highest of any alternative. The area open to geothermal leasing, located generally to the east of Whitewater, would be subject to CSU stipulations, the impact of which would be the same as that described under Effects Common to All Alternatives.

Leasing decisions for oil and gas are presented in **Table 4-59**, Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative C.

Table 4-59
Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative C

Leasable Minerals (Fluid)	With Development Potential	Without Development Potential
Federal Mineral Estate Development Potential	*826,300*	*404,900*
Closed to Leasing	404,400	219,300
Open to Leasing	421,800	185,700
Open with No Stipulations	20,500	28,600
Open with NSO Stipulations[1]	243,000	59,800
Open with CSU Stipulations[1]	228,000	98,800
Open with TL Stipulations[1]	158,800	82,800

Source: BLM 2010a
[1] NSO, CSU, and TL stipulations may overlap. As such, the total acreage of stipulations may be greater than the total area open to fluid mineral leasing.

Of the 607,600 acres of federal mineral estate that would be open to leasing, 421,800 acres (69 percent) would be open in areas with development potential. Approximately 20,500 acres (5 percent of lands with development potential) would be open with no stipulations, providing the least flexibility for oil, gas, and geothermal leasing and development. The remaining 401,300 acres (95 percent of lands with development potential) would have some type of stipulation applied to the leases unless an exception or modification were granted (per **Appendix B**, Stipulations). The types of impacts from applying stipulations in areas with development potential would be the same as those described under Effects Common to All Alternatives.

This alternative would increase restrictions on development in comparison with Alternative A. Of the 421,800 acres of federal mineral estate that would be open to leasing that have development potential, 243,000 acres (58 percent) would be subject to an NSO stipulation (14 percent less acres than under Alternative A), 228,000 acres (54 percent) would be subject to a CSU stipulation (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), and 158,800 acres (11 percent) would be subject to a TL stipulation (24 percent less acres than under Alternative A) (**Table 4-55**, Quantitative Impacts on Mineral Resources). Restrictions would result from management actions associated with soils, water resources, special status species habitat, old-growth forest, important fish and wildlife areas, wild horses, cultural resources, visual resources, lands with wilderness characteristics, recreation, areas where other mineral resources or operations are incompatible with oil, gas, or geothermal leasing and development, ACECs, national historic trails, and

backcountry byways, as well as other restrictions associated with paleontological resources and WSR eligible segments.

Stipulations would restrict the locations and sizes of surface disturbance allowed for oil, gas, and geothermal development in specific areas. As a result, the cost of extraction could increase, and the resource could be inaccessible in places due to technical reasons, such as the resource is too far to reach with directional or horizontal drilling, thereby making some of the federal mineral estate effectively inaccessible.

Locatable Minerals

Under Alternative C, 45,100 acres would be recommended for withdrawal from mineral entry (preventing the location of future mining claims). Combined with the additional 23,300 acres previously withdrawn (under Alternative A), the availability of locatable minerals would be limited on 68,400 acres, or 6 percent of the mineral estate underlying BLM-administered lands (3.2 times more acres than under Alternative A). Lands recommended for withdrawal under this alternative could affect 6,000 acres of active mining claims. The types of impacts would be the same as those described under Effects Common to All Alternatives.

The area with high gold potential along the Dolores River would be withdrawn from claiming under Alternative C. Permitted recreational placer activity would only be allowed to continue on valid and existing mining claims.

Like under Alternative B, under Alternative C, the center of the area with moderate copper and silver potential would be withdrawn as part of the proposed Sinbad Valley ACEC. This withdrawal would decrease the potential for the future development of a copper/silver mine in the decision area.

The proposed Sinbad Valley ACEC would border the uranium high potential area, but its designation would not impact the potential for future uranium mining because it would not overlap the high potential area.

Salable Minerals

Under alternative C, 452,000 acres would be closed to the disposition of salable materials (mineral materials) (57 percent more acres than under Alternative A). An additional 365,600 acres open to mineral material development are subject to NSO stipulations under this alternative. Disposition of mineral materials requires surface mining methods. Therefore, NSO stipulations would effectively close these areas to mining mineral materials unless an exception was granted.

CSU and TL stipulations associated with soils, special status species habitats, wildlife emphasis areas, cultural resources, lands with wilderness characteristics, and ACECs, as well as other restrictions associated with paleontological resources, would cover much of the open area and would restrict the locations, sizes, and timing of surface disturbance allowed for potential future mining

activities. The types of impacts would be the same as those described under Effects Common to All Alternatives, but Alternative C would be the most restrictive because more stipulations would be applied than under any other alternative.

General

The type and location of new ROWs granted in areas managed as VRM Class I or II could be limited because they would have to meet more stringent VRM objectives than new ROWs in areas managed as VRM Class III and IV. These impacts would occur over 656,700 acres managed as VRM Class I and II, the most of any alternative.

Alternative D

Solid Leasable Minerals – Coal

Under Alternative D, 16 percent of the area with coal potential would be managed as unacceptable for coal leasing due to screening criteria based on resource values (**Appendix N**), which is 3 percent more than under Alternative A. The types of impacts would be the same as those described under Effects Common to All Alternatives.

Under Alternative D, 265,600 acres would be acceptable to coal leasing. Of that total, 44,900 acres (17 percent) would have no stipulations. Impacts would be similar to those described under Alternative B.

The types of impacts from applying stipulations within the area acceptable for coal leasing would be similar to those described under Alternative B (including the exception for coal exploration and development activities in areas with an NSO stipulation for steep slopes). Alternative D would apply fewer NSO stipulations (125,400 acres or 47 percent of the area acceptable for coal leasing) than Alternatives B or C and would thus be less restrictive.

Solid Leasable Minerals – Non-Energy Leasables, Potash

In the decision area, 136,000 acres (13 percent) would be closed to the leasing of non-energy minerals. The current RMP is silent on decisions for non-energy leasables; therefore a comparison to the baseline is not reasonable. Within the 2,800-acre potash development potential area, 500 acres of the Sewemup Mesa WSA would be closed, and an additional 250 acres would be open to leasing with an NSO stipulation, leaving 2,050 acres available for exploration or development of potential potash resources in the decision area.

Fluid Leasable Minerals – Oil, Gas, and Geothermal

Under Alternative D, 1,130,700 acres (92 percent) of federal mineral estate would be open to oil, gas, and geothermal leasing and development, a less than one percent decrease from Alternative A. Approximately 100,500 acres (9 percent) of federal mineral estate would be closed under Alternative D (4 percent increase from Alternative A).

Of the 398,000 acres with geothermal potential in the GJFO decision area, 369,100 acres (93 percent) would remain open to leasing. Approximately 28,400 acres (7 percent) of the area with potential for geothermal resources would be closed to geothermal leasing. The area open to geothermal leasing, located generally to the east of Whitewater, would be subject to CSU stipulations, the impact of which would be the same as that described under Effects Common to All Alternatives.

Leasing decisions for oil and gas are presented in **Table 4-60**, Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative D.

Table 4-60
Acres of Oil and Gas Leasing Decisions by Development Potential, Alternative D

Leasable Minerals (Fluid)	With Development Potential	Without Development Potential
Federal mineral estate development potential	*826,300*	*404,900*
Closed to leasing	52,900	47,600
Open to leasing	773,400	357,300
Open with no stipulations	126,500	59,500
Open with NSO stipulations[1]	274,100	126,800
Open with CSU stipulations[1]	316,600	129,200
Open with TL stipulations[1]	265,000	153,700

Source: BLM 2010a
[1] NSO, CSU, and TL stipulations may overlap. As such, the total acreage of stipulations may be greater than the total area open to fluid mineral leasing.

Of the 1,130,700 acres of federal mineral estate that would be open to leasing, 773,400 acres (68 percent) would be open in areas with development potential. Approximately 126,500 acres (16 percent of lands with development potential) would be open with no stipulations. The remaining 646,900 acres (84 percent of lands with development potential) would have some type of stipulation applied to the leases unless an exception or modification were granted (see **Appendix B**, Stipulations). The types of impacts from applying stipulations in areas with development potential would be the same as those described under Effects Common to All Alternatives.

This alternative would increase restrictions on development compared to Alternative A. Of the 773,400 acres of mineral estate that would be open to leasing with potential, 274,100 acres (35 percent) would be subject to an NSO stipulation (3 percent less acres than under Alternative A), 316,600 acres (41 percent) would be subject to a CSU stipulation (please note that because many CSU stipulations under Alternative A do not have mapped acreages, an acreage-based comparison is not considered accurate), and 265,000 acres (34 percent) would be subject to a TL stipulation (48 percent more acres than under

Alternative A; **Table 4-55**, Quantitative Impacts on Mineral Resources). These restrictions result from management actions associated with soils, water resources, special status species habitat, woodlands and old-growth forest, fish and wildlife areas, wild horses, cultural resources, visual resources, and recreation. They also result from management actions for areas where other mineral resources or operations are incompatible with oil, gas, or geothermal leasing and development, ACECs, national historic trails, and backcountry byways, as well as other restrictions associated with paleontological resources.

Stipulations would restrict the locations and sizes of surface disturbance allowed for oil, gas, and geothermal development in specific areas. As a result, the cost of extraction could increase, and the resource could be inaccessible in places due to technical reasons, such as if the resource were too far to reach with directional or horizontal drilling, thereby making some of the federal mineral estate effectively inaccessible.

Locatable Minerals

Under Alternative D, 1,300 acres would be recommended for withdrawal from the location of mining claims, thereby preventing the location of future mining claims. Combined with the additional 23,300 acres previously withdrawn, the availability of locatable minerals would be limited on 24,600 acres, or 2 percent of the mineral estate underlying BLM-administered lands (slightly more acres than under Alternative A). No mining claims would be affected by lands recommended for withdrawal under this alternative. The types of impacts would be the same as those described under Effects Common to All Alternatives.

The area with high gold potential along the Dolores River would not be withdrawn from future claiming under Alternative D. Permits for recreational mining could be approved, meaning users engaging in this activity would not be displaced.

Salable Minerals

Under Alternative D, 155,300 acres would be closed to the disposition of salable minerals (mineral materials) (40 percent fewer acres than under Alternative A). An additional 307,500 acres open to mineral material development would be subject to NSO stipulations under this alternative. Disposition of mineral materials requires surface mining, so NSO stipulations would effectively close these areas to mining mineral materials unless an exception were granted.

Much of the area would be covered by CSU and TL stipulations associated with soils, special status species habitats, wildlife emphasis areas, cultural resources, lands with wilderness characteristics, and ACECs, as well as other restrictions associated with paleontological resources. These stipulations would restrict the locations, sizes, and timing of surface disturbance allowed for potential future mining. The types of impacts would be the same as those described under

Effects Common to All Alternatives, but Alternative D, with its fewer stipulations, would be more flexible than Alternatives B and C.

General

The type and location of new ROWs granted in areas managed as VRM Class I or II could be limited because they would have to meet more stringent VRM objectives than new ROWs in areas managed as VRM Class III and IV. These impacts would occur over 291,300 acres managed as VRM Class I and II, the least of any action alternative.

Cumulative

The CIAA for locatable minerals, mineral materials, and non-energy leasable minerals is the GJFO planning area, regardless of land ownership. Impacts on mineral resources that are individually minor may cumulatively reduce exploration and production of commodities from BLM-administered lands. The BLM has no control over many of the factors that affect mineral extraction and prospecting. These factors include regulatory policy, public perception and concerns, transportation, well spacing, low commodity prices, taxes, and housing and other necessities for workers. Issues under BLM control are discussed earlier in this section, and most preclude the leasing or development of mineral resources or the additional costs to projects.

Coal exploration and development would continue under all alternatives on existing leases. However, new coal leases and development would be impacted from an increase in the amount of lands allocated as unacceptable for coal leasing and development. An increase in stipulations across all alternatives, specifically NSO stipulations, would reduce exploration and methane capture opportunities.

Potash exploration and mining would be limited under Alternatives B, C, and D. Most of the 2,800-acre potash development potential area, centered on the Sinbad Valley in the southwest corner of the planning area, would be closed to leasing of non-energy minerals or would be covered with an NSO stipulation. However, since the current RMP is silent on non-energy leasing decisions, all action alternatives would provide more opportunities for potash exploration and mining than would Alternative A.

Interest in domestic oil and gas exploration and development mirrors the swings in the mineral commodity prices. As the price increases, the development of existing leases increases, as well as the demand for new leases, even in areas with less development potential. Stipulations on oil and gas leasing would have a cumulative effect on the ability to develop these resources. As interest in renewable energy development grows, the demand for geothermal leases is expected to increase.

Locatable mineral development is an ongoing enterprise in the planning area and would continue under all alternatives. As prices for gold remain high,

exploration for gold is expected to increase. Mining for copper and silver would be impacted under Alternatives B and C because the center of the moderate copper and silver potential area would be withdrawn as part of designating the Sinbad Valley ACEC.

Salable mineral extraction and use is expected to increase, along with increasing mining activity, commercial development, recreation, and private property development, especially along the Interstate 70 and state highway corridors. As the amount of BLM-administered land available for disposition of salable materials is reduced from Alternative A (by 53 percent under Alternative B, 55 percent under Alternative C, and 37 percent under Alternative D), demand for salable minerals would increase in other areas.

Mineral exploration and development would continue to occur under all alternatives. However, acreages open to exploration and development would vary by alternative. Overall, Alternative C would be the most restrictive to mineral development and could result in the greatest number of cumulative impacts. Alternative A would be the least restrictive to mineral development and could result in the fewest cumulative impacts.

4.5 SPECIAL DESIGNATIONS

This section is a description of the special designation areas in the GJFO planning area and follows the order of topics addressed in **Chapter 3**:

- Wilderness Study Areas
- Areas of Critical Environmental Concern
- Wild and Scenic Rivers
- National Trails
- National, State, and BLM byways

4.5.1 Wilderness Study Areas

This section discusses impacts on WSAs from proposed management actions of other resources and resource uses. Existing conditions concerning WSAs are described in **Section 3.4.1**, Wilderness Study Areas. The size and number of WSAs would be the same under all alternatives and is described in **Table 2-1**.

Methods of Analysis

Indicators of impacts on WSAs include the following:

- Potential changes in wilderness characteristics (naturally appearing, opportunities for solitude or primitive and unconfined recreation, and unique or supplemental values) within the WSAs
  - Naturally Appearing—Status of native biological communities; abundance and distribution of nonindigenous species; AUMs of livestock use inside the WSA

  - Opportunities for Solitude or Primitive and Unconfined Recreation—Amount of visitor use; area of WSA affected by travel routes; type and number of agency provided and user-created recreation facilities; type and extent of management restrictions
  - Unique and Supplemental Values—Severity of disturbances to cultural resources; status of indigenous species that are listed or that are candidates for listing as threatened or endangered

Impacts on the wilderness characteristics of untrammeled, natural, and undeveloped appearance, opportunities for solitude or primitive and unconfined recreation, and unique or supplemental values are considered in this analysis.

The analysis includes the following assumptions:

- The BLM will continue to manage WSAs in the planning area according to BLM Manual 6330, Management of Wilderness Study Areas (BLM 2012i) until Congress either designates or releases all or portions of the WSAs from further consideration.
- Management of WSAs is subject to valid existing rights and grandfathered uses under all alternatives, as consistent with BLM Manual 6330.
- Actions that will "impair the suitability of WSAs for preservation as wilderness" will not be permitted unless they were to meet one of the following exception criteria described in BLM Manual 6330, Management of Wilderness Study Areas (BLM 2012i):
  - Emergencies, such as suppression activities associated with wildfire or search and rescue operations
  - Reclamation activities designed to minimize impacts on wilderness values created by Interim Management Policy violations and emergencies
  - Uses and facilities that are considered grandfathered or valid existing rights under the Interim Management Policy
  - Uses and facilities that clearly protect or enhance the land's wilderness values or that are the minimum necessary for public health and safety in the use and enjoyment of the wilderness values
  - Reclamation of pre-FLPMA impacts
- All activities approved in a WSA will be closely managed to ensure that it will not impair the area's wilderness characteristics and therefore its suitability for designation as wilderness. Preservation of wilderness characteristics within a WSA is paramount and should be

the primary consideration when evaluating any proposed action or use.

- Impacts on wilderness and WSAs from implementing management actions for other resources, resource uses, and special designations will be considered negligible. Allowable uses in WSAs are permitted if they meet the "nonimpairment" standard.
- Implementation-level activities within wilderness and WSAs will be evaluated on a case-by-case basis to determine how the activity would impact the wilderness characteristics; actions may enhance wilderness characteristics or may be detrimental to wilderness characteristics.
- WSAs, if released by Congress, will still contain wilderness characteristics, and BLM management could impact those characteristics.

Effects Common to All Alternatives

Effects of Wilderness Study Areas Management

Because the BLM would not permit any actions that impair a WSA's wilderness characteristics, such impacts would only occur from activities associated with valid existing rights or grandfathered uses. There may be indirect impacts from management of other resources that would enhance wilderness characteristics; however, such impacts are generally negligible because protections are not as strict as those afforded to WSAs, in accordance with BLM Manual 6330, Management of Wilderness Study Areas (BLM 2012i).

The oil, gas, and coal leases in Demaree Canyon and Little Book Cliffs WSAs (described in **Section 3.4.1**) are considered valid existing rights and have existing structures (including access roads, drill pads, wells, and pipeline gathering systems). The mineral rights and structures exist even though they can compromise wilderness characteristics, especially during minerals extraction. BLM Manual 6330, Management of Wilderness Study Areas (BLM 2012i) states that mining and mineral leasing uses can continue in the manner and to the degree in which these uses were being conducted at the time FLPMA was passed, as long as they do not cause unnecessary or undue degradation of the lands. While this clause allows for a natural progression of development, new impacts cannot be of a significantly different type than the impacts involved with the pre-FLPMA activity. Depending on the location of mineral extraction sites throughout the WSAs, impacts could be localized if production areas were concentrated, or impacts could be more widespread if sites of active production were dispersed throughout the WSA. Regarding coal extraction, the severity of impact on wilderness characteristics would depend on whether mines were surface or subsurface. In subsurface mining, values impacted could include undeveloped values and opportunities for solitude (when mining is active),

whereas wilderness characteristics and unconfined recreation would be affected with surface mining.

Mining claims are next to the Sewemup Mesa WSA boundary. If developed, associated activities could impact visitors' perceptions if the activities were visible from within the WSA. The nearness of the land with compromised wilderness characteristics and recreation values would in turn affect the perception of similar values within the Sewemup Mesa WSA, particularly opportunities for solitude and scenic and ecological values.

A recent proposal was submitted to the BLM for potash exploration next to the Sewemup Mesa WSA boundary. If potash were discovered, activities associated with its development could be incompatible with the protection of wilderness character in the WSA. These characteristics would be perceived as degraded, particularly opportunities for solitude and scenic and ecological values.

Existing range improvements constitute a valid existing right and would continue to be maintained. Structures may diminish the undeveloped characteristics of WSAs. Grazing itself would continue in the same manner and at the same degree of physical and visual impacts that existed at the time of the passage of FLPMA; cattle grazing may impact the untrammeled characteristic of the WSAs.

Changes in grazing may be allowed in number, kind, or season of use if, following the preparation of an environmental assessment (if not adequately addressed in an existing NEPA document), the effects were found to be negligible (BLM 2012i). Livestock grazing is considered a valid existing right in all WSAs, except Sewemup Mesa and Little Book Cliffs, which is in the LBCWHR. Structures used for grazing, such as fences, stock trails, springs, and stock ponds, exist in these areas, with human-made stock ponds being widespread throughout the grazing allotments.

Wild horse grazing within the LBCWHR could impact various wilderness characteristics. This is because grazing and other activities of horses could degrade the landscape, thereby potentially impacting the naturalness and untrammeled nature of the Little Book Cliffs WSA. Ultimately, the BLM would strive to minimize the impacts on relevant wilderness characteristics through proper management of the wild horse population.

The Palisade WSA has seen an increase in recreational rock climbing in a small area due to the use of one permit for guided climbing trips into the area. While some climbers have expressed interest in adding permanent climbing bolts in the WSA (which could impact wilderness characteristics), the area is used mostly by the permittee, and public interest for climbing in the area remains low.

Stipulations, closures, and exclusion areas implemented to protect soil resources may indirectly improve the naturalness of WSAs. The protection of

soil resources outside of WSAs or lands with wilderness characteristics (described in **Section 4.3.12**) would in turn lead to heightened wilderness characteristics for any existing WSA. Stipulations, closures, and exclusion areas could have the same effect on water resources via the lack of interference with hydrologic processes.

In WSAs, all fire and seeding treatments would have to conform to Interim Management Policy; therefore, impacts on WSAs would likely be negligible.

Managing all WSAs as VRM Class I contributes to the protection of the wilderness characteristics of untrammeled and natural appearance. All WSAs would be managed as ROW exclusion areas, which would help preserve the wilderness characteristics of the WSAs. The BLM would consider the acquisition of lands within or next to WSAs in order to enhance wilderness characteristics.

WSAs are closed to fluid mineral leasing and have an NSO stipulation. These restrictions would help protect all wilderness characteristics. The Demaree and Little Book Cliffs WSAs are closed to coal leasing, which further protects wilderness characteristics. Sewemup Mesa and the Palisade WSAs are not within the coal potential area, so impacts from coal are null in these WSAs.

Effects of Management Should Congress Release WSAs from Wilderness Consideration
This section discusses the effects of managing released WSA lands on wilderness characteristics. Effects of managing released WSA lands on other resources and resource uses are discussed in general within those other resource and resource use sections of this chapter.

Closing released WSA lands to public motorized use, not including administrative use (e.g., motorized use associated with grandfathered uses and valid existing rights, such as livestock grazing permittees), would protect the wilderness characteristics. This would be accomplished by restricting activities that could impact natural and untrammeled appearance and opportunities for solitude and primitive/unconfined recreation.

There is the potential for degradation of wilderness characteristics of released WSA lands from motorized and mechanized travel on designated routes. Such travel could impact natural and untrammeled appearance and opportunities for solitude and primitive and unconfined recreation.

Closing released WSA lands to wood product sales and harvest (including Christmas tree harvest) would minimize impacts on wilderness characteristics. Opening released WSA lands to wood product sales and harvest could diminish opportunities for solitude and degrade scenic and ecological values.

Prohibiting issuance of SRPs for competitive events would result in visitor numbers and noise likely remaining at low levels, and the retention of

naturalness, solitude, and opportunities for primitive and unconfined recreation. Issuing SRPs for competitive events on released WSA lands would have the opposite effect because high concentrations of recreation users (large groups or frequent group encounters) would decrease outstanding opportunities for solitude.

Managing released WSA lands as ROW exclusion areas would help preserve all wilderness characteristics of those lands. Managing released WSA lands as ROW avoidance areas would have the same effect on those lands where ROWs are not developed.

Closing released WSA lands to mineral material disposal, non-energy leasable mineral exploration and development, coal leasing, and fluid mineral leasing and geophysical exploration would help protect all wilderness characteristics. Opening released WSA lands to any of these uses would diminish opportunities for solitude and could degrade scenic and ecological values. All WSAs in the planning area are located in areas of low to no development potential for oil and gas and moderate to no development potential for coalbed natural gas. Parts of the Little Book Cliffs and Demaree Canyon WSAs, however, may be available for coal development, as they are located within the coal potential area. Such development would diminish opportunities for solitude and could degrade scenic and ecological values.

Applying NSO stipulations and prohibiting surface-disturbing activities and new developments on released WSA lands would protect naturalness.

Managing released WSA lands as VRM Class I would contribute to the protection of the wilderness characteristics of untrammeled and natural appearance. Managing released WSA lands as VRM Class II or III would allow some modifications to the landscape that could impair the naturalness of the area.

If released by Congress from consideration as a WSA, stipulations, closures, and exclusion areas implemented to protect soil resources may indirectly improve the naturalness of the released lands. If a WSA were released from its WSA status and changed to Wilderness designation or as a land with wilderness characteristics unit managed to protect wilderness characteristics, then management would follow the appropriate management prescriptions. In either case, the protection of soil resources outside of WSAs, Wilderness Areas, or lands with wilderness characteristics (described in **Section 4.3.12**) would in turn lead to heightened wilderness characteristics for any existing WSA or related designation. Stipulations, closures, and exclusion areas could have the same effect on water resources via the lack of interference with hydrologic processes.

Implementing management for the following resources would have negligible or no impact on WSAs and are therefore not discussed in detail: forestry;

recreation; national trails; national, state, and BLM byways; and interpretation and environmental education.

Alternative A

Effects of Wilderness Study Areas Management
Alternative A would allow resource uses in WSAs that maintain each area's suitability for preservation as wilderness and protects the viability of current wilderness characteristics.

Regarding travel management, there is the potential for degradation of wilderness characteristics in WSAs from motorized and mechanized travel on existing ways. Such travel could impact natural and untrammeled appearance and opportunities for solitude and primitive/unconfined recreation.

Effects of Management Should Congress Release WSAs from Wilderness Consideration
The purpose of **Table 4-61**, Impacts on Released Wilderness Study Area Lands by Alternative, is to summarize by alternative the various management actions that would result in each WSA should it be released.

If Congress were to release the Little Book Cliffs WSA from wilderness consideration, then managing lands under the 1987 RMP would include the prescriptions summarized in **Table 4-61**. Opening released Little Book Cliffs WSA lands to all modes of travel would degrade wilderness characteristics. Such travel would impact natural and untrammeled appearance and opportunities for solitude and primitive and unconfined recreation.

Table 4-61
Impacts on Released Wilderness Study Area Lands by Alternative[1]

Management Action	Alternative A				Alternative B				Alternative C				Alternative D			
	S	D	P	L	S	D	P	L	S	D	P	L	S	D	P	L
Close to public motorized use	S		P[2]		S		P		S	D	P	L[3]				
Close to public mechanized use					S				S	D	P	L[3]				
Seasonally close to public motorized use		D[2]		L[2]												
Limit public motorized use to designated routes			P[2]	L[2]		D		L				L[4]	S	D	P	L
Limit public mechanized use to designated routes			P[2]			D	P	L[3]					S	D	P	L[3]
Limit public motorized use to existing routes		D[2]	P[2]													
Open to all modes of travel				L[2]												

Table 4-61
Impacts on Released Wilderness Study Area Lands by Alternative[1]

Management Action	Alternative A				Alternative B				Alternative C				Alternative D			
	S	D	P	L	S	D	P	L	S	D	P	L	S	D	P	L
Consider SRPs for competitive events	S	D	P	L		D		L[3]					S	D	P	L[3]
Prohibit SRPs for competitive events					S		P		S	D	P	L[3]				
Open to wood product sales and harvest						D	P	L[3]						D		L[3]
Unsuitable for forest harvest (Alt. A)/ closed to wood product sales and harvest (Alts. B-D)	S	D	P	L	S				S	D	P	L[3]	S		P	
Sensitive to public utility development (Alt. A)/ ROW avoidance (Alts. B-D)	S[2]	D[2]	P[2]	L[2]		D	P	L					S	D	P	L
Unsuitable for public utilities (Alt. A)/ROW exclusion (Alts. B-D)	S[2]	D[2]	P[2]	L[2]	S				S	D	P	L				
Open to mineral material sales		D[2]		L[2]		D	P	L[3]					S	D		L[3]
Close to mineral material sales	S	D[2]	P	L[2]	S				S	D	P	L[3]			P	
Open to non-energy leasable minerals						D	P	L[3]					S	D	P	L[3]
Close to non-energy leasable minerals					S				S	D	P	L[3]				
VRM Class I	S		P[2]													
VRM Class II			P[2]	L[2]	S	D	P		S	D	P	L[3]			P	
VRM Class III		D[2]	P[2]	L[2]		D		L[3]					S	D		L[3]
VRM undesignated		D[2]		L[2]												
Open to fluid mineral leasing						D		L[3]					S	D	P	L[3]
Close to fluid mineral leasing	S	D	P	L	S		P		S	D	P	L				
Subject to no surface occupancy and no surface-disturbing activities stipulation					S		P	L	S	D	P	L			P	

[1]S=Sewemup Mesa WSA (17,800 acres); D=Demaree Canyon WSA (22,700 acres); P=The Palisade WSA (26,700 acres); L=Little Book Cliffs WSA (29,300 acres)
[2]This action would apply to only a portion of the noted WSA lands if released.
[3]This action would apply to only that portion of the Little Book Cliffs WSA lands, if released, that are outside the LBCWHR (6,500 acres).
[4]This action would apply to only that portion of the Little Book Cliffs WSA lands, if released, that are within the LBCWHR (22,800 acres).

Under Alternative A, if Congress were to release any of the four WSAs from wilderness consideration, wilderness characteristics would not be preserved for the long term, and any wilderness characteristics would only be protected indirectly from other resource management.

Alternative B

Effects of Wilderness Study Areas Management

Lands managed for wilderness characteristics, where they are next to WSAs, could create additional protection for WSAs because the management for the areas is similar. A wider expanse of contiguous land containing WSAs and lands managed for wilderness characteristics could therefore heighten protection within WSAs and could further ensure the integrity of wilderness characteristics. Under Alternative B, The Palisade would be contiguous with the West Creek (adjacent) lands with wilderness characteristics inventory unit.

Wilderness study areas would be closed to motorized use, except for administrative use, including routes associated with grandfathered uses and valid existing rights. Closing WSAs to motorized use would protect the wilderness characteristics in these areas by restricting activities that could impact natural and untrammeled appearance and opportunities for solitude and primitive and unconfined recreation.

The mileages of routes are proposed to be designated administrative-only or closed based upon WSA planning criteria are shown in **Table 4-62**.

Table 4-62
Route Designations and Wilderness Study Area Planning Criteria under Alternative B

Planning Criteria	Final Designation Administrative Use (miles)	Final Designation Closed (miles)	Total miles designated as Administrative Use or Closed
WSA	5.3	22.3	27.6

Source: BLM 2010a

Closing WSAs to wilding permits would force those users to look elsewhere for similar opportunities, but it would also protect wilderness characteristics by eliminating disturbances from this activity.

If Congress were to release any WSAs, except for the Little Book Cliffs WSA, from wilderness consideration, the lands may still receive some protection by being managed according to management prescriptions for lands with wilderness characteristics (see **Section 4.3.12**). If Congress were to release the Little Book Cliffs WSA from wilderness consideration, it would be managed as part of and in accordance with the LBCWHR (see **Section 4.3.7**, Wild Horses).

Effects of Management Should Congress Release WSAs from Wilderness Consideration
Impacts are summarized in **Table 4-61**.

Under Alternative B, if Congress were to release the Sewemup Mesa WSA from wilderness consideration, wilderness characteristics would be preserved for the long term.

If Congress were to release the Little Book Cliffs WSA from wilderness consideration, then that portion overlapping the LBCWHR (22,800 acres) would be managed as part of and in accordance with the Alternative B LBCWHR management prescriptions (see **Table 4-64** and **Section 4.3.7**, Wild Horses). In that portion, the wilderness characteristics of unique and supplemental values would be preserved for the long term. However, the natural and untrammeled appearance and opportunities for solitude and primitive/unconfined recreation could be degraded on that portion overlapping the LBCWHR because motorized travel would be limited to designated routes.

The remainder of the Little Book Cliffs WSA not overlapping the LBCWHR (6,500 acres), if released, would be managed per the prescriptions summarized in **Table 4-61**. On these 6,500 acres, wilderness characteristics would be preserved for the long term.

If Congress were to release Demaree Canyon WSA from wilderness consideration, it would be managed per the prescriptions summarized in **Table 4-61**. Wilderness characteristics would not be preserved for the long term. Any wilderness characteristics would be protected only indirectly by other resource management.

If Congress were to release The Palisade WSA from wilderness consideration, it would be managed per the prescriptions summarized in **Table 4-61**. Wilderness characteristics could be indirectly preserved for the long term by prescriptions associated with The Palisade ACEC.

Alternative C

Effects of Wilderness Study Areas Management
The types of impacts from management of lands with wilderness characteristics would be the same as those described under Alternative B.

Effects of Management Should Congress Release WSAs from Wilderness Consideration
Impacts are summarized in **Table 4-61**.

Under Alternative C, if Congress were to release Sewemup Mesa, Demaree Canyon, or The Palisade WSAs from wilderness consideration, wilderness characteristics would be preserved for the long term.

Closing WSAs to wilding permits would force those users to look elsewhere for similar opportunities, but it would also protect wilderness characteristics by eliminating disturbances from this activity.

If Congress were to release the Little Book Cliffs WSA from wilderness consideration, then that portion overlapping the LBCWHR (22,800 acres) would be managed as part of and in accordance with the Alternative C LBCWHR management prescriptions (see **Table 4-61** and **Section 4.3.7**, Wild Horses). As under Alternative B, in that portion, the wilderness characteristics of unique and supplemental values would be preserved for the long term. However, the natural and untrammeled appearance and opportunities for solitude and primitive and unconfined recreation could be degraded on that portion overlapping the LBCWHR because motorized travel would be limited to designated routes.

The remainder of the Little Book Cliffs WSA not overlapping the LBCWHR (6,500 acres), if released, would be managed in accordance with the prescriptions summarized in **Table 4-61**. On these 6,500 acres, wilderness characteristics would be preserved for the long term.

Alternative D

Effects of Wilderness Study Areas Management
Under Alternative D, there are no lands managed for wilderness characteristics contiguous with any existing WSAs. Impacts would be similar to those described under Alternative A.

Closing WSAs to wilding permits would force those users to look elsewhere for similar opportunities, but it would also protect wilderness characteristics by eliminating disturbances from this activity.

Under Alternative D, WSAs would be closed to motorized and mechanized use, and the same management prescriptions and impacts from comprehensive travel and transportation management would apply as described under Alternative B.

Effects of Management Should Congress Release WSAs from Wilderness Consideration
Impacts are summarized in **Table 4-61**.

Under Alternative D, if Congress were to release the Sewemup Mesa or Demaree Canyon WSAs from wilderness consideration, wilderness characteristics would not be preserved for the long term. Any wilderness characteristics would be protected only indirectly from other resource management.

If Congress were to release the Little Book Cliffs WSA from wilderness consideration, then that portion overlapping the LBCWHR (22,800 acres) would be managed as part of and in accordance with the Alternative D

LBCWHR management prescriptions (see **Table 4-61** and **Section 4.3.7**, Wild Horses). The remainder of the Little Book Cliffs WSA not overlapping the LBCWHR (6,500 acres), if released, would be managed in accordance with the prescriptions summarized in **Table 4-61**. On all released Little Book Cliffs WSA lands, the wilderness characteristics of unique and supplemental values would likely be preserved for the long term. However, the natural and untrammeled appearance and opportunities for solitude and primitive and unconfined recreation could be degraded because motorized travel would be limited to designated routes.

If Congress were to release The Palisade WSA from wilderness consideration, wilderness characteristics could be indirectly preserved for the long term by prescriptions associated with The Palisade ACEC.

Cumulative

Montrose County has a Colorado RS 2477 claim to improve an old route that runs along the western boundary of Sewemup Mesa WSA. This improved access route, coupled with an overall increase in use in the Gateway area, could lead to an increase in visitation to this area, which could impact wilderness characteristics.

4.5.2 Areas of Critical Environmental Concern

This section discusses impacts on ACECs from proposed management actions of other resources and resource uses. Existing conditions concerning ACECs are described in **Section 3.4.2**, Areas of Critical Environmental Concern.

Interdisciplinary team meetings were held to discuss citizen ACEC nominations and the effectiveness of current ACEC management areas. The discussions of those meetings are described in **Appendix D**, Summary of Areas of Critical Environmental Concern Report on the Application of Relevance and Importance Criteria, and were used in this analysis.

Methods of Analysis

Impacts identified for ACECs are specific to the area and are based on the effect management actions would have on the relevant and important values of an ACEC, which are identified in **Appendix D**.

Impacts on ACECs include the following:

- Impacts would occur if management actions that fail to "prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards" (BLM Manual 1613, Areas of Critical Environmental Concern) (BLM 1988).

The analysis includes the assumption that although management actions for most resources and resource uses have field-office-wide application, ACEC

management prescriptions apply only to those lands within each specific ACEC, as outlined.

Effects Common to All Alternatives

The acreage designated as ACECs under each alternative would be directly correlated with the extent of resources afforded protection throughout the decision area. As such, the more acreage that is designated as an ACEC, the more resources that would be protected.

In general, management actions that protect resources, such as improvements in water quality and quantity, surface disturbance restrictions, management for desired plant communities and habitats, travel restrictions and closures, and recreation restrictions, would help maintain and improve the important and relevant values within ACECs. Impacts would vary depending on the ACEC and the values that would be affected.

In all ACECs, the BLM would implement restrictions on surface-disturbing activities, such as requiring NSO stipulations, closure to fluid mineral leasing, and travel and recreation restrictions. These would help protect and prevent damage to the important and relevant values each ACEC was designated to protect. ACECs that overlap with WSAs would receive additional protection from restrictions within WSAs, such as closure to fluid mineral, geothermal, and oil shale leasing, until Congress either designates the WSAs as wilderness or releases them from wilderness consideration. Under all alternatives, exclosures associated with the hydrologic study area within the Badger Wash ACEC would directly protect the important and relevant values from surface disturbance, as large areas are permanently fenced.

Weed treatments within ACECs (such as tamarisk removal along waterways) would cause short-term degradation of certain resources due to increased likelihood of soil erosion and sedimentation and removal of stream shading vegetation. Over the long term, these treatments would improve the relevant and important biological values within ACECs.

Fish and wildlife, special status species, and cultural resources protections would apply within ACECs and would complement protections within these areas and prevent degradation of ACEC values.

Depending on their extent, location, and severity, wildfires could cause short- and long-term damage to ACEC values through habitat removal, changes to the visual landscape, sedimentation of waterways, increased likelihood of weed invasion and conversion to cheatgrass. ESR techniques would be applied to minimize impacts.

Grazing would be allowed in most ACECs, depending upon the location and alternative. If mismanaged, overgrazing could damage the resources an ACEC was designated to protect through trampling and weed spread, thus degrading

habitats and scenic values. Adaptive management would be used to adjust grazing to reduce impacts.

Travel, particularly motorized travel, and utility development within ACECs could cause impacts on ACEC values. Impacts could include flattening or removal of vegetation, desired plant communities, and special status plant species, habitat degradation and fragmentation, weed spread, degradation of scenic resources, damage to cultural or geologic resources, and increased noise. Impacts would be reduced where travel routes are closed or seasonally closed to motorized use, limited to designated routes, or where lands are managed as ROW avoidance or exclusion areas.

Designation of special management areas or management of lands for wilderness characteristics that overlap or lie adjacent to ACECs may also provide some protection of ACEC values due to complementary management objectives.

Quantitative impacts associated with ACECs are shown in **Table 4-63**, Acreage Impacts on Areas of Critical Environmental Concern.

Table 4-63
Acreage Impacts on Areas of Critical Environmental Concern

Resource or Resource Use	Alt A	Alt B	Alt C	Alt D
ACECs	28,900	123,000	168,000	33,200
Livestock Grazing				
Open for Livestock Grazing	26,700	111,100	75,800	30,200
Closed to Livestock Grazing	0	5,700	74,300	1,300
Comprehensive Travel and Transportation Management				
Closed to Motorized Use	6,100	34,100	118,700	30,200
Motorized Use Limited to Existing Routes	100	0	0	0
Motorized Use Limited to Designated Routes	22,600	86,400	49,100	3,000
Open to Intensive Motorized Travel	0	0	0	0
Closed to Mechanized Travel		34,100	116,400	27,900
Limited to Designated Routes for Mechanized Travel		86,400	51,400	5,300
Open to Cross-country Mechanized Travel	0	0	0	0
Closed to Horse Travel	1,300	1,300	1,300	1,300
Limited to Designated Routes for Horse Travel		0	2,300	2,300
Open to Cross-country Horse Travel		122,100	164,200	29,600
Closed to Foot Travel	0	1,300	1,300	0
Limited to Designated Routes for Foot Travel		0	2,300	2,300
Open to Cross-country Foot Travel		122,100	164,200	30,900
Lands and Realty				
ROW exclusion areas	16,600	70,900	100,400	32,400
ROW avoidance areas	9,600	52,100	67,400	400
Fluid Mineral Leasing				
Closed to Fluid Mineral Leasing	1,400	52,800	166,000	26,700
NSO	27,400	113,900	168,000	33,200
CSU	1,500	57,900	67,400	5,400
TL	4,900	51,400	71,500	20,000

Source: BLM 2010a

Implementing management for the following resources would have negligible or no impact on ACECs and are therefore not discussed in detail: air quality; wild horses; paleontology; visual resources; national trails; national, state, and BLM byways; Native American tribal uses; public health and safety; socioeconomics; or environmental justice.

Alternative A

Under Alternative A, GJFO would continue to manage five ACECs on 28,900 acres. Impacts would be similar to those described for Effects Common to All Alternatives.

Some restrictions would continue to be applied within ACECs, although management would rely on outdated guidance and may not fully reflect current conditions and issues.

While areas with high cultural or wildlife value would be unsuitable for forestry under this alternative, some impacts from forestry within ACECs would continue to occur since forestry management would not be stringent enough to prevent these impacts.

Under Alternative A, 26,700 acres (93 percent) of ACECs would continue to be open, and 0 acres would be closed to grazing. Impacts from grazing would be similar to those described for Effects Common to All Alternatives.

The potential for recreation-related impacts would continue where the Rough Canyon ACEC overlaps with the Bangs Canyon SRMA. The overlapping RMZ would continue to be focused to support the ACEC, which would minimize impacts. If impacts occurred, the BLM would change management within the SRMA to help protect the values for which the ACEC was designated.

Under Alternative A, motorized use would continue to be closed on 6,100 acres (22 percent) and limited to designated or existing routes on 22,600 acres (78 percent). As under all alternatives, no ACECs would be open to intensive use. The types of impacts on ACEC values, as described for Effects Common to All Alternatives, would be reduced or minimized.

ROW exclusion areas would be identified within 16,600 acres (57 percent) of ACECs. In addition, ROW avoidance areas would be identified within 9,600 acres (33 percent) of ACECs. In these areas, impacts on ACEC values described for Effects Common to All Alternatives would be avoided or minimized. Utility development in areas not identified for avoidance or exclusion would continue to cause impacts as described for Effects Common to All Alternatives.

NSO, CSU, and TL stipulations within ACECs are presented in **Table 4-63**. Under Alternative A, 27,400 acres (95 percent) of ACECs would continue to be open to fluid mineral leasing with an NSO stipulation applied. The Unaweep Seep ACEC (80 acres) (less than 1 percent) would be closed to fluid mineral

leasing. These restrictions would protect ACEC values from surface disturbance in these areas.

While only a small portion of the areas found to have relevant and important scenic values would be designated as an ACEC, 49 percent of all areas found to have relevant and important scenic values, regardless of ACEC designation, would still be managed as VRM Class I or II, which would help maintain the scenic quality and sensitive landscapes of the areas. However the remaining 51 percent of lands found to have relevant and important scenic values would be managed as VRM Class III (34 percent) or would not have an assigned VRM classification (17 percent), which could result in an impact to the visual quality of the areas or allow landscape modifications in sensitive landscapes that would attract the attention of the casual observer.

Lack of interpretation or environmental education under Alternative A would continue to result in user actions that could degrade ACEC values.

Alternative B

Under Alternative B, 13 ACECs on 123,000 acres (4.2 times more acres than under Alternative A) would be designated. Impacts would be similar to those described for Effects Common to All Alternatives.

Under Alternative B, 111,100 acres (95 percent) of ACECs would be open, and 5,700 acres (5 percent) would be closed to grazing. Impacts from grazing would be similar to those described for Effects Common to All Alternatives.

Impacts from recreation-related impacts would be similar to those described for Alternative A. In addition, the Dolores River Riparian ACEC and Juanita Arch ACEC overlap with the Dolores River Canyon SRMA. The overlapping areas would be focused to support the ACECs, which would minimize impacts. If impacts occurred, the BLM would change management within the SRMA to protect the values for which the ACECs were designated.

Under Alternative B, motorized use in ACECs would be prohibited on 34,100 acres (28 percent) and limited to designated routes or seasonally closed on 86,400 acres (70 percent). Seasonal closures would also apply to mechanized travel, affording another level of protection during sensitive times of year. As under all other alternatives, no acres within ACECs would be open to intensive use. Pyramid Rock ACEC (1,300 acres) would be closed to equestrian use and foot travel, further reducing travel-related impacts in that area. The types of impacts on ACEC values from comprehensive travel and transportation management, as described for Effects Common to All Alternatives, would be reduced or minimized.

The mileages of routes are proposed to be designated administrative-only or closed based upon ACEC planning criteria are shown in **Table 4-64**.

Table 4-64
Route Designations and ACEC Planning Criteria under Alternative B

Planning Criteria	Final Designation Administrative Use (miles)	Final Designation Closed (miles)	Total miles designated as Administrative Use or Closed
ACEC	37.7	55.3	93

Source: BLM 2010a

Closing WSAs to wilding permits would force those users to look elsewhere for similar opportunities, but it would also protect wilderness characteristics by eliminating disturbances from this activity.

ROW exclusion areas would be identified within 70,900 acres (58 percent) of ACECs, and ROW avoidance areas would be identified within 52,100 acres (42 percent). In these areas, impacts on ACEC values from utility development, as described for Effects Common to All Alternatives, would be avoided or minimized. Utility development in areas not identified for avoidance or exclusion would cause impacts as described for Effects Common to All Alternatives.

BLM would consider acquisition of lands within or adjacent to ACECs, which could provide for more contiguous BLM-administered land, prevent encroachment of private development, and enhance the relevant and important values for which the ACEC was designated.

The Pyramid Rock ACEC, located within the coal resource development potential area, would be identified as unacceptable for further consideration of coal leasing and development, eliminating opportunities for coal development to impact values relevant and important values for which the ACEC was designated.

NSO, CSU, and TL stipulations within ACECs are presented in **Table 4-63**. In addition, 52,800 acres (43 percent) of ACECs (including Badger Wash, Dolores River Riparian, Juanita Arch, The Palisade, Rough Canyon, and Sinbad Valley) would be closed to fluid mineral leasing under Alternative B to protect the areas' important and relevant values by prohibiting surface disturbing activities in these areas. Surface-disturbing activities within the Roan and Carr Creeks would be subject to a CSU stipulation, while an NSO stipulation would apply to Sage-Grouse leks, nesting, and early brood-rearing habitat. Together, these two stipulations would protect relevant and important values of the ACEC by restricting or prohibiting activities that could compromise unique riparian habitats, genetically pure populations of cutthroat trout, and Greater Sage-Grouse habitat.

While only a small portion of the areas found to have relevant and important scenic values would be designated as an ACEC, 99 percent of all areas found to have relevant and important scenic values, regardless of ACEC designation,

would still be managed as VRM Class I or II, which would help maintain the scenic quality and sensitive landscapes of the areas (the only exception is a 300-acre portion of the Dolores River Riparian ACEC which would be managed as VRM Class III).

Enhanced awareness and appreciation of ACEC values resulting from interpretation and environmental education under Alternative B could result in user actions that would protect ACEC values.

Master Leasing Plan

Approximately 70,500 acres of ACECs are within the Shale Ridges and Canyons MLP analysis area. Under the Proposed RMP (Alternative B), protection would be afforded each ACEC's relevant and important criteria by applying COAs and stipulations to restrict surface occupancy and surface-disturbing activities. For example, all ACECs except for Roan and Carr Creeks ACEC would be protected by an NSO leasing stipulation that would preclude any surface occupation or surface-disturbing activity on new leases. Roan and Carr Creeks ACEC would be protected by a CSU stipulation that would limit surface-disturbing activities to certain locations that would not degrade relevant and important criteria in the ACEC.

Alternative C

Under Alternative C, 23 ACECs on 168,000 acres (5.8 times more acres than under Alternative A) would be designated. Impacts from recreation, land acquisition, and environmental education would be similar to those described for Alternative B.

Under Alternative C, 75,800 acres (45 percent) of ACECs would be open to grazing and 74,300 acres (44 percent) would be closed to grazing. Impacts from grazing would be similar to those described for Effects Common to All Alternatives.

The Rough Canyon ACEC would overlap with the Bangs SRMA, and the overlapping RMZ would be focused to support the ACEC, which would minimize impacts. If impacts occurred, the BLM would change management within the SRMAs to protect the values for which the ACECs were designated.

Under Alternative C, motorized use would be closed on 118,900 acres (71 percent) and limited to designated routes or seasonally closed on 49,100 acres (30 percent). Seasonal closures would also apply to mechanized travel, affording another level of protection during sensitive times of year. As under all alternatives, no areas would be open to intensive motorized use. Pyramid Rock ACEC (1,300 acres) would be closed to all modes of travel, further reducing travel-related impacts in that area. The types of impacts on ACEC values from comprehensive travel and transportation management, as described for Effects Common to All Alternatives, would be reduced or minimized.

ROW exclusion areas would be identified within 100,400 acres (60 percent) of ACECs, and ROW avoidance areas would be identified within 67,400 acres (40 percent). In these areas, impacts on ACEC values from utility development, as described for Effects Common to All Alternatives, would be avoided or minimized.

NSO, CSU, and TL stipulations within ACECs are presented in **Table 4-63**. In addition, 166,000 acres (99 percent) of ACECs would be closed to fluid mineral leasing under Alternative C. These management actions would protect ACEC values from surface disturbance in these areas.

Enhanced awareness and appreciation of ACEC values resulting from interpretation and environmental education under Alternative C could result in user actions that would protect ACEC values.

Alternative D

Under Alternative D, five ACECs would continue to be designated, though the total acreage of these ACECs would increase to 33,200 acres (15 percent more acres than under Alternative A). Impacts from recreation, land acquisition, and environmental education would be similar to those described for Alternative B.

Under Alternative D, 30,200 acres (91 percent) of ACECs would be open, and 1,300 acres (4 percent) would be closed to grazing. Impacts from grazing would be similar to those described for Effects Common to All Alternatives.

For this alternative, the Rough Canyon ACEC would overlap with the Bangs SRMA. Impacts would be similar to those described for Alternative A.

Under Alternative D, motorized use would be prohibited on 30,200 acres (91 percent) and limited to designated routes on 3,000 acres (9 percent). As under all other alternatives, 0 acres would be open to cross-country motorized use. Pyramid Rock ACEC (1,300 acres) would be open only to foot travel, further reducing travel-related impacts in that area. No ACECs would be closed to cross-country foot travel. The types of impacts on ACEC values from comprehensive travel and transportation management, as described for Effects Common to All Alternatives, would be reduced or minimized.

ROW exclusion areas would be identified within 32,400 acres (98 percent) of ACECs, and ROW avoidance areas would be identified within 400 acres (1 percent). In these areas, impacts on ACEC values from utility development, as described for Effects Common to All Alternatives would be avoided or minimized. Utility development in areas not identified for avoidance or exclusion would cause impacts as described for Effects Common to All Alternatives.

NSO, CSU, and TL stipulations within ACECs are presented in **Table 4-63**. In addition, 26,700 acres (80 percent) of ACECs would be closed to fluid mineral

leasing under Alternative D. These management actions would protect ACEC values from surface disturbance in these areas.

While only a small portion of the areas found to have relevant and important scenic values would be designated as an ACEC, 46 percent of all areas found to have relevant and important scenic values, regardless of ACEC designation, would still be managed as VRM Class I or II, which would help maintain the scenic quality and sensitive landscapes of the areas. However the remaining 54 percent of lands found to have relevant and important scenic values would be managed as VRM Class III (24 percent) or IV (30 percent), which could result in an impact to the visual quality of the areas or allow landscape modifications in sensitive landscapes that would attract the attention of the casual observer. Alternative D provides the least amount of protection for lands found to have relevant and important scenic values.

Enhanced awareness and appreciation of ACEC values resulting from interpretation and environmental education under Alternative D could result in user actions that would protect ACEC values.

Cumulative

Cumulative impacts on ACECs under the Proposed RMP (Alternative B) and alternatives could result from non-BLM actions and decision on lands adjacent to ACECs. While protections exist within ACECs, population growth, development, and recreation throughout the planning area may, over time, encroach upon these areas, causing potential degradation of the important and relevant resources, such as through increased noise, air pollution, and light pollution. Other impacts include displacement of species, habitat fragmentation, and changes to the visual landscape that could indirectly affect resources within ACECs. Impacts would be greater in areas where recreation areas, such as SRMAs or ERMAs, or development were adjacent to an ACEC. The BLM would adaptively manage to protect ACEC values and minimize impacts where applicable and feasible.

4.5.3 Wild and Scenic Rivers

This section discusses the impacts on WSRs from proposed management actions of other resources and resource uses. Existing conditions concerning WSRs are described in **Section 3.4.3**, Wild and Scenic Rivers.

Methods of Analysis

Indicators of impacts on WSRs include the following:

- Any potential change to the ORVs, tentative classification (i.e., wild, scenic, recreational), or free-flowing nature of the river segment or corridor area from its current state, as described in **Section 3.4.3** and **Appendix C**.

Documentation of the process used to determine suitability can be found in **Appendix C**. The analysis looks at both the 0.5-mile study corridor and the river mileage on BLM-administered land to more accurately portray impacts.

The analysis includes the following assumptions:

- All eligible stream segments under consideration for WSR designation will be managed under interim protective measures required by the WSR Act and BLM Manual 6400, Wild and Scenic Rivers – Policy and Program Direction for Identification, Evaluation, Planning, and Management (BLM 2012h) until the Record of Decision for this RMP is adopted. At that time, any stream segment not found suitable for inclusion in the NWSRS will lose its interim protection. This procedure and the interim protective measures will ensure that the values for which these river segments were found eligible are not compromised until the final RMP is adopted.
- If WSR protection is not provided (i.e., if segments are found not suitable or Congress releases them from WSR consideration), provisions may still remain to protect these river corridors under a combination of existing plans and policies and actions proposed under the action alternatives of this RMP. These provisions protect streamside and riparian habitats, riparian and aquatic wildlife, water quality, and cultural and visual resources. The major difference between designation and non-designation is the legislative, and thus lasting, protection afforded designated streams. In addition, the WSR Act requires that BLM develop a comprehensive management plan for the designated stream segment Decisions in this RMP, however, affect suitability only. Once a segment is determined suitable, it can be formally recommended to Congress or the Secretary of the Interior for inclusion in the NWSRS.
- Implementing certain actions and alternatives analyzed in this RMP could negatively impact WSR values. These values include the free-flowing nature, ORVs, and tentative classification of the segments. The impacts could occur because under certain alternatives, stream segments are determined to be not suitable for inclusion in the NWSRS. Under a not suitable determination, all interim protections associated with the WSR Act are eliminated. Recognizing that, the analysis of impacts on eligible stream segments includes an evaluation of where the management actions may be inconsistent with the tentative classification given to each eligible segment, as well as impacts on its ORVs or free-flowing nature.

Effects Common to All Alternatives

All segments, regardless of eligibility, suitability, or nonsuitability determination, may receive indirect protection to the WSR characteristics (i.e., ORVs, free-

flowing nature, water quality, and tentative classification) from stipulations for the protection of other resources. An NSO stipulation generally provides protection by prohibiting surface occupancy and surface-disturbing activities that might degrade or contribute to the degradation of the ORVs, and by preventing projects that might impact the tentative classification (i.e., wild, scenic, recreational) or free-flowing nature of the segment. A CSU stipulation would provide a slightly lesser degree of protection to the WSR characteristics, as surface-disturbing activities are allowed, but rather must be modified or moved so as not to impact the resource. Finally, TL stipulations provide a similar level of protection as NSO, but only during certain times of the year. These are especially important in protecting aquatic and terrestrial wildlife species and their habitat during critical times. The acres affected by each type of stipulation are detailed under each alternative below. Stipulations that often provide overlapping protection for WSR segments include, but are not limited to, those under the Water Resources program (e.g., NSO for Major River Corridors and Hydrology River) and Soil Resources (e.g., NSO for Geology Slope. See Appendix C for a full list of protective measures.).

Weed treatments in the short-term may impact ORVs or tentative classification as evidence of human activity may be seen. However in the long-term, weed treatment and eradication would benefit ORVs as riparian health improves.

In WSR study segments where scenic values have been identified as an ORV, VRM Class I and II management would provide the most protection to the scenic ORV. VRM Class I and II management may also provide indirect protection for other ORVs or tentative classification by preventing certain types of development that would impact the ORVs or tentative classification. Conversely, VRM Class III or IV management could lead to impacts on scenic ORVs by allowing development that would directly impair scenic quality. VRM Class III or IV management may also indirectly impact other ORVs or tentative classification by allowing certain types of development. Under all alternatives, Colorado River Segment 3 would be managed as VRM Class I to the south of the river and VRM Class II to the north of the river. This would provide protection to the tentative classification and the ORVs by precluding large-scale development that would be incompatible with VRM Class I or II management. Impacts from VRM on Colorado River Segment 3 are not discussed further under the separate alternatives impact analysis. The acres managed under each VRM class for the remaining 13 segments are detailed under each alternative below.

While livestock grazing presently appears to be commensurate with management of the ORVs, it could have minor and localized effects on some ORVs. Livestock grazing in riparian areas may impact water quality, potentially affecting fish, wildlife, vegetation, and recreation ORVs. Because livestock grazing is subject to BLM Standards for Public Land Health and Guidelines for Livestock Grazing Management in Colorado, adjustments to grazing

management would be implemented in cases where land health standards are not being met due to grazing activities. These adjustments could include changes in stocking rate, the timing of grazing, and additional terms and conditions.

Increased recreation has the potential to impact ORVs associated with each segment. However, impacts could be mitigated by building infrastructure to keep people away from special resources or through education efforts. Motorized and mechanized vehicle use could impact ORVs and tentative classification of WSR study segments. Closing areas to motorized or mechanized travel would protect areas from impacts associated with such use. Designating routes for certain motorized and mechanized uses would help protect ORVs to a lesser degree.

WSR study segments may also be impacted by being within ROW avoidance or exclusion areas. ROW exclusion would provide the most protection to ORVs and tentative classification by prohibiting all new ROWs in the area. This is especially true of North Fork of West Creek, tentatively classified as wild, so as not to allow intrusions that would change the classification. While this is also helpful to segments classified as scenic, such classification allows for more change than segments classified as wild. The southern portion of Colorado River Segment 3 excludes ROWs in accordance with wilderness protection. This would provide direct impacts on scenic, geological, and wildlife ORVs. Recreational ORVs could also benefit as the user experience would not be diminished by the development of new ROWs south of the river. North of the river, the BLM would require undergrounding of new utility lines or would require them to be located within the railroad ROW or along existing roads. This would prevent the sprawl of new utility lines within the segment study corridor. Because much of the corridor includes canyons or steep slopes, the development of new utilities within the segment study corridor is unlikely, with, perhaps, the exception of along the railroad. Impacts from ROW development on Colorado River Segment 3 are not discussed further under the separate alternatives impact analysis. The acres managed as ROW avoidance and exclusion areas are detailed under each alternative below.

Within the McInnis Canyons NCA, the BLM would continue to acquire private in-holdings from willing sellers, including along Colorado River Segment 3. The consolidation of land management would enhance the BLM's ability to manage the segment for the protection of the ORVs and tentative classification. Acquisition of land from willing sellers of private land would provide the same benefits to other segments.

Development resulting from fluid mineral leasing has the potential to impact ORVs and tentative classification of segments. As discussed above, some impacts may be mitigated through stipulations. In order to further reduce impacts, ORVs and tentative classification may benefit from being closed to fluid mineral leasing. All segments except the following are in areas of low to no potential for oil and

gas and impacts are therefore not expected: a portion of Roan Creek, a portion of Carr Creek, and Colorado River Segment 1. The following segments do not have potential for geothermal resources and impacts are therefore not expected: Roan and Carr Creeks, Dolores River, a portion of Blue Creek, Ute Creek, North Fork West Creek, and a portion of West Creek. Segments closed to fluid mineral leasing are detailed under each alternative below.

A portion of West Creek, Rough Canyon Creek, and North Fork West Creek are withdrawn from locatable mineral entry. Rough Canyon Creek and portions of segments occurring within WSAs (Dolores River, West Creek, North Fork West Creek, and Ute Creek) are and would remain closed to mineral material sales. Prohibiting such development would protect the ORVs and tentative classification of the segments. While not all segments are closed to such uses, the segments may receive protection from such uses via stipulations, as detailed under each alternative below.

Except for valid existing rights, Segment 3 of the Colorado River is "withdrawn from i) all forms of entry, appropriation, or disposal under the public land laws; ii) location, entry, and patent under the mining laws; and iii) the operation of the mineral leasing, mineral materials, and geothermal leasing laws" (Public Law 106-353, Section 6(l)(5)(c), Colorado Canyons National Conservation Area and Black Ridge Canyons Wilderness Act of 2000). As such, the general prohibition of new energy development in the area would contribute to the protection of the ORVs along the segment and would help preserve its tentative classification. Impacts from energy development on Colorado River Segment 3 are not discussed further under the separate alternatives impact analysis.

The Dolores River itself is not within The Palisade or the Sewemup Mesa WSAs. However, portions of the study corridor extend into The Palisade WSA (130 acres) the Sewemup Mesa WSA (870 acres). WSA management includes VRM Class I, ROW exclusion, closure to motorized and mechanized vehicle use, NSO stipulation for surface-disturbing activities, and closure to fluid mineral leasing, all of which would provide protection for the ORVs and free-flowing nature of the segment. In addition, portions of West Creek, North Fork West Creek, and Ute Creek are also within the Palisade WSA and would receive protection from WSA management.

Where WSR study segments overlap ACECs, ACEC management would complement WSR objectives. Details of ACEC management prescriptions can be found in **Chapter 2**. Impacts of management prescriptions such as VRM class, stipulations, ROW avoidance/exclusion decisions, and leasing decisions are folded into the applicable discussion. Only a total acreage of overlap is provided under each alternative below.

WSR study segments could benefit from interpretation and environmental education efforts that teach users about the importance of protecting the ORVs

and encouraging them to recreate in the area in ways that do not threaten the resources.

Implementing management for the following resources would have negligible or no impact on WSRs and are therefore not discussed in detail: air quality; wild horses; wildland fire management; forestry; national trails; and national, state, and BLM byways.

Alternative A

Under Alternative A, the GJFO would continue to manage the 14 segments identified in **Chapter 2** (**Table 2-2**) as eligible for inclusion in the NWSRS. The BLM would protect the free-flowing nature, ORVs, and tentative classifications (i.e., wild, scenic, recreational) of the segments until a suitability determination is made for the segments.

Continuation of current management would result in a long-term impact on the characteristics associated with eligible WSR segments because they would continue to be protected by interim protective management. The BLM would not approve any action that would adversely affect the free-flowing nature of any of the 14 WSR segments, their ORVs, or tentative classifications. Impacts may be experienced where other special management designations overlap a stream segment, thereby providing an additional layer of protection, and where other RMP management actions help protect or enhance the ORVs. Acreages associated with selected management prescriptions are shown in **Table 4-65**, Select Quantitative Wild and Scenic River Impacts, Alternative A.

Alternative A provides NSO protection to portions of all segments totaling about 19,000 acres. The alternative also provides CSU protection to portions of all segments except for North Fork West Creek for a total of about 22,900 acres. Finally, portions of five segments are protected by TL stipulations for a total of about 3,900 acres (see **Table 4-65**). Impacts are the same as those described under Effects Common to All Alternatives.

Alternative A would provide VRM Class I or II protection for approximately 12,400 acres (49 percent) of eligible segments, excluding Colorado River Segment 3. Of the segments with a scenic ORV, the majority of Blue Creek (2,400 acres), Colorado River Segment 1, and a portion of the Dolores River (400 acres) are managed as VRM Class III or are undesignated (see **Table 4-65**). While development in these areas would pose a threat to the scenic ORV of the segments, under eligibility, the BLM would not permit any project that would diminish the scenic ORV of the segments.

Portions of three segments are within Bangs Canyon SRMA: East Creek (1,800 acres), Rough Canyon Creek (1,200 acres), and Gunnison River Segment 2 (600 acres). The Bangs Canyon SRMA is primarily used by local communities and management of the zones overlapping the three WSR segments is commensurate with protection of the ORVs.

Table 4-65
Restrictions from Wild and Scenic River and Other Programs that Affect Eligible Wild and Scenic River Segments, Alternative A

Segment	Stipulation (acres)			VRM Class (acres)				ROW		Closed to Fluid Mineral Leasing (acres)	Petitioned for Withdrawal from Locatable Mineral Entry (acres)
	NSO	CSU	TL	I	II	III	Undesignated	Exclusion	Avoidance		
Blue Creek	1,500	2,900	0	0	600	0	2,400	0	100	0	0
Carr Creek	1,400	1,700	0	0	0	0	1,700	0	1,300	0	0
Colorado River Segment 1	1,100	2,200	300	0	0	2,100	100	0	2,200	0	0
Colorado River Segment 2	80	100	0	0	0	100	0	0	100	0	0
Dolores River	5,900	5,900	0	1,100	4,400	200	200	3,300	0	1,000	0
East Creek	2,000	1,900	40	0	1,500	400	0	500	1,400	0	0
Gunnison River Segment 2	800	1,000	0	0	500	400	100	500	400	0	0
North Fork Mesa Creek	300	700	0	0	0	0	700	0	0	0	0
North Fork West Creek	1,100	200	600	0	1,100	0	0	900	0	900	100
Roan Creek	400	2,000	1,600	0	0	0	2,000	0	1,200	0	0
Rough Canyon Creek	1,300	1,200	0	0	1,200	0	0	900	100	0	900
Ute Creek	1,400	1,400	500	0	200	0	0	1,400	0	0	0
West Creek	1,700	1,700	800	0	1,800	0	0	1,700	0	600	600
Total	**19,000**	**22,900**	**3,800**	**1,100**	**11,300**	**3,200**	**7,200**	**9,200**	**6,800**	**2,500**	**1,600**

Source: BLM 2010a

Under Alternative A, portions of the Dolores River (11,000 acres) and Gunnison River Segment 2 (400 acres) are closed to motorized use. All or portions of 11 segments (Colorado River Segments 1 and 2, Dolores River, North Fork Mesa Creek, Blue Creek, Roan Creek, Carr Creek, North Fork West Creek, Ute Creek, East Creek, and West Creek) totaling approximately 11,200 acres are open to cross-country motorized travel. The remaining area is either limited to designated or limited to existing roads and trails.

Portions of all segments except for North Fork Mesa Creek would be protected as either ROW exclusion areas or ROW avoidance areas (9,200 acres and 6,800 acres, respectively) under Alternative A, which accounts for about 63 percent of eligible segments, excluding Colorado River Segment 3 (see **Table 4-65**). Impacts are the same as those described under Effects Common to All Alternatives.

Colorado River Segment 1 and portions of Roan and Carr Creeks are within the area of coal resource potential and are acceptable for coal leasing and development. Coal development has the potential to impact ORVs through surface disturbance leading to soil erosion, impaired water quality, and habitat fragmentation or loss. However, under Alternative A, the BLM would not permit coal development if it were found to impact the ORVs, free-flowing nature, or tentative classification of the segments.

All of the segments with moderate to high potential for oil and gas (a portion of Roan Creek, a portion of Carr Creek, and Colorado River Segment 1) are open to fluid mineral leasing. However they may be subject to stipulations that would mitigate impacts from such activities (see **Table 4-65**). Of the segments with potential for geothermal resources (a portion of Blue Creek, Colorado River Segments 1 and 2, East Creek, Gunnison River Segment 2, North Fork West Creek, Rough Canyon Creek, and a portion of West Creek), only a portion of North Fork West Creek (900 acres) and a portion of West Creek (600 acres) are closed to geothermal leasing. The segments open to leasing may be subject to stipulations that would mitigate impacts from geothermal development activities (see **Table 4-65**).

A portion of four segments totaling about 2,500 acres overlap ACECs and receive protection from ACEC management as discussed under Impacts Common to All Alternatives. A portion of Rough Canyon Creek (900 acres) is within Rough Canyon ACEC; portions of North Fork West Creek (900 acres), Ute Creek (100 acres), and West Creek (600 acres) are within the Palisade ACEC; and a portion of West Creek (100 acres) is within the Unaweep Seep ACEC.

Alternative B

Under Alternative B, the BLM would determine that a portion of the Dolores River is suitable for inclusion in the NWSRS, and also determine that the remaining portions of the river are not suitable. For a detailed description of the suitable and not suitable reaches on the Dolores River, see **Appendix C**.

Under Alternative B, the BLM would determine that all other eligible stream segments are not suitable for inclusion in the NWSRS.

While only a portion of the Dolores River would be managed as suitable, Alternative B would provide some protection to study segments via stipulations imposed on fluid mineral leasing and other surface-disturbing activities. In total, 5 percent more acres would be protected by NSO, 42 percent fewer acres would be protected by CSU, and 4.8 times more acres would be protected by TL stipulations (see **Table 4-66**, Restrictions from Wild and Scenic River and Other Programs that Affect Suitable and Eligible Wild and Scenic River Segments, Alternative B). The specific stipulations and closures to fluid mineral leasing that would overlap each of the not suitable segments in Alternative B are:

Segment	**Stipulation or ACEC Overlap**
Blue Creek	• Closed to fluid mineral leasing (Maverick lands with wilderness characteristics unit)
	• LANDS WITH WILDERNESS CHARACTERISTICS NSO CO (Maverick lands with wilderness characteristics unit)
	• CSU-30: VRM Class II
	• CSU-32: Recreation Management Areas (Gateway ERMA)
	• NSO-2: Streams/Springs Possessing Lotic Riparian Characteristics
Carr Creek	• GEOLOGY SOIL CSU CO
	• CSU-30: VRM Class II
	• CSU-39: Roan and Carr Creeks ACEC
	• NSO-2: Streams/Springs Possessing Lotic Riparian Characteristics
Colorado River 1	• HYDROLOGY RIVER NSO CO
	• NSO-2: Streams/Springs Possessing Lotic Riparian Characteristics
Colorado River 2	• HYDROLOGY RIVER NSO CO
	• NSO-2: Streams/Springs Possessing Lotic Riparian Characteristics
Colorado River 3	• Closed to fluid mineral leasing (McInnis Canyon NCA)
	• HYDROLOGY RIVER NSO CO

Segment	Stipulation or ACEC Overlap
Dolores River	• Closed to fluid mineral leasing (Dolores River Canyon SRMA)
	• HYDROLOGY RIVER NSO CO
	• NSO-1 (Visual Resources)
	• NSO-2: Streams/Springs Possessing Lotic Riparian Characteristics
East Creek	• NSO-1 (Visual Resources)
	• NSO-2: Streams/Springs Possessing Lotic Riparian Characteristics
Gunnison River 2	• HYDROLOGY RIVER NSO CO
	• NSO-2: Streams/Springs Possessing Lotic Riparian Characteristics
North Fork Mesa Creek	• CSU-30: VRM Class II
	• NSO-2: Streams/Springs Possessing Lotic Riparian Characteristics
North Fork West Creek	• Closed to fluid mineral leasing (The Palisade WSA)
	• NSO-43: Wilderness Study Area (The Palisade WSA)
	• NSO-2: Streams/Springs Possessing Lotic Riparian Characteristics
Roan Creek	• GEOLOGY SOIL CSU CO
	• CSU-30: VRM Class II
	• CSU-39: Roan and Carr Creeks ACEC
	• NSO-2: Streams/Springs Possessing Lotic Riparian Characteristics
Rough Canyon Creek	• Closed to fluid mineral leasing (Bangs Canyon SRMA; Rough Canyon ACEC)
	• NSO-12: ACECs (Rough Canyon ACEC)
	• NSO-2: Streams/Springs Possessing Lotic Riparian Characteristics

Segment	Stipulation or ACEC Overlap
Ute Creek	• Closed to fluid mineral leasing (Unaweep Canyon lands with wilderness characteristics unit) • LANDS WITH WILDERNESS CHARACTERISTICS NSO CO (Unaweep Canyon lands with wilderness characteristics unit) • NSO-2: Streams/Springs Possessing Lotic Riparian Characteristics
West Creek	• Closed to fluid mineral leasing (Dolores River Canyon SRMA) • RECREATION SRMA NSO CO (Dolores River Canyon SRMA) • NSO-2: Streams/Springs Possessing Lotic Riparian Characteristics

Impacts are the same as those described under Effects Common to All Alternatives.

Alternative B would provide more protection to the study segments than under Alternative A through VRM management. The Dolores River would be managed primarily as VRM Class II, with portions managed as VRM Class I or III. Portions of three nonsuitable segments (Dolores River nonsuitable segment, West Creek, North Fork West Creek, and Ute Creek) would also receive protection from VRM Class I management for a total of about 2,600 acres (2.4 times more acres than under Alternative A). All or portions of 11 segments would be managed as VRM Class II, totaling about 13,500 acres (19 percent more acres than under Alternative A). Segments managed as VRM Class III or IV total about 7,500 acres (28 percent fewer acres than under Alternative A; see **Table 4-66**). A small portion of Colorado River Segment 1 (200 acres, 7 percent) would be managed as VRM Class IV. The small portion managed as VRM Class IV would allow for visual intrusion that would impact the scenic ORV of the area.

A small portion of the Dolores River's nonsuitable segment (400 acres) is within the Maverick unit that would be managed for wilderness characteristics. Lands with wilderness characteristics management, including NSO, closed to motorized travel, ROW exclusion, closed to fluid mineral and non-energy leasing, closed to mineral material sales, and VRM Class II, would help protect ORVs and the free-flowing nature of the segment. Portions of nonsuitable segments totaling 3,100 acres are also within units managed for wilderness characteristics and would receive similar protection. For example, a portion of Blue Creek (800 acres) is within the Maverick unit and a portion of Ute Creek (1,100 acres) is within the Unaweep unit.

Table 4-66
Restrictions from Wild and Scenic River and Other Programs that Affect Suitable and Eligible Wild and Scenic River Segments, Alternative B

Segment	Stipulation (acres)			VRM Class (acres)				ROW		Closed to Fluid Mineral Leasing (acres)	Petitioned for Withdrawal from Locatable Mineral Entry (acres)
	NSO	CSU	TL	I	II	III	IV	Exclusion	Avoidance		
Suitable											
Dolores River	3,200	1,700	2,400	900	2,000	300	0	2,300	900	3,200	400
Nonsuitable											
Blue Creek	1,600	1,700	2,700	0	2,800	0	0	800	2,000	800	0
Carr Creek	1,100	600	100	0	0	1,700	0	0	1,700	0	0
Colorado River Segment 1	2,200	1,200	1,600	0	2,000	0	200	0	2,100	0	0
Colorado River Segment 2	100	100	0	0	100	0	0	0	100	40	0
Dolores River	2,700	2,100	2,700	100	2,600	0	0	2,400	300	2,700	1,200
East Creek	1,900	1,500	1,900	0	0	1,900	0	0	1,900	100	0
Gunnison River Segment 2	1,000	500	500	0	600	400	0	400	500	900	0
North Fork Mesa Creek	300	400	300	0	700	0	0	0	700	0	0
North Fork West Creek	1,100	100	500	900	200	0	0	900	100	1,100	100
Roan Creek	500	1,400	1,700	0	0	1,900	0	0	2,000	0	0
Rough Canyon Creek	1,200	800	1,200	0	1,200	0	0	1,000	200	1,200	0

Table 4-66
Restrictions from Wild and Scenic River and Other Programs that Affect Suitable and Eligible Wild and Scenic River Segments, Alternative B

Segment	Stipulation (acres)			VRM Class (acres)				ROW		Closed to Fluid Mineral Leasing (acres)	Petitioned for Withdrawal from Locatable Mineral Entry (acres)
	NSO	CSU	TL	I	II	III	IV	Exclusion	Avoidance		
Ute Creek	1,400	500	800	50	1,100	200	0	1,100	200	1,400	0
West Creek	1,700	600	1,700	600	100	1,000	0	600	1,100	1,700	300
Total	**20,000**	**13,200**	**18,100**	**2,600**	**13,500**	**7,500**	**200**	**9,500**	**13,800**	**12,900**	**1,600**

Source: BLM 2010a

As there are more SRMAs and individual ERMAs proposed under Alternative B than under Alternative A, more WSR study segments would have the potential to be impacted by concentrated recreation management. Management of the SRMAs and ERMAs would focus on certain outcomes to benefit the users and management of the zones overlapping the three WSR study segments is commensurate with protection of the ORVs. All or portions of the Dolores River, Blue Creek, West Creek, North Fork West Creek, and Ute Creek, totaling approximately 5,700 acres are within the Dolores River Canyon SRMA. All or portions of Gunnison River Segment 2 and Rough Canyon Creek, totaling approximately 1,800 acres, are within Bangs SRMA.

All or portions of nine WSR study segments (Dolores River, Blue Creek, Gunnison River Segment 2, Roan Creek, Carr Creek, Rough Canyon Creek, West Creek, North Fork West Creek, and Ute Creek) totaling about 11,200 acres would be closed to motorized vehicle use (2 percent fewer acres than under Alternative A). None of the areas are open to cross-country motorized or mechanized use. Impacts are the same as those described under Effects Common to All Alternatives.

Alternative B would provide more protection to WSR study segments via ROW avoidance and exclusion than under Alternative A. In total, 2.2 times more acres would be protected as ROW avoidance areas and 3 percent more acres would be protected as ROW exclusion areas (see **Table 4-67**) than under Alternative A. Impacts are the same as those described under Effects Common to All Alternatives.

Only Colorado River Segment 1 and a small portion of Roan Creek are within the area of coal resource potential; however, Colorado River Segment 1 is in an area unacceptable for further coal leasing. Coal development has the potential to impact the fish ORV in Roan Creek through surface disturbance leading to soil erosion, impaired water quality and habitat fragmentation or loss. However, the trout in Roan Creek are currently considered protected under the Endangered Species Act and any new coal development would require consultation with USFWS, including measures designed to minimize impacts.

All of the segments with development potential for oil and gas (Roan Creek, Carr Creek, Colorado River Segment 1, and portions of Colorado River Segment 2) are open to fluid mineral leasing. However they may be subject to stipulations that would mitigate impacts from such activities (see **Table 4-67**). Of the segments with potential for geothermal resources (a portion of Blue Creek, Colorado River Segments 1 and 2, East Creek, Gunnison River Segment 2, North Fork West Creek, Rough Canyon Creek, and a portion of West Creek), only the following are open to geothermal leasing: Blue Creek, Colorado River Segments 1 and 2, a portion of East Creek, and a portion of Gunnison River Segment 2. These segments may be subject to stipulations that

Table 4-67
Restrictions from Wild and Scenic River and Other Programs that Affect Suitable Wild and Scenic River Segments, Alternative C

Segment	Stipulation (acres)			VRM Class (acres)				ROW		Closed to Fluid Mineral Leasing (acres)	Petitioned for Withdrawal from Locatable Mineral Entry (acres)
	NSO	CSU	TL	I	II	III	IV	Exclusion	Avoidance		
Blue Creek	1,700	2,000	2,700	0	2,900	0	0	900	2,000	900	200
Carr Creek	1,700	1,400	100	0	1,700	0	0	300	1,400	1,300	0
Colorado River Segment 1	2,200	2,200	1,600	0	2,200	0	0	0	2,200	0	0
Colorado River Segment 2	100	100	0	0	100	0	0	0	100	70	0
Dolores River	5,900	3,300	5,100	1,000	4,900	0	0	2,600	3,300	5,600	4,400
East Creek	700	1,500	1,900	0	1,900	0	0	400	1,500	400	200
Gunnison River Segment 2	1,000	500	500	0	1,000	0	0	400	500	600	0
North Fork Mesa Creek	300	700	300	0	700	0	0	0	700	0	0
North Fork West Creek	1,100	100	400	900	200	0	0	900	100	1,000	700
Roan Creek	2,000	1,400	600	0	2,000	0	0	0	1,400	1,900	0
Rough Canyon Creek	1,200	400	1,200	0	1,200	0	0	900	400	1,200	900
Ute Creek	1,300	200	800	50	1,300	0	0	1,100	200	1,300	1,200
West Creek	1,600	1,100	1,400	500	1,200	0	0	600	1,100	1,300	1,200
Total	**20,800**	**14,900**	**16,600**	**2,450**	**21,300**	**0**	**0**	**8,100**	**14,900**	**15,570**	**8,800**

Source: BLM 2010a

would mitigate impacts from geothermal development activities (see **Table 4-67**). Note that while the study corridor for East Creek is 2,900 acres, 1,100 acres are within the Dominguez-Escalante NCA, which is closed to fluid mineral leasing. Therefore, the entirety of the East Creek study area would be closed to fluid mineral leasing.

All or portions of eight segments totaling about 11,100 acres overlap ACECs and receive protection from ACEC management as discussed under Impacts Common to All Alternatives. A portion of the Dolores River suitable segment (1,900 acres) is within the Dolores River Riparian ACEC, which is managed to protect resources including scenic and paleontological values. Portions of the Dolores River nonsuitable segment (2,600 acres) are within the Dolores River Riparian ACEC and within the Palisade ACEC which is managed to protect resources including scenic values. Portions of other nonsuitable segments are also within ACECs and would receive incidental protection. A portion of Blue Creek (100 acres) is within the Dolores River Riparian ACEC; portions of Ute Creek (100 acres), North Fork West Creek (1,000 acres), and West Creek (900 acres) are within the Palisade ACEC; portions of Roan and Carr Creeks (1,900 acres and 1,700 acres, respectively) are within the Roan and Carr Creeks ACEC; a portion of Rough Canyon Creek (900 acres) is within the Rough Canyon ACEC; and a portion of West Creek (900 acres) is within the Unaweep Seep ACEC.

Alternative C

Under Alternative C, all segments would be determined suitable for inclusion in the NWSRS. The BLM would continue managing the segments to protect the free-flowing nature, associated ORVs, and tentative classification. Protections are summarized in Table 4-67 and consist of restrictions from the WSR and other resource programs, including VRM classifications, stipulations, and fluid mineral leasing closures. Implementation of Alternative C would result in impacts similar to or the same as those described under Alternative A as the BLM would not approve any action that would adversely affect the free-flowing nature of any of the 14 WSR segments, their ORVs, or tentative classifications. Impacts may be experienced where other special management designations overlap a stream segment and provide an additional layer of protection, and where other RMP management actions help protect or enhance the ORVs.

Alternative C would provide the most protection to WSR study segments via stipulations. Compared to Alternative A, 9 percent more acres would be protected by NSO, 35 percent fewer acres would be protected by CSU, and 4.3 times more acres would be protected by TL stipulations (see **Table 4-67**, Restrictions from Wild and Scenic River and Other Programs that Affect Suitable Wild and Scenic River Segments, Alternative C). Impacts are the same as those described under Effects Common to All Alternatives.

Alternative C would provide the most protection to WSR study segments from VRM as all segments would be managed as either VRM Class I or II. Portions of the Dolores River, North Fork West Creek, Ute Creek, and West Creek would be managed as VRM Class I, totaling approximately 2,450 acres (2.2 times more acres than under Alternative A). The remaining segments would be managed as VRM Class II, totaling approximately 21,300 acres (88 percent more acres than under Alternative A; see **Table 4-67**). Impacts are the same as those described under Effects Common to All Alternatives.

A small portion of the Dolores River (1,100 acres) and Blue Creek (900 acres) are within the Maverick lands with wilderness characteristics unit that would be managed for wilderness characteristics; portions of West Creek (100 acres) and North Fork West Creek (100 acres) are within West Creek unit; portions of West Creek (300 acres) and Ute Creek (1,200 acres) are within Unaweep unit; portions of Dolores River (500 acres) are within the Lumsden Canyon unit; and portions of Gunnison River Segment 2 (400 acres) and East Creek (400 acres) are within the Bangs Canyon unit. The types of impacts would be similar to those described under Alternative B.

Under Alternative C, fewer WSR study segments overlap SRMAs compared to the other action alternatives. Impacts would be similar to those described under Alternative B. All or portions of Gunnison River Segment 2 and Rough Canyon Creek, totaling approximately 1,400 acres, are within Bangs SRMA.

All or portions of 12 suitable segments (Colorado River Segments 1 and 2, Dolores River, Blue Creek, Gunnison River Segment 2, Roan Creek, Carr Creek, Rough Canyon Creek, East Creek, West Creek, North Fork West Creek, and Ute Creek) totaling about 14,400 acres would be closed to motorized vehicle use (26 percent more acres than under Alternative A). None of the areas are open to cross-country motorized or mechanized use.

Alternative C would provide the most protection to WSR study segments via ROW avoidance and exclusion. All or portions of nine segments would be managed as ROW exclusion (Dolores River, North Fork Mesa Creek, Blue Creek, Gunnison River Segment 2, Rough Canyon Creek, East Creek, West Creek, North Fork West Creek, and Ute Creek) totaling approximately 8,100 acres. While more segments would be protected as ROW exclusion areas than under Alternative A, 12 percent fewer acres would be protected, compared with Alternative A. An additional 14,900 acres along all segments would be managed as ROW avoidance (2.2 times more acres than under Alternative A; see **Table 4-67**). Impacts are the same as those described under Effects Common to All Alternatives.

Colorado River Segment 1 and a small portion of Roan Creek are within the area of coal resource potential. Under Alternative C, both segments are located in areas that are unacceptable for further coal leasing, which would ensure that

there would be no impacts from coal leasing on the ORVs, free-flowing nature, or tentative classification of the segments.

Of the segments with moderate to high potential for oil and gas (Roan Creek, Carr Creek, Colorado River Segment 1, and Colorado River Segment 2), portions of all segments, including all of Colorado River Segment 1, are open to fluid mineral leasing, totaling approximately 2,700 acres. However they may be subject to stipulations that would mitigate impacts from such activities (see **Table 4-67**). Of the segments with potential for geothermal resources (a portion of Blue Creek, Colorado River Segments 1 and 2, East Creek, Gunnison River Segment 2, North Fork West Creek, Rough Canyon Creek, and a portion of West Creek), only the following are open to geothermal leasing: Colorado River Segments 1 and portions of Colorado River Segment 2 and Gunnison River Segment 2. These segments may be subject to stipulations that would mitigate impacts from geothermal development activities (**Table 4-67**). Note that while the study corridor for East Creek is 2,900 acres, 1,100 acres are within the Dominguez-Escalante NCA, which is closed to fluid mineral leasing. Therefore, the entirety of the East Creek study area would be closed to fluid mineral leasing.

All or portions of 11 segments totaling about 12,600 acres overlap ACECs and receive protection from ACEC management as discussed under Impacts Common to All Alternatives. A portion of Colorado River Segment 1 (900 acres) is within the Colorado River Riparian ACEC. Portions of the Dolores River (3,200 acres) and Blue Creek (200 acres) are within the Dolores River Riparian ACEC. Portions of the Dolores River (1,300 acres), West Creek (800 acres), North Fork West Creek (1,000 acres), and Ute Creek (100 acres) are within the Palisade ACEC. A portion of Gunnison River Segment 2 (400 acres) is within the Gunnison River Bluffs ACEC; portions of Roan and Carr Creeks (1,900 acres and 1,700 acres, respectively) are within the Roan and Carr Creeks ACEC; a portion of Rough Canyon Creek (900 acres) is within the Rough Canyon ACEC; a portion of East Creek (100 acres) is within Nine-mile Hill Boulders ACEC, and a portion of West Creek (100 acres) is within the Unaweep Seep ACEC.

Alternative D

Under Alternative D, all 14 eligible segments would be determined not suitable, a potential long-term impact on the WSR characteristics of these segments as the ORVs, free-flowing nature, and tentative classification identified during eligibility would not be protected by either eligibility or suitability management. While the BLM would not be obligated to protect the ORVs, free-flowing nature, or tentative classification of the segments, they may still receive protection from other resource management actions.

Alternative D would provide less protection for the WSR study segments via NSO and CSU stipulations as Alternative A, although TL stipulation protections

would increase. Compared to Alternative A, 7 percent fewer acres would be protected by NSO, 59 percent fewer acres would be protected by CSU, and 4.3 times more acres would be protected by TL stipulations (see **Table 4-68**, Restrictions from Wild and Scenic River and Other Programs that Affect Eligible Wild and Scenic River Segments, Alternative D). Impacts are described under Effects Common to All Alternatives.

Alternative D would provide the least amount of protection to the WSR study segments from VRM and has the most VRM Class IV areas of any action alternative. Portions of West Creek, North Fork West Creek, and Ute Creek totaling approximately 1,450 acres would be managed as VRM Class I (32 percent more acres than under Alternative A). All or portions of nine segments (Blue Creek, Colorado River Segments 1 and 2, Dolores River, East Creek, Gunnison River Segment 2, Rough Canyon Creek, Ute Creek and West Creek) would be managed as VRM Class II, totaling about 6,200 acres (45 percent fewer acres than under Alternative A). Segments managed as VRM Class III or IV total about 16,200 acres (55 percent more acres than under Alternative A; see **Table 4-68**). Of the segments with scenic ORVs, a portion of Blue Creek (2,600 acres), a portion of Colorado River Segment 1 (500 acres), a portion of the Dolores River (4,900 acres), a portion of North Fork West Creek (200 acres), a portion of Ute Creek (200 acres), and a portion of West Creek (1,100 acres) would be managed as VRM Class III or IV, potentially allowing impairment of the scenic quality.

Under Alternative D, fewer WSR study segments would overlap SRMAs compared to Alternative B. The type of impacts would be similar to those described under Alternative B, but would occur over a smaller area. All or portions of Gunnison River Segment 2 and Rough Canyon Creek, totaling approximately 1,700 acres, are within Bangs SRMA. A portion of Gunnison River Segment 2 (340 acres) is within the Gunnison River Bluffs SRMA.

All or portions of five segments (Dolores River, Gunnison River Segment 2, Rough Canyon Creek, West Creek, and North Fork West Creek) totaling about 4,000 acres would be closed to motorized vehicle use (65 percent fewer acres than under Alternative A). None of the areas are open to cross-country motorized or mechanized use.

Alternative D would provide the least protection to WSR study segments via ROW avoidance and exclusion. Portions of five segments would be managed as ROW exclusion (Dolores River, Rough Canyon Creek, West Creek, North Fork West Creek, and Ute Creek) totaling approximately 3,400 acres (64 percent fewer acres than under Alternative A). Portions of three segments would be managed as ROW avoidance (Gunnison River Segment 2, Rough Canyon Creek, and East Creek) totaling approximately 1,100 acres (84 percent fewer acres than under Alternative A; see **Table 4-68**). Impacts are the same as those described under Effects Common to All Alternatives.

Table 4-68
Restrictions from Wild and Scenic River and Other Programs that Affect Eligible Wild and Scenic River Segments, Alternative D

Segment	Stipulation (acres)			VRM Class (acres)				ROW		Closed to Fluid Mineral Leasing (acres)	Petitioned for Withdrawal from Locatable Mineral Entry (acres)
	NSO	CSU	TL	I	II	III	IV	Exclusion	Avoidance		
Blue Creek	1,200	400	2,700	0	300	2,600	0	0	0	0	0
Carr Creek	1,300	600	100	0	0	1,700	0	0	0	0	0
Colorado River Segment 1	2,200	1,100	1,600	0	1,800	300	200	0	0	0	0
Colorado River Segment 2	100	100	0	0	100	0	0	0	0	0	0
Dolores River	5,900	2,100	5,100	0	1,000	4,800	100	1,000	0	1,000	0
East Creek	400	1,400	1,900	0	40	1,900	0	0	500	100	0
Gunnison River Segment 2	1,000	500	500	0	600	300	100	0	200	0	0
North Fork Mesa Creek	300	0	300	0	0	700	0	0	0	0	700
North Fork West Creek	1,100	100	400	900	0	200	0	900	0	900	0
Roan Creek	500	1,400	600	0	0	2,000	0	0	0	0	0
Rough Canyon Creek	1,200	800	1,200	0	1,200	0	0	900	400	0	900
Ute Creek	900	400	800	50	1,100	200	0	50	0	50	0
West Creek	1,600	400	1,400	500	40	1,100	0	500	0	600	900
Total	**17,700**	**9,300**	**16,600**	**1,450**	**6,180**	**15,800**	**400**	**3,350**	**1,100**	**2,650**	**2,500**

Source: BLM 2010a

Colorado River Segment 1 and a small portion of Roan Creek are within the coal resource potential area and are acceptable for further coal leasing and development. Impacts from coal development on Roan Creek would be the same as those described under Alternative B. Colorado pikeminnow and razorback sucker found in Colorado River Segment 1 are protected under the Endangered Species Act and any new coal development would have to receive concurrence from USFWS. The scenic ORV would be mostly protected by VRM Class II management, and the bald eagle (the basis for the wildlife ORV along the segment) is protected by the Bald and Golden Eagle Protection Act.

All of the segments with potential for oil and gas (Roan Creek, Carr Creek, and Colorado River Segments 1 and 2) are open to fluid mineral leasing. However they may be subject to stipulations that would mitigate impacts from such activities (see **Table 4-68**). Of the segments with potential for geothermal resources (a portion of Blue Creek, Colorado River Segments 1 and 2, East Creek, Gunnison River Segment 2, North Fork West Creek, Rough Canyon Creek, and a portion of West Creek), only a portion of East Creek (100 acres), a portion of North Fork West Creek (900 acres), and a portion of West Creek (600 acres) following are closed to geothermal leasing, leaving the remaining areas available. These segments may be subject to stipulations that would mitigate impacts from geothermal development activities (see **Table 4-68**).

All or portions of five segments totaling about 3,000 acres overlap ACECs and receive protection from ACEC management as described under Impacts Common to All Alternatives. Portions of the Dolores River (100 acres), West Creek (800 acres), North Fork West Creek (1,000 acres), and Ute Creek (60 acres) are within the Palisade ACEC. A portion of Rough Canyon Creek (900 acres) is within the Rough Canyon ACEC, and a portion of West Creek (100 acres) is within the Unaweep Seep ACEC.

Cumulative

The CIAA for WSRs includes all land, regardless of ownership, within the GJFO and surrounding BLM field offices. Under Alternatives A and C, where all stream segments would be found eligible or suitable, management of the Colorado and Dolores River would be consistent with neighboring field office, which also found that portions of those rivers are suitable for inclusion in the NWSRS. Alternative B, in which some portions of the Dolores River are found suitable, would be consistent with suitability determinations in the Uncompahgre and Moab Field Offices. The Uncompahgre and Moab Field Offices determined that sections of the Dolores River that are primarily under federal ownership are suitable for inclusion in the NWSRS. For the segments under Alternatives B and D, where the BLM would not be required to prevent impacts on the free-flowing nature, tentative classification, or ORVs, there could be impacts when approving permits or resource use applications. There are no reasonably foreseeable future projects at this time that would impact the segments. However, if major projects are proposed and there is no systematic analysis of

impacts on river-related values pursuant to the WSR Act, there could be significant cumulative impacts on river-related values.

Other federal agencies considering permit applications (not under BLM authority) that could affect the free-flowing nature, ORVs, or tentative classification of any of the eligible or suitable segments would need to seek formal comments from the BLM and the BLM would discourage projects with such impacts. Other agencies would not be required to act on the BLM's comments, so the effect to eligible and suitable segments would depend on the decisions outside of BLM authority. For stream segments determined not suitable under Alternatives B and D, the BLM would not make recommendations based solely on the need to protect WSR values when BLM is asked for comments on projects authorized by other agencies. Rather, if asked to comment, the BLM would focus on impacts on documented multiple-use values, rather than focusing on compliance with the WSR Act standards for protection of ORVs, free flowing nature, and classification.

4.5.4 National Trails

This section discusses impacts on national trails from proposed management actions of other resources and resource uses. Existing conditions concerning national trails are described in **Section 3.4.4**, National Trails.

As described in the 1968 National Trails System Act, Section 3(3), "National historic trails… follow as closely as possible and practicable the original trails or routes of travel of national historic significance. Designation of such trails or routes shall be continuous, but the established or developed trail, and the acquisition thereof, need not be continuous onsite. National historic trails shall have as their purpose the identification and protection of the historic route and its historic remnants and artifacts for public use and enjoyment."

Direct impacts on national trails typically result from actions that disturb the soil or alter characteristics of the surrounding environment that contribute to trail significance and introduce visual elements out of character with the property or that alter its setting, or result in neglect of the resource to the extent that it is deteriorated or destroyed. For example, surface-disturbing activities that impact trail ruts for historic trail are considered a direct impact because the trail segments are nonrenewable. Conversely, actions that result in data collection and preservation of national historic and recreational trails would also be considered impacts.

Indirect impacts on national trails result from project-induced increases or decreases in activity in the planning area. The construction of a recreational facility may increase visitor use, which could result in indirect impacts on previously undisturbed trail segments, particularly along national historic trails. Recreation, in particular, is a complex issue, as actions taken to preserve historic values can positively and negatively affect heritage tourism and trail enthusiasts.

Methods of Analysis

Indicators of impacts on national trails include the following:

- Alterations to the level of public recreation, and the features giving the Old Spanish National Historic Trail its national historic significance
- Alterations to the level of public recreation or changes to the scenic, natural, and cultural resources of the Tabeguache National Recreation Trail
- Substantial interference with the nature and purposes/values for which the components of the System were designated occurs
- Impacts to the resources, qualities, values, and associated settings of the public land areas through which such National Trails may pass, and the primary trail use or uses

For all agency undertakings that could impact national trails, the BLM complies with Section 106 of the NHPA prior to conducting the undertaking. Section 106 compliance typically includes inventory, evaluation, and consultation with the Colorado State Historic Preservation Office.

The analysis includes the following assumptions:

- Protection of national trails and related sites occur in accordance with federal laws and BLM regulations and agreements.
- The BLM looks favorably at opportunities to cooperate with private landowners to minimize or eliminate disturbance to national trails.
- Recognizing that national trails often comprise numerous routes rather than a single trace, all protective zones begin at the outer edges of trails rather than at a centerline, which is difficult to define.
- Certain projects, due to their size or topography of the land, may require consideration of visual intrusions into the setting beyond the foreground or middleground zones to comply with Section 106 of the NHPA.

Effects Common to All Alternatives

The portion of the Old Spanish National Historic Trail that occurs on BLM-administered lands within the GJFO is minimal. Approximately 40 miles of the Trail are within the GJFO planning area, and approximately 7 miles of the Trail are under BLM jurisdiction. The congressionally designated route within the planning area follows US Highway 50; therefore, the BLM manages a separate route for the historic trail experience. Once the Old Spanish trail-wide comprehensive plan is completed by the BLM and National Park Service, the portion of the Trail on BLM-administered lands would be managed in consideration of the trail-wide comprehensive plan and to minimize impacts on

the Trail In the interim, BLM management actions would have minimal impact on the Trail under any alternative.

Comprehensive travel and transportation management restrictions in place for the Old Spanish and Tabeguache Trails would continue to impact trail usage. For example, under all alternatives sections of the Old Spanish Trail are open to motorized, mechanized, and non-motorized travel. Travel restrictions for the Tabeguache Trail vary by alternative and are therefore described by alternative below. For both trails, travel restrictions would impact the types of experiences available along these trails. Opening the trails to more types of uses would likely increase use levels, but may discourage some users who desire a quiet soundscape and less crowded experience.

Management for other resources along the lands adjacent to national trails may impact features of trails and the visitor experience. In general, surface-disturbing activities would not preserve or promote the scenic, natural, and cultural resources found along the Old Spanish or Tabeguache Trails.

Stipulations on surface-disturbing activities (e.g., NSO and CSU) and ROW location restrictions (i.e., ROW avoidance and exclusion areas) could benefit trails by restricting or minimizing surface disturbance, thus preserving the scenic, natural, and cultural resources. Impacts from fluid minerals would be minimal for both trails under all alternatives due to NSO and CSU stipulations for the Old Spanish Trail (see **Chapter 2**) and low oil and gas potential in the area adjacent to both the Old Spanish and Tabeguache Trails. Neither the Old Spanish Trail nor the Tabeguache Trail is within the coal potential area; therefore, no impacts from coal development are anticipated under any alternatives. Locatable mineral development has the potential to impact national trails under all alternatives as development of this resource would not be compatible with preservation of trail values. The area surrounding the Old Spanish and Tabeguache Trails is not withdrawn or proposed for withdrawal under any alternatives.

Measures in place to protect other resources may indirectly provide some enhancement or preservation of the qualities of national trails or limitations on development of trails. For example, applying NSO stipulations to protect cultural resources have the potential to enhance cultural resources as well as preserve scenic qualities in the area around the Old Spanish or Tabeguache Trails. Similarly, protective measures for paleontology would have the potential to limit surface disturbance and thus preserve scenic and historic values. Restrictions on surface-disturbing activities to protect other resources may limit improvements to national trails that may be needed to preserve them. For the Tabeguache Trail, these restrictions could limit recreation-related development needed to enhance the recreational experience along the trail.

Protection for special status species may also impact management of the Old Spanish Trail. Populations of a federally threatened species, the Colorado

hookless cactus, may occur near the Old Spanish Trail. Site-specific analysis would be required to determine locations of populations. Should populations be identified in this area, management activities allowed on the Old Spanish Trail would be consistent with the preservation of this species.

Implementing management for the following resources would have negligible or no impact on national trails and are therefore not discussed in detail: air, climate, geology, water resources, vegetation, fish and wildlife, wild horses, wildland fire management, lands with wilderness characteristics, forestry, livestock grazing, wilderness study areas, coal, and national, state, and BLM byways.

Alternative A

Under Alternative A, the BLM would continue to work with the National Park Service and local non-federal partners to manage the Old Spanish Trail. The Tabeguache Trail would not be petitioned for listing as a national recreational trail.

No special restrictions would be put in place for surface occupancy or fluid mineral leasing surrounding the Old Spanish Trail, which could result in impacts on visual resources or setting for the trail.

Visual resource management has the potential to impact the natural scenic qualities of trails. Under Alternative A, portions of the Old Spanish Trail would be managed as VRM Class III and portions would have no VRM designation. VRM Class III areas allow for moderate changes to the landscape that may be noticeable. In areas without a VRM classification, projects would be required to meet VRM objectives on a case-by-case basis. In both cases, development may be permitted that could impact the scenic qualities of the trail.

Fluid mineral leasing and development along portions of the Old Spanish Trail with no VRM designation could inhibit the BLM's ability to continue to achieve the nature and purpose of the trail.

Alternative B

Under Alternative B, management of the Old Spanish Trail would continue as described under Alternative A. In addition, an NSO stipulation prohibiting surface occupancy and surface-disturbing activities within a 50-meter buffer around the Old Spanish Trail would be in place, providing more protection from surface-disturbing activities than under Alternative A. The BLM would not petition the Tabeguache Trail for listing as a National Recreation Trail, and there would be no special management actions targeted at enhancing its recreational value.

Under Alternative B, a 50-meter buffer around the Old Spanish Trail would be managed as VRM Class III, providing more protection from disturbance than under Alternative A. Minimal visual impacts on the Old Spanish Trail are

anticipated because the trail corridor was categorized as VRI Class IV during the 2009 visual resource inventory (Otak 2009). Impacts would be similar to those described under Alternative A. The Tabeguache Trail would be managed as VRM Class II, providing an adequate level of protection necessary to protect users' experiences. However, since VRM Class II objectives also limit the type and visibility of development that can occur, this designation may preclude some development necessary to support recreational use along the trail.

Under Alternative B, 50 meters on either side of the Old Spanish Trail would be managed as a ROW avoidance area limiting the impacts from new transmission and roadway development.

Protecting against soil erosion and improving soils to maintain vegetative cover is proposed under Alternative B. These measures have the potential to impose restrictions on recreational development and management activities associated with trails.

The combination of an NSO stipulation, consistent VRM designation along the entire Old Spanish Trail, and management as ROW avoidance would allow the BLM to achieve the nature and purpose of the trail.

Under Alternative B, the BLM would not petition to have the Tabeguache Trail listed as a National Recreation Trail as described in the National Trails System Act of 1968 as amended (PL 90-543). Recreational use of the trail is not likely to increase as much as if the BLM were to petition for listing; there would be fewer opportunities to improve interpretation and education regarding the natural, cultural, and historical resources associated with the trail, but less pressure on trail resources, including cultural and historic resources adjacent to the trail. The portion of the Tabeguache Trail located within Bangs SRMA would be managed according to the management actions of the SRMA. A portion of the Tabeguache Trail passes through the Rough Canyon ACEC. If activities associated with trail management were found to impact the relevant and important values for which the ACEC was designated, activities would be modified, which could limit certain uses of the trail.

Implementation of an interpretation and environmental education program under Alternative B would enhance awareness and appreciation of national trails within the decision area.

Alternative C

Under Alternative C, management of the Old Spanish Trail would continue as described under Alternative A. In addition, an NSO stipulation prohibiting surface occupancy and surface-disturbing activities within a 0.5-mile buffer of the Old Spanish Trail would be in place. A CSU stipulation would be applied within 5 miles of either side of the Old Spanish Trail. Combined, these stipulations would provide the most protection from surface-disturbing activities of any alternative. Impacts from oil and gas would be minimal for both the Old Spanish

and Tabeguache Trails due to restrictions in place and low potential adjacent to the trails.

Under Alternative C, a 50-meter buffer around the Old Spanish Trail would be managed as VRM Class III, providing more protection from disturbance than under Alternative A, but still allowing for some visual disturbance along the trail. As under Alternative B, VRM management for the Old Spanish Trail would result in minimal impacts because the trail corridor was categorized as VRI Class IV during the 2009 visual resource inventory (Otak 2009). Impacts from VRM along the Tabeguache Trail would be the same as those described under Alternative B.

Under Alternative C, 50 meters on either side of the Old Spanish Trail would be managed as a ROW avoidance area limiting the impacts from new transmission and roadway development.

Protecting against soil erosion and improving soils to maintain vegetative cover is proposed under Alternative C, the impacts of which are the same as those described under Alternative B.

The combination of NSO and CSU stipulations, consistent VRM designation along the entire Old Spanish Trail, and management as ROW avoidance would allow the BLM to achieve the nature and purpose of the trail.

Management actions to protect Rough Canyon Creek, which would be found suitable for inclusion in the NWSRS, may impact the Tabeguache Trail since it overlaps the WSR study corridor. If activities associated with trail management were found to impact ORVs or tentative classification of the segment, activities would be modified. Impacts from the WSR segment are likely negligible due to the location of the trail on the canyon rim away from the river. All other impacts on Tabeguache Trail would be similar to those described for Alternative B.

Implementation of an interpretation and environmental education program under Alternative C would enhance awareness and appreciation of national trails within the decision area.

Alternative D

Under Alternative D, the Old Spanish Trail would continue to be managed as described under Alternative A. In addition, an NSO stipulation prohibiting surface occupancy and surface-disturbing activities within a 50-meter buffer around the Old Spanish Trail would be in place. Impacts from fluid minerals would be minimal for both the Old Spanish and Tabeguache Trails due to restrictions in place and low potential adjacent to the trails.

Under Alternative D, a 50-meter buffer around the Old Spanish Trail would be managed as VRM Class IV, providing similar protection from disturbance as

under Alternative A. Impacts from VRM on the Tabeguache Trail would be the same as those described under Alternative B.

Under Alternative D, 50 meters on either side of the Old Spanish Trail would be managed as a ROW avoidance area limiting the impacts from new transmission and roadway development.

Protecting against soil erosion and improving soils to maintain vegetative cover is proposed under Alternative D, the impacts of which are the same as those described under Alternative B.

Applying an NSO stipulation and managing the corridor as ROW avoidance would help the BLM achieve the nature and purpose of the Old Spanish Trail. However, the VRM Class IV designation could inhibit the BLM's ability to continue to achieve the nature and purpose of the trail if development substantially interferes with the nature and purpose.

Implementation of an interpretation and environmental education program under Alternative D would enhance awareness and appreciation of national trails within the decision area.

Cumulative

The CIAA used to analyze cumulative impacts on national trails includes the entire planning area, as well as adjacent BLM field offices in which the Old Spanish National Historic Trail or Tabeguache Trail occurs. The Old Spanish Trail is the only national trail adjacent to or within the planning area boundary. It also occurs within the Uncompahgre Field Office to the south and the Moab Field Office to the west. Management of the Old Spanish Trail in those field offices is similar to the management prescribed in this plan. Under the agency preferred alternative in the Uncompahgre RMP revision, being revised at this time, the BLM would not petition for the designation of the Tabeguache Trail as a National Recreation Trail because sections of the trail are built for low-clearance passenger vehicles, which does not meet the criteria for designation.

Past, present, and reasonably foreseeable actions with the potential to have cumulative impacts on national trails include continued oil and gas development, ROW location, and, most importantly, increasing recreation and visitor use in the region putting additional pressure on trails. As discussed, management of the Old Spanish Trail is conducted in coordination with the National Park Service and local non-federal partners. Management plan development for this trail, as well as management direction provided for the Tabeguache Trail from adjacent BLM field offices or federal land managers has the potential to decrease the potential for degradation and assist in the preservation of natural, cultural and historic trail resources.

4.5.5 National, State, and BLM Byways

This section discusses the impacts on national, state, and BLM byways from proposed management actions of other resources and resource uses. Existing conditions concerning national, state, and BLM byways are described in **Section 3.4.5**, National, State, and BLM Byways.

Byways, including scenic and historic byways, are an important resource that support recreation needs on BLM-administered lands and tourism needs of local communities.

Byways are used frequently and are susceptible to direct and indirect impacts. Direct impacts on byways include any action that substantially limits or prevents the use of the byways. Indirect impacts include actions that alter the scenic or historic values associated with the byway.

Methods of Analysis

Indicators of impacts on national, state, and BLM byways include the following:

- Management actions that fail to prevent irreparable damage to important archaeological, historic, cultural, natural, recreational, or scenic qualities of a byway.

The analysis includes the following assumption:

- Management prescribed for national, state, and BLM byways will provide opportunities for motor touring while enhancing the understanding of the multiple uses of public lands.

Effects Common to All Alternatives

For all alternatives the BLM would support the management of designated national highways within the planning area consistent with other resources. Designated byways include the Grand Mesa Scenic and Historic Byway, Dinosaur Diamond National Scenic Highway, Unaweep-Tabeguache Scenic and Historic Byway, and any additional byways designated by the US Secretary of Transportation during the life of the plan. The BLM would work with local, state, and federal partners to manage these byways.

Management of BLM resources along the lands adjacent to scenic byways may affect the visitors experience depending on the permitted activities. Generally, surface-disturbing activities would not enhance the visitor experience as they would detract from the byways' historic, natural, or scenic qualities. However, management actions such as applying NSO stipulations, closing areas to fluid mineral leasing, identifying ROW avoidance and exclusion areas, and special designations such as WSAs, ACECs, and WSRs could all benefit byways by restricting or minimizing surface disturbance thus preserving the historic, natural and scenic qualities of lands adjacent to byways. Impacts from these management actions, including those adjacent to byways, are discussed by

alternative. Visual impacts from mineral development or exploration, such as dust clouds, could occur in most of these areas and would impact visitor experiences; however, the impact would be short term. In addition, for all alternatives, there is little overlap of lands adjacent to byways and areas with high or moderate fluid mineral potential, therefore fluid minerals development is not likely to result in significant changes to scenic and historic qualities for byways.

VRM Classes I and II benefit byways by limiting surface disturbance that could detract from scenic values. While byways themselves do not mandate a specific VRM classification, VRM classifications from management of adjacent or overlapping resources may result in protection of scenic values on lands surrounding byways (see **Section 4.3.10**, Visual Resources).

Restoring unhealthy vegetation communities and reducing infestations of noxious weeds could indirectly affect byways by enhancing the natural diversity of the native landscape in areas adjacent to the byways. Short-term disturbance may occur due to the use of machinery for vegetation manipulation, but these effects would be temporary. Weed treatments, such as the removal of tamarisk or Russian olive, would provide localized benefit, particularly along the Unaweep-Tabeguache Scenic and Historic Byway where it parallels the Dolores River. Similarly, promoting, and protecting paleontological resources associated with the Dinosaur Diamond National Scenic Byway would enhance this byway.

Stipulations to protect against soil erosion and maintain vegetative cover are proposed under all alternatives and would impact byways by enhancing or preserving the scenic qualities of adjacent lands.

The byways that would be managed and/or designated under each alternative are displayed in **Table 4-69**, Miles of Designated Byways.

Table 4-69
Miles of Designated Byways

	Alt A	Alt B	Alt C	Alt D
National Byway				
Dinosaur-Diamond	22	22	22	22
State Byways				
Grand Mesa	4	4	4	4
Unaweep-Tabeguache	28	28	28	28
Total	**32**	**32**	**32**	**32**
BLM Byways				
Land's End	n/a	n/a	n/a	2
John Brown's Canyon	n/a	n/a	n/a	6
Niche to Blue Mesa	n/a	n/a	n/a	14
Winter Flats Road	n/a	n/a	n/a	26
Total	**n/a**	**n/a**	**n/a**	**48**

Source: BLM 2010a

Implementing management for the following resources would have negligible or no impact on byways and are therefore not discussed in detail: air quality; special status species; fish and wildlife; wild horses; wildland fire management; lands with wilderness characteristics; forestry; livestock grazing; WSAs; and national trails.

Alternative A

Under Alternative A, efforts to protect scenic ORVs along eligible WSR segments would benefit scenic values of the byways by prohibiting or limiting most surface-disturbing activities. The WSR study corridor of the Dolores River, North Fork West Creek, West Creek, and Ute Creek all overlap the Unaweep-Tabeguache Byway.

No restrictions on fluid mineral extraction specific to byways would be in place under this alternative; therefore, impacts on the adjacent landscapes from fluid mineral development could occur, but are unlikely due to the limited mineral potential adjacent to byways.

NSO stipulations for cultural resources would limit impacts on visual resources and therefore protect adjacent byways.

Lack of interpretation and environmental education resources along byways could result in user actions that degrade historic or natural qualities of lands adjacent to byways should sensitive resources not be protected for other resource programs.

By not establishing any BLM byways, resources along those roads would not receive the level of public recognition and traffic would not increase at levels commensurate with an official byway.

Alternative B

As under Alternative A, no BLM byways would be established under this alternative. As a result, fewer visitors to byways would be anticipated under this alternative and impacts would be the same as those described under Alternative A.

A CSU stipulation would apply to fluid mineral leasing and other surface-disturbing activities within 0.5-mile of either side of the centerline of scenic byways. Fluid mineral potential for the buffer surrounding byways under Alternative B is, however, limited. Within the area covered by the CSU stipulation, 10,600 acres are in areas with potential; 9,900 acres of no potential are found within the buffer. Development of fluid minerals could impact scenic or historic values of byways through the introduction of new facilities and increased traffic.

Surface use restrictions proposed for cultural resource protection would limit impacts on visual resources and therefore protect scenic qualities associated with any adjacent byways.

Alternative C

As under Alternative A, no BLM byways would be established under this alternative. As a result, fewer visitors to byways would be anticipated under this alternative and impacts would be the same as those described under Alternative A.

Impacts from WSR management actions would be the same as those described under Alternative A.

Under Alternative C, a CSU stipulation within 0.5-mile of scenic byways would be applied. This stipulation would cover 15,400 acres surrounding 25 miles of scenic byways, all of which falls within low potential areas for fluid mineral development. Due to the lack of fluid mineral potential adjacent to the byways, development of fluid minerals is not likely to impact scenic or historic values of byways.

Surface use restrictions proposed for cultural resource protection would limit impacts on visual resources and therefore protect adjacent byways.

Alternative D

Four BLM byways would be established under this alternative: Land's End, John Brown's Canyon, Niche to Blue Mesa, and Winter Flats Road (see **Table 4-69**). There would likely be an increase in driving for pleasure on newly designated routes and impacts would be similar to those described under Alternative B.

A portion of the Unaweep-Tabeguache and Niche Road byways would run through the Dolores River Canyon SRMA, and driving for pleasure combined with SRMA visitation could lead to an increase in use. As discussed for Alternative B, enhanced awareness and appreciation can result in increased protective actions but may also strain resources. In addition, noticeable increases in traffic may be perceived as a negative impact by local residents who value remote settings or depend on the byways for transportation.

A CSU stipulation would be applied within 0.25-mile of scenic byways and would cover 15,900 acres encompassing 52 miles of roads. Similar to Alternatives B and C, fluid mineral potential for the buffer surrounding byways is limited. The CSU would apply to 3,300 acres of moderate potential along 10 miles of road and 12,600 acres of low potential along 42 miles of road. Due to the lack of high fluid mineral potential adjacent to the byways, development of fluid minerals is not likely to impact scenic or historic values of byways.

Surface use restrictions proposed for cultural resource protection would limit impacts on visual resources and therefore protect adjacent byways.

Cumulative

The CIAA used to analyze cumulative impacts on byways includes the planning area and the Grand Mesa Scenic Byway, the only byway on lands adjacent to the planning area boundary.

Proposed management actions likely to have the greatest effect on byways in the GJFO planning area are activities associated with energy and minerals development, land use, and visitor use. Energy development has potential to impact byways by altering visual landscapes through the addition of pipelines or transmission lines and increased truck traffic on roadways. Certain land uses that surround BLM-administered lands, such as continued growth and development, also have the potential to affect byways by leading to increased visitor use of byways and increased demand for resources such as housing, energy and utilities, the development of which has the potential to impact naturalness of lands surrounding byways by converting lands from their natural setting.

4.6 SOCIAL AND ECONOMIC CONDITIONS

This section is a description of the support conditions in the GJFO planning area and follows the order of topics addressed in **Chapter 3**:

- Native American tribal uses
- Public health and safety
- Socioeconomics and environmental justice

4.6.1 Native American Tribal Uses

This section addresses potential effects from management actions on Native American tribal interests, specifically Indian Trust Assets, treaty-based rights, and reservation lands. Indian Trust Assets are legal interests in property, physical assets, or intangible property rights held in trust by the US for Indian tribes or individual Indians. There are no known Indian Trust Assets or treaty-based rights or responsibilities of the BLM in the planning area; therefore, no further analysis is required.

If Indian Trust Assets or treaty-based rights are revealed during the RMP process or implementation, the BLM will conduct consultation and fulfill its obligations under applicable treaties, the tribal trust relationship, various federal laws, DOI and BLM regulations, and guidance and executive orders. The BLM, as a federal agency, will continue to maintain government-to-government relationships with federally recognized Indian tribes and will consult with tribes during resource management actions affecting tribal lands and resources.

Overall socioeconomic effects from management actions are discussed in **Section 4.6.3**, Socioeconomics and Environmental Justice. Cultural and traditional tribal uses of the planning area include gathering and harvesting plants, medicines, material, hunting, fishing, and ceremonial and religious use.

Effects on traditional cultural properties, sacred sites, culturally important natural resources, traditional practices, and tribal access are discussed in **Section 4.3.8**, Cultural Resources.

4.6.2 Public Health and Safety

This section discusses impacts on public health and safety from proposed management actions of other resources and resource uses. Existing conditions concerning public health and safety are described in **Section 3.6.2**, Public Health and Safety.

Methods of Analysis

The analysis includes the following assumptions:

- Public health and safety issues will receive priority consideration in the management of BLM-administered lands.
- Demand for safe visits will increase with increasing numbers of public land users.
- Activities and resources available in and around the planning area will continue to be important to the health and safety of current and future residents.
- Most abandoned mine sites in the planning area are identified and characterized.
- All new hazardous materials and waste sites are identified and characterized.
- Resource development activities identify any possible generation of hazardous waste.
- No substantial new hazardous materials uses and (or) waste generating occurs within the planning area.
- The BLM's Hazard Management and Resource Restoration Program responds to all hazardous material releases on public surface. Emergency cleanup actions are implemented on sites posing a substantial threat to the public and (or) the environment.

The pace and timing of mineral development activities is dependent on a variety of factors outside the management decisions of BLM. These include national and international energy demand and prices, production factors within the planning area, and business strategies of operators. Because the pace of development in the planning area is unknown, a relatively constant rate of development is assumed for this analysis. Therefore, actual impacts could vary if the rate of development or production changes over the study period.

Effects Common to All Alternatives

ROW exclusion areas preclude the development of projects such as energy facilities and transmission lines. Since the construction, operation and

maintenance of such development projects come with associated safety risks for both workers and the public, alternatives that have greater acreages of ROW exclusion areas are considered to have lower long-term, indirect health and safety impacts.

Lands that are open for consideration for mineral material sales have the potential for future health and safety risks related to mining activities. The number of acres open to mineral material sales is considered to be proportional to the potential for long-term, indirect health and safety risks.

Lands that are open for fluid mineral leasing have the potential for future health and safety risks related to oil, gas, and geothermal exploration, development, operation, and decommissioning. The number of acres open for leasing is considered to be proportional to the potential for long-term, direct health and safety impacts. In recent years, public concern has become heightened regarding emissions of chemicals to the atmosphere in conjunction with oil and gas production and potential contamination of freshwater aquifers, domestic or municipal water wells, and surface waters, particularly in relation to hydraulic fracturing. To date, no studies have documented significant cancer-based or noncancer-based public health risks from oil and gas operations using emission rates and operational practices typical of current development in the GJFO. However, as with spills and other accidental releases on pads or during fluids transport, potential risks from airborne or groundwater-borne chemicals would be statistically related to the amount of oil and gas activity. Use, storage, and transportation of fluids such as produced water, hydraulic fracturing fluids, and condensate have the possibility of spills that could migrate to surface or groundwater causing human health impacts. The possibility that hydraulic fracturing fluids may migrate to shallow groundwater sources is still speculative based on ongoing studies by the EPA (EPA 2011a). Hydraulic fracturing occurs in the gas-producing formations at depths greater than 5,000 feet in the GJFO. Water, sand, and chemical additives are pumped into the formation at extremely high pressure to create fractures that allow gas to flow into the well. Theoretically, improperly completed wells or perforations into zones of geological weakness (i.e., faults or fractures) could create conduits that allow hydraulic fracturing fluids, produced water, and methane to migrate to groundwater resources. If a groundwater source is contaminated, there are few cost-effective ways to reclaim that water source; thus, the long-term impacts of groundwater contamination are considerable. In addition to BLM Onshore Orders 43 CFR 3160) and COGCCs requirements for well completions (COGCC 2010b), GJFO protects surface and shallow groundwater through stipulations and site-specific COAs for drilling, completions, and fluids management.

Lands that are acceptable for further coal leasing and development have the potential for future health and safety risks related to coal mining. The acres

acceptable for further leasing and development are considered to be proportional to the potential for long-term, direct health and safety impacts.

Hazardous fuels treatments, including prescribed fire and mechanical treatment, would improve public safety by reducing fire hazard. Many of these fuels treatments occur in locations to reduce the chance of a wildfire burning from BLM-administered lands onto adjacent private lands. These fuels treatments reduce the fire behavior when a wildfire burns into them, increasing the potential of success of fire suppression operations. Treatments to reduce hazardous fuels also help protect other public land users that could become trapped, injured, or even killed during a wildfire event. The highest priority of the Wildland Fire Management program, which includes the fuels program, is to protect firefighter and public safety.

Surface waters can be indirectly impacted over the long term from development activities in the same watershed and from livestock grazing, which can introduce both chemical and biological (e.g., fecal coliform, nitrogen) contamination into waters. Contaminated surface waters pose health risks to recreational users who may come into contact with those waters. Development activities in the vicinity of drinking water aquifers (groundwater) pose a risk of contamination of those aquifers and health impacts on consumers of the groundwater. All alternatives include a planning objective to protect municipal watersheds and source water protection areas, however, actions vary between alternatives.

Under all alternatives, livestock grazing has the potential for human interaction and injury. The potential for long-term, indirect impacts are considered to be in direct proportion to the acreages that are open for livestock grazing under each alternative, and therefore, the level of risk varies by alternative along with these acreages.

Managing No Shooting Areas improves public health and safety by limiting the risk of the public being injured by gunfire. The potential for long-term, direct impacts are considered to be inversely proportional to the acreages that are closed for shooting under each alternative, and therefore, the level of risk varies by alternative along with these acreages.

Implementing management for the following resources would have negligible or no impact on public health and safety and are therefore not discussed in detail: air quality; soils resources; vegetation; special status species; fish and wildlife; wild horses; cultural resources; paleontology; visual resources; lands with wilderness characteristics; forestry; WSAs; ACECs; national trails; and national, state, and BLM byways.

Alternative A

There are no public health and safety impacts uniquely associated with Alternative A. As a result, impacts under this alternative would be similar to

those described under Effects Common to all Alternatives and all current conditions and trends would be expected to continue.

Alternative B

Alternative B promotes the delisting of impaired water bodies (303d listed) by monitoring actions, including, but not limited to, grazing, comprehensive travel and transportation management, and other surface-disturbing actions and implementing appropriate management change. This management action could improve water quality in currently impaired water bodies and result in lower health risks for users of those waters.

The use of chemical treatments in wildland fire management and vegetation treatments for weeds would result in increased use, storage, transportation of these chemicals, and a related increase in potential for human health risks through exposure.

Prohibiting recreational target shooting in Coal Canyon would address the numerous complaints from the public over safety issues, enhance public safety in a prime horse viewing area for both visitors and residents alike, and guard against the reoccurrence of horses being shot in the canyon.

Alternative B would reduce risks to public health and safety by implementing safety signs in shooting areas and providing safety guidelines on safe shooting practices. The risks associated with recreational target shooting would be the same as those described under Effects Common to all Alternatives. Alternative B contains the second-most No Shooting Areas.

Alternative C

Alternative C would also promote the delisting of impaired water bodies (303d listed). The impacts of which would be similar to those described under Alternative B.

The use of chemical treatments in wildland fire management and vegetation treatments for weeds would be minimized, resulting in impacts that may be slightly less than those described under Alternative B.

Alternative C would also reduce risks to public health and safety by implementing safety signs in shooting areas and providing safety guidelines on safe shooting practices. The risks associated with recreational target shooting would be the same as those described under Effects Common to all Alternatives, but would occur over a smaller area. Alternative C contains the most No Shooting Areas of the action alternatives because of concerns regarding resource damage from this activity.

Alternative D

Alternative D would also promote the delisting of impaired water bodies (303d listed). The impacts of which would be similar to those described under Alternative B.

The use of chemical treatments in wildland fire management and vegetation treatments for weeds would be minimized, resulting in impacts that may be slightly less than those described under Alternative B.

Alternative D would also reduce risks to public health and safety by implementing safety signs in shooting areas and providing safety guidelines on safe shooting practices. The risks associated with recreational target shooting would be the same as those described under Effects Common to all Alternatives, and Alternative D would manage the fewest acres as closed to target shooting.

Cumulative

The CIAA used to analyze cumulative impacts on public health and safety is composed of fourth-order watersheds that completely or partially overlap the planning area. Fourth-order watersheds were used as the basic unit of analysis because impacts from most management actions proposed under the RMP and other existing activity plans are not expected to have cumulative influence beyond this scale.

Past and present actions that have affected public health and safety include illegal dumping of hazardous waste, dispersed or unmanaged target shooting, visitors finding themselves unprepared for remote settings, risks from abandoned mine openings, and risks associated with sites that are being used or were used for resource extraction.

Over the lifespan of the RMP, these actions and risks are expected to continue to grow in proportion to the increasing population of the CIAA and increasing use of BLM-administered lands by a regional and national audience. A larger population may result in more people dumping trash and hazardous wastes and a greater strain on law enforcement. If energy development increases, risks associated with extractive infrastructure would be expected to rise.

4.6.3 Socioeconomics and Environmental Justice

This section was prepared for and in cooperation with the GJFO by researchers at Colorado Mesa University. BLM has reviewed and accepted the information contained in the following section.

This section discusses impacts on socioeconomics and environmental justice from proposed management actions of other resources and resource uses. Existing conditions concerning socioeconomics and environmental justice are described in **Section 3.6.3**, Socioeconomics, and **Section 3.6.4**, Environmental Justice.

Methods of Analysis

Analysis in this chapter includes three prominent activities that take place on land administered by the GJFO: recreation, livestock grazing, and energy resource extraction, especially natural gas drilling and production. Other contributions to regional economic and social conditions are also examined, including potential renewable energy development and the role for environmental amenities in attracting residents and businesses. All of these activities can bring benefits to the region but can also impose costs. Impact analysis does not formally weigh costs and benefits but should make clear the presence of both.

Market and Non-market Values

Economic analysis takes one of two forms depending on the available data. For those activities that generate measurable spending (market values), the analysis estimates economic impact in terms of output (total spending), value added (income), and employment in the regional economy. Spending to produce natural gas, to raise cattle, and to recreate on BLM land fits this type of analysis. The analysis uses the IMPLAN model, which was developed by the Minnesota IMPLAN Group. The input-output analysis performed by IMPLAN, in essence, measures the cumulative impact from an initial dollar of spending that makes its way through the economy. Three types of impacts are measured. Direct impacts are income and employment directly affected by activity on BLM land, e.g., a rancher spends money with a local veterinarian. Indirect impacts occur when related industries gain from purchases by the directly impacted businesses, e.g., the veterinarian buys supplies from local firms. Induced impacts are the results of spending by employees hired due to the business activity just described. Together, these are reported as the total impact of the different management alternatives.

Not all economic values can be measured by market transactions. If people are willing to pay for an item or experience, it has economic value to them even if they can enjoy it without payment, e.g., free entry to BLM lands. Furthermore, if people are willing to pay to ensure a particular outcome, such as wilderness preservation, that outcome has economic value for them whether or not a mechanism exists for them to achieve it. Finally, environmental amenities can attract individuals or businesses to an area. In terms of workers, for example, this value can be described as a willingness to work for lower wages or salaries in order to partake of those amenities. These non-market values can be estimated, but that has not been done for land administered by GJFO. This analysis looks at values estimated for similar settings and note that, even when estimates aren't available, the existence of such values should be acknowledged.

Indicators

Socioeconomic indicators are used to identify the relative effects that the different management alternatives have on the regional economy and society.

Indicators of impacts on market value outcomes include the following:

- Output (Total Spending)
- Value Added (Income)
- Level of Employment

The market value indicators will be determined by changes in indicators particular to each activity analyzed.

The indicator for livestock grazing will be changes in the number of cattle grazed (derived from changes in AUMs).

The indicators for natural gas drilling and production include the following:

- Wells drilled
- Wells completed
- Producing wells

The indicators for recreation include the following:

- Number of out of area visitors
- Number of participants per recreation category

Indicators for non-market outcomes include the following:

- Willingness to pay for a tangible good or an experience
- Willingness to pay to secure a desired outcome

Assumptions

The analysis includes the following assumptions for livestock grazing:

- The actual AUMs utilized will be the same in each of the 20 years of the planning period.
- A decrease in actual AUMs will represent a corresponding decrease in cattle grazing.

The analysis includes the following assumptions for natural gas drilling and production:

- Increasing or decreasing acres available for leasing will change the number of wells drilled, the number of wells completed, and the level of natural gas production in proportion to the change in acres.
- Stipulating land as NSO will increase well drilling and completion costs by 10 to 100 percent. Costs increase because the drilling pad

would have to be placed outside the NSO boundary or an exception would have to be sought to drill inside the boundary. Removing such a stipulation will reduce those costs by 10 to 50 percent.

- Large blocks of NSO stipulations can make it impossible to reach fluid minerals, even with directional and new horizontal drilling technologies. The technology is constantly improving, so it is unclear at what point NSO blocks are considered too large to allow for mineral extraction. In order to compare alternatives, this analysis will assume that 15 percent of the NSO areas will not be accessible by directional or horizontal drilling.
- A stipulation that increases costs will have two effects. It will decrease drilling and, therefore, production, which will lessen the economic impact. At the same time the higher costs will increase spending on drilling that does take place, which will increase the economic impact.
- Existing leases and claims would not be affected by the closures or withdrawals proposed under this RMP.
- Valid existing leases would be managed under the stipulations in effect when the leases were issued; new stipulations proposed under this RMP would apply on new leases.
- Other land use stipulations limit the timing or location of drilling and related development to minimize impacts to resources but will not reduce drilling.
- Of wells drilled, 10 percent will be dry holes.
- Wells completed during the planning period will produce throughout the planning period.
- Only wells completed during the planning period will be counted as producing wells for the analysis.
- Scenario 1 assumes that 11 wells are drilled per year: the average number drilled over the preceding 20 years.
- Scenario 2 assumes that 39 wells are drilled per year: the largest number of wells drilled in any year on record.
- Scenario 3 assumes that 197 wells are drilled per year: based on the planning period estimate from the RFD.
- Future drilling will include a mix of conventional/directional and horizontal wells. Each scenario includes such a mix.

The analysis includes the following assumptions for recreation:

- According to the base theory of economic development, the regional economic impact of recreation derives from spending by visitors from outside the local economy. In that sense recreation is like an export, except that the consumers travel to the resource to use it.
- Recreation use will continue to increase over the study period. The estimate for this report is a 1.26 percent per year increase.
- Adjusted, vehicle counter data will be assumed to represent the number of visitors for recreation purposes.

Forecasts of Population and Total Employment

The communities in the GJFO planning area are anticipated to continue their population growth over the next 20 years. According to the Colorado Department of Local Affairs, population is expected to grow by roughly an average of 1.5 percent per year between 2010 and 2030. Long term projections place the county's population at 167,385 residents in 2020 and 197,380 residents in 2030. As the population continues to grow over the next 20 years, communities are likely to see continued economic growth. For example, the total number of jobs is projected to increase from 72,402 jobs in 2010 to 89,247 jobs in 2020 and is expected to reach 105,026 jobs in 2030.

Impacts by Economic Sector

Summary Tables

The detailed analysis of economic impacts that follows is organized by economic sector (activity). However, the two tables below summarize these impacts by alternative. **Table 4-71**, Comparison of Socioeconomic Indicators by Alternative; Values for 2029 (Year 20 of Planning Period), compares the level of activity for the socioeconomic indicators of each sector. The values shown for comparison are from 2029, which is year 20 of the planning period. Notice that for livestock grazing two scenarios are analyzed: a higher level of activity and a lower level of activity. For natural gas drilling and extraction three levels of activity are analyzed. Each of those activity levels is analyzed as if NSO stipulations impose relatively lower costs on drilling and then again as if NSO stipulation costs are higher. The number of wells drilled and the number producing are very close to the same in the two cost scenarios and are reported as identical in the table. The numbers for recreation are significantly higher than in the DRMP because the estimates for numbers of visitors have been increased. In addition, a second scenario for recreation has been included. This is based on spending patterns developed by the National Forest Service's National Visitor Use Monitoring (NVUM) program. These values are higher than the values estimated for GJFO, largely because NVUM reports significantly higher spending by bicyclists and hikers than did the estimate for GJFO. The estimates for spending by OHV users was higher in the NVUM estimates but much closer to the GJFO estimates.

Table 4-70, Comparison of Economic Impacts by Alternative; Values for 2029 (Year 20 of Planning Period) (2014 dollars), summarizes the quantifiable economic impacts described in the following sections. The values are based on the level of activity shown in **Table 4-71**, Comparison of Socioeconomic Indicators by Alternative; Values for 2029 (Year 20 of Planning Period). The values shown for comparison are for 2029, which is year 20 of the planning period.

Table 4-70
Comparison of Economic Impacts by Alternative; Values for 2029
(Year 20 of Planning Period) (2014 dollars)

Activity / Impact	Alternative			
	A	Proposed Alternative	C	D
Grazing: Projected Actual AUM Use				
Total Spending	$2,866,851	$ 2,859,704	$ 1,660,848	$2,866,851
Value Added	$740,888	$ 739,041	$ 429,217	$740,888
Employment	34.4	34.3	19.9	34.4
Grazing: Maximum AUM Use				
Total Spending	$5,152,139	$5,109,011	$2,746,183	$5,152,139
Value Added	$1,331,481	$1,320,335	$709,703	$1,331,481
Employment	61.7	61.2	32.9	61.7
Gas Drilling and Extraction: 11 Wells (Lower NSO Costs)				
Total Spending	$102,617,424	$102,617,424	$92,992,999	$102,617,424
Value Added	$58,041,418	$58,041,418	$52,597,682	$58,041,418
Employment	313.9	313.9	284.4	313.9
Gas Drilling and Extraction: 39 Wells (Lower NSO Costs)				
Total Spending	$363,825,412	$363,825,412	$329,723,395	$363,825,412
Value Added	$205,783,206	$205,783,206	$186,494,774	$205,783,206
Employment	1,112.8	1,112.8	1,008.5	1,112.8
Gas Drilling and Extraction: 197 Wells (Lower NSO Costs)				
Total Spending	$1,888,039,322	$1,888,039,322	$1,711,070,193	$1,888,039,322
Value Added	$1,067,704,456	$1,067,704,456	$967,626,705	$1,067,704,456
Employment	5,755.4	5,755.4	5,215.9	5,755.4
Gas Drilling and Extraction: 11 Wells (Higher NSO Costs)				
Total Spending	$125,784,755	$125,784,755	$113,738,546	$125,784,755
Value Added	$71,058,743	$71,058,743	$64,255,344	$71,058,743
Employment	375.9	375.9	340.1	375.9
Gas Drilling and Extraction: 39 Wells (Higher NSO Costs)				
Total Spending	$445,964,134	$445,964,134	$404,811,771	$445,964,134
Value Added	$251,935,545	$251,935,545	$228,689,443	$251,935,545
Employment	1,332.8	1,332.8	1,210.0	1,332.8
Gas Drilling and Extraction: 197 Wells (Higher NSO Costs)				
Total Spending	$2,318,052,608	$2,318,052,608	$2,104,126,467	$2,318,052,608
Value Added	$1,309,321,532	$1,309,321,532	$1,188,497,464	$1,309,321,532
Employment	6,907.3	6,907.3	6,270.8	6,907.3

Table 4-70
Comparison of Economic Impacts by Alternative; Values for 2029
(Year 20 of Planning Period) (2014 dollars)

Activity / Impact	Alternative			
	A	Proposed Alternative	C	D
Recreational Use Based on GJFO Estimates				
Total Spending	$15,844,905	$15,990,022	$15,510,126	$15,813,822
Value Added	$9,441,794	$9,527,762	$9,241,4004	$9,422,925
Employment	169.4	170.9	165.9	169.1
Recreational Use Based on NVUM Estimates				
Total Spending	$ 30,054,918	$ 30,353,267	$ 29,545,651	$ 30,048,677
Value Added	$ 17,610,478	$ 17,785,136	$ 17,304,363	$ 17,603,545
Employment	325.6	328.8	320.1	325.6

Source: Calculations from BLM data

Table 4-71
Comparison of Socioeconomic Indicators by Alternative; Values for 2029
(Year 20 of Planning Period)

Activity / Indicators	Alternative			
	A	Proposed	C	D
Grazing: Projected Actual AUM Use				
Head of Cattle Grazed in 2029 (AUMs/12 months)	2,841	2,834	1,646	2,841
Grazing: Maximum AUM Use				
Head of Cattle Grazed in 2029 (AUMs/12 months)	5,106	5,063	2,722	5,106
Gas Drilling and Extraction: 11 Wells				
Wells drilled in 2029	11	11	10	11
Producing wells in 2029	198	199	180	202
Gas Drilling and Extraction: 39 Wells				
Wells drilled in 2029	39	39	35	39
Producing Wells in 2029	702	706	638	720
Gas Drilling and Extraction: 197 Wells				
Wells drilled in 2029	197	196.5	178.5	197
Producing wells in 2029	3,545	3,565	3,223	3,638
Recreational Use				
Total Visitors in 2029	999,319	1,009,311	977,932	997,219
Motorized visitors in 2029	469,680	474,376	450,892	464,983
Mechanized Visitors 2029	329,775	333,073	323,179	336,370
Non-mechanized Visitors in 2029	199,864	201,862	203,861	195,866

Source: Calculations from BLM data

The activity levels and dollar values shown are for the Grand Junction Field Office overall. The individual sections for grazing, natural gas, and recreation each also report values for Mesa and Garfield Counties individually.

Cumulative impacts over the entire planning period are summarized in **Tables 4-72** through **4-79**.

Impact on Agriculture

Livestock Grazing

Economic Impacts. In this analysis, the regional economic impacts result from the expenditures involved in raising the livestock. As described earlier, the IMPLAN analysis estimates the final impact of that spending on the regional economy. When this spending has played itself out, the total spending generated, resulting jobs, income earned, etc., are described as the economic impact of livestock production.

Cattle are by far the most common class of livestock permitted for grazing by GJFO; so much so, that the analysis assumes that all land used for grazing is used for cattle. On GJFO land as well as other BLM managed lands, there is a difference between available AUMs and those actually used over the course of a year. Available AUM's are defined as active AUM's on a permittee's grazing permit. Economic impact analysis requires that we distinguish between these two categories because only those AUMs utilized will contribute to an impact on the regional economy.

The economic impact of grazing derives from the number of cattle produced. For purposes of this analysis, the average AUM usage over the preceding ten years was calculated to establish historical use. A baseline for usage in Alternative A was established by comparing this historical usage to AUMs included for future use in that alternative. Then the changes in actual AUMs for the Proposed Alternative and for Alternatives C, and D were calculated. This gave the information for the first scenario reported in the analysis. A second scenario was run using the total number of AUMs available in each alternative. This represents the maximum possible use of grazing permits.

Alternatives A and D were projected to have the same number of cattle, 2,841. This is about 138 cattle fewer than the preceding ten year average, due to closure of some allotments or reduction of permitted AUMs available completed prior to this planning process during those ten years. The Proposed Alternative would result in only seven fewer head than alternatives A and D. Alternative C would reduce annual grazing to the equivalent of 1,646 cattle, 1,195 fewer than in alternatives A and D. Cattle budgets developed by Colorado State University were used to estimate the economic impact of the various alternatives. Prices over the period 2008-2011 were averaged to try to account for the fluctuation in cattle prices.

Table 4-72, Total Economic Impacts of Cattle Grazing by Alternative Based on Actual AUM Use (2014 dollars), reports the results of the analysis. Alternatives A and D are the same and would each generate more than $2.8 million in total spending, about $741 thousand in total value added (incomes) and about 34 jobs. The Proposed Alternative results in slightly smaller dollar values but essentially the same number of jobs. Alternative C lowers sales by more than $1.2 million; lowers value added (incomes) by over $300,000, and lowers employment by 14 jobs. Alternative C can be considered a considerable change compared to Alternatives A, B and D. The analysis assumes that this scenario repeats itself over the 20-year planning period.

Table 4-72
Total Economic Impacts of Cattle Grazing by Alternative Based on Actual AUM Use (2014 dollars)

Impact	A and D	Proposed	C
Total Output (Spending)	$2,866,851	$ 2,859,704	$1,660,848.0
Total Value Added (Income)	$740,888	$ 739,041	$ 429,217
Employment	34.4	34.3	19.9

Source: IMPLAN calculations from BLM data

A second analysis was also conducted to determine the economic impact if all available AUMs were utilized. Under this scenario, the number of cattle for Alternative A and D would be 5,106. There would be a slight reduction to 5,063 head under the Proposed Alternative , and a greater reduction to 2,722 cattle under Alternative C. **Table 4-73**, Total Economic Impacts of Cattle Grazing by Alternative Based on Maximum AUM Use (2014 dollars), describes the predicted economic impacts.

Table 4-73
Total Economic Impacts of Cattle Grazing by Alternative Based on Maximum AUM Use (2014 dollars)

Impact	A and D	Proposed	C
Total Output (Spending)	$5,152,139	$5,109,011	$2,746,183
Total Value Added (Income)	$1,331,481	$1,320,335.1	$709,703
Employment	61.7	61.2	32.9

Source: IMPLAN calculations from BLM data

In this analysis, Alternatives A and D would again have the greatest economic impact with over $5 million in total spending, over $1.3 million in total value added (incomes) and 61.7 jobs deriving from cattle production utilizing grazing on GJFO land. Alternative B has slightly lower dollar values but nearly the same employment. Alternative C shows a lesser economic impact with about $2.4 million less in total spending, more than 600 thousand dollars less in total value added (incomes), and 28 fewer jobs than in Alternatives A and D.

Table 4-74, Total Economic Impacts of Cattle Grazing by Alternative Based on Actual AUM Use Reported for Mesa and Garfield Counties (2014 dollars), breaks down the total economic impacts of grazing into impacts for Mesa and Garfield Counties individually. This is based on the relative number of AUMs in the two counties. The largest number of AUMs is in Mesa County; therefore, the greatest economic impact shows up in Mesa County.

Table 4-74
Total Economic Impacts of Cattle Grazing by Alternative
Based on Actual AUM Use Reported for Mesa and Garfield Counties(2014 dollars)

Impact for Mesa County	**A and D**	**Proposed**	**C**
Total Output (Spending)	$2,077,444	$ 2,072,264	$ 1,203,523
Total Value Added (Income)	$544,895	$ 543,537	$ 315,674
Employment	25.6	25.5	14.8
Impact for Garfield County	**A and D**	**Proposed**	**C**
Total Output (Spending)	$789,407	$787,440	$457,325
Total Value Added (Income)	$195,992	$195,504.1	$113,543.6
Employment	8.7	8.7	5.1

Source: IMPLAN calculations from BLM data

Table 4-75, Total Economic Impacts of Cattle Grazing by Alternative Based on Maximum AUM Use for Mesa and Garfield Counties (2014 dollars), breaks down the total economic impacts of grazing into impacts for Mesa and Garfield Counties individually. This is based on the relative number of AUMs in the two counties. The largest number of AUMs is in Mesa County; therefore, the greatest economic impact shows up in Mesa County.

Table 4-75
Total Economic Impacts of Cattle Grazing by Alternative
Based on Maximum AUM Use for Mesa and Garfield Counties(2014 dollars)

Impact for Mesa County	**A and D**	**Proposed**	**C**
Total Output (Spending)	$ 3,733,463	$ 3,702,210	$ 1,990,002
Total Value Added (Income)	$ 979,254	$ 971,057	$ 521,960.0
Employment	46.0	45.6	24.5
Impact for Garfield County	**A and D**	**Proposed**	**C**
Total Output (Spending)	$ 1,418,677	$ 1,406,801	$ 756,181
Total Value Added (Income)	$ 352,226	$ 349,278	$ 187,743
Employment	15.7	15.6	8.4

Source: IMPLAN calculations from BLM data

It is possible that a reduction in AUMs might not lead to a one-for-one reduction in cattle production if livestock producers substituted more locally grown alfalfa and private grazing land for lost AUMs.

Social Impacts. As described in Chapter 3 (Section 3.6.3, Socioeconomics), the communities of De Beque, Glade Park, Loma/Mack, and Gateway are

particularly associated with ranching. Social impacts from management of grazing on GJFO lands would be expected to be most noticeable in these areas. Alternatives A, Proposed, and D keep available AUMs at about the same level, allowing grazing to continue at the same level. These management practices themselves would not alter the social conditions described in Chapter 3. Alternative C would decrease available AUMs by about 40 percent. If ranchers were not able to replace that grazing capacity with private land or additional alfalfa feeding, it would lead to less ranching activity. Ranching incomes would certainly be reduced and some ranching operations might cease. If idle ranchland was converted to other uses, such as residential or commercial development, the rural character of these communities would lessen.

Impact on Natural Resource Extraction

As for many locations in Colorado, natural resource extraction has historically been a significant component of local economies in the planning area. The three most important have been coal, uranium, and natural gas. The socioeconomic impacts of the proposed alternatives are discussed below with each resource having its own section.

Natural Gas Drilling and Extraction

Economic Impacts. The regional economic impact of natural gas production on GJFO managed land results primarily from expenditures to drill wells and to extract gas from completed wells. To the extent that these expenditures circulate through the regional economy, they have a regional economic impact. The alternatives (A, B, C, and D) would have varying economic impacts if they result in different levels of drilling and/or extraction. A management plan can affect the level of drilling and extraction by either increasing or decreasing the land available for drilling or by increasing or decreasing the costs of those two activities. Management plans have no effect on the price of natural gas, which is the most important factor in the decision to produce or not to produce.

The Field Office has recently begun receiving applications to drill horizontal wells into shale formations. The RFD includes the development potential of the shale play. In the RFD report prepared by the GJFO, acreage available for natural gas leasing is divided into six categories by potential for production: very high, high, moderate, low, very low, and none for conventional/directional drilling as well as shale gas/horizontal drilling. The area with known potential for development in the RFD includes land already leased as well as land still available to be leased. This impact analysis considers drilling in the low to very high potential categories as the area of potential development.

Allocating land as unavailable to leasing or placing an NSO stipulation does not affect land currently under lease. Both of these actions would take effect only if a lease expired. Since steps can be taken to keep a lease active, an important assumption is that, as a practical matter, changes in both acreage available for

leasing and in NSO stipulations would affect only land not already leased. This would, of course, limit the effect on drilling by those management actions. The percentage of available acres not yet leased is around 22 percent of the area with development potential. Therefore, in the analysis, differences between the management alternatives would have a limited effect on production because they would affect only a small portion of the land available for production. **Table 4-76**, Number of Unleased Acres with NSO Stipulations by Alternative, shows for each alternative how many acres available for leasing within the area of development potential (Low, Moderate, High, or Very High development potential) remain unleased. It also indicates how many of those unleased acres are stipulated as NSO.

Table 4-76
Number of Unleased Acres Available for Leasing with NSO Stipulations by Alternative

Alternative A		Proposed Alternative		Alternative C		Alternative D	
Acres Not Leased	NSO Acres	Acres Not Leased	NSO Acres	Acres Not Leased	NSO Acres	Acres Not Leased	NSO Acres
172,039	77,509	166,000	70,100	97,198	42,387	171,303	58,541

Source: BLM

The economic impact analysis presented here is intended to compare the outcomes from the Proposed Alternative and Alternatives C, and D to the baseline of Alternative A, which continues current management practices. Because the alternatives are based on a different drilling strategy, which incorporates horizontal drilling, the cost structures are significantly different from past drilling. Therefore, it is not possible to take the calculated economic impacts and assume that they are an accurate representation of the recent economic impacts from natural gas production.

The first scenario run for this analysis assumes an average of 11 federal wells drilled annually. It is based on the average over the 20 years from1992-2011 and includes part of a bust as well as the recent boom. This scenario would result in 220 federal wells drilled over the next 20 years. Historically, 137 federal wells were drilled over the t ten years ending in 2011, and 220 were drilled over the 20 years ending in 2011. The highest number of federal wells ever drilled in a year was 39 in 2006; only three wells were drilled in 2009. Two wells were drilled during 2010, which is nominally the first year of the planning period. While recent assessments are that production in the area is starting to recover, no one is predicting a quick return to the peak production of the recent boom. A second scenario was run for an annual average of 39 wells drilled. This would represent 20 years of drilling at the highest level of drilling during the recent boom. Finally, a third scenario based on the RFD was run. This scenario assumed that 197 wells would be drilled in each year of the planning period.

The economic impact in any particular year is the result of the expenditures for drilling plus the expenditures for maintaining the wells that continue to produce gas in that year. It is assumed that 10 percent of wells drilled would be dry holes. Those dry holes would not generate the additional spending that goes with the completion costs for wells that are brought to the extraction stage. Drilling and completion costs are based on Authority for Expenditure (AFE) documents acquired from a regional producer by GJFO. The average life of natural gas wells in the planning area is 20 to 30 years (RFD); so the analysis assumes that each well completed during the planning period would be producing at the end of the planning period. This analysis is derived from one developed by Davies, et al. (2007).

Alternative A continues current management practices and serves as the baseline against which the other alternatives are compared. Alternative B in the Draft RMP/EIS slightly reduced the number of acres available for leasing and slightly reduced the number of acres affected by NSO stipulations. Overall, compared to Alternative A, it was as if 0.8 of a well is lost over the entire 20 years in Scenario 1. There are 2.5 fewer wells in Scenario 2 and a similarly small loss in Scenario 3. Alternative D also slightly reduces the acres available for leasing and reduces the number of acres subjected to NSO stipulations. Overall, compared to Alternative A the net impact is as if over the entire 20 years 0.15 of an additional well would be drilled in Scenario 1. For Scenario 2 less than one additional well would be drilled and for Scenario 3 fewer than five new wells. Again, the economic impact of Alternative D is analyzed to be the same as Alternative A.

The economic impact of Alternative C differs more from Alternative A. Alternative C removes enough acres from leasing that the analysis shows a marked decrease in production. As with alternatives B and D, the effect of changing NSO stipulations is negligible. For alternative C, the analysis shows the equivalent of about 20 fewer wells drilled over the 20 years compared to Alternative A in Scenario 1. For Scenario 2 the difference is about 73 wells, and for Scenario 3 the difference is 369 wells. That would be about 9 percent fewer wells. Alternative C would appear to have a noticeable impact while Alternatives A, B, and D are essentially equivalent.

In this Proposed RMP/Final EIS, Alternatives A, C, and D remain the same. The Proposed RMP has been modified from the original Alternative B in the Draft RMP/EIS. The Proposed RMP was compared to both Alternative B from the Draft RMP/EIS and to Alternative A to see if it differs significantly from them. Compared to Alternative A in Scenario 1, the Proposed RMP would reduce the economic impact by roughly the equivalent of 1.6 wells over the entire 20 year period. For Scenario 2, the reduction would be equivalent to about 5 wells over the 20 year period, and the reduction would be proportionally the same for Alternative 3. Compared to Alternative B in the Draft RMP/EIS, the impact of the Proposed RMP would be about 0.3% less. For the GJFO the impact of the

Proposed RMP is reported as being equivalent to the impact of Alternative B in the Draft RMP/EIS and also equivalent to the impact of Alternative A.

Since the Proposed RMP/Final EIS also breaks down the economic impact for Mesa and Garfield Counties separately, the Proposed RMP was compared to Alternative B of the Draft RMP/EIS in each county to see if it might have a significantly noticeable impact in one county or the other even though the overall impacts are equivalent. For Mesa County the difference between Alternative B of the Draft RMP/EIS and the Proposed RMP is negligible. Mesa County sees a reduction of slightly less than 3% in acres available to be leased, but many of those acres were already limited with NSO restrictions. For the Scenarios described above, the Proposed RMP would result in a roughly 0.03% reduction in economic impact compared to Alternative B. Garfield County loses no acres available for leasing, but sees an increase of over 3% in acres subjected to NSO stipulations in the Proposed RMP compared to Alternative B in the Draft RMP/EIS. It is necessary to remember though that only 26% of the available acres in Garfield County remain unleased. Compared to Alternative B in the Draft RMP/EIS, the Proposed RMP would reduce the economic impact by just over 0.05% for Garfield County. It is reported as being equivalent to Alternative B.

Tables 4-77, Total Economic Impacts of Gas Drilling and Extraction by Alternative, 2010, 2019, and 2029 Based on 11 New Wells per Year (2014 dollars), compares economic impacts between Alternative A (Proposed and D) and Alternative C based on an IMPLAN simulation. According to the analysis, in 2019 Alternative A would result in 24 more jobs and over $8.4 million more in total spending compared to Alternative C. The planning period ends in 2029 with 29.5 more jobs and about $9.6 million more in total spending for Alternative A than for Alternative C. Note that for both alternatives, the economic impacts in each succeeding year are greater than the year before due to the fact that wells drilled in previous years would continue to produce natural gas. The tables compare Alternatives A and C for each of the years shown.

Table 4-77
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029
Based on 11 New Wells per Year (2014 dollars)

	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$77,893,162	$70,591,908	$89,604,628	$81,202,950	$102,617,424	$92,992,999
Total Value Added (Income)	$43,776,636	$39,673,265	$50,533,624	$45,795,358	$58,041,418	$52,597,682
Employment	209.7	190.0	259	234.7	313.9	284.4

Source: IMPLAN calculations from BLM data

Table 4-78 reports this information for Mesa And Garfield Counties separately.

Table 4-78
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029 for Mesa and Garfield Counties
Based on 11 New Wells per Year (2014 dollars)

Mesa County	**2010 (Year 1)**		**2019 (Year 10)**		**2029 (Year 20)**	
	Alt. A (B & D)	**Alt. C**	**Alt. A (B & D)**	**Alt. C**	**Alt. A (B & D)**	**Alt. C**
Total Output (Spending)	$50,543,981	$45,806,268	$57,963,520	$52,528,674	$66,207,507	$59,998,015
Total Value Added (Income)	$28,486,620	$25,816,442	$32,661,109	$29,598,700	$37,299,458	$33,801,207
Employment	143.3	129.9	176.1	159.6	212.6	192.6
Garfield County	**2010 (Year 1)**		**2019 (Year 10)**		**2029 (Year 20)**	
	Alt. A (B & D)	**Alt. C**	**Alt. A (B & D)**	**Alt. C**	**Alt. A (B & D)**	**Alt. C**
Total Output (Spending)	$27,349,180	$24,785,639	$31,641,107	$28,674,276	$36,409,916	$32,994,984
Total Value Added (Income)	$15,290,015	$13,856,822	$17,872,514	$16,196,657	$20,741,959	$18,796,475
Employment	66.4	60.1	82.9	75.1	101.3	91.8

Source: IMPLAN calculations from BLM data

A second analysis was run using an average of 39 wells drilled per year. Thirty-nine was the maximum number of wells drilled on GJFO land in any year. Those 39 wells were drilled in 2006. The outline of the analysis parallels that above.

Again, Alternatives B and D have virtually the same outcome as Alternative A and are not reported separately. Alternative C results in reduced drilling and extraction compared to Alternative A as illustrated in **Table 4-79**, Total Economic Impacts of Gas Drilling and Extraction by Alternative, 2010, 2019, and 2029 Based on 39 New Wells per Year (2009 dollars). In the last year of the

Table 4-79
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029
Based on 39 New Wells per Year (2014 dollars)

	2010 (Year 1)		**2019 (Year 10)**		**2029 (Year 20)**	
	Alt. A (B & D)	**Alt. C**	**Alt. A (B & D)**	**Alt. C**	**Alt. A (B & D)**	**Alt. C**
Total Output (Spending)	$276,166,489	$250,280,934	$317,689,135	$287,911,573	$363,825,412	$329,723,395
Total Value Added (Income)	$155,207,977	$140,660,069	$179,164,663	$162,371,243	$205,783,206	$186,494,779
Employment	743.4	673.7	918.3	832.3	1,112.8	1,008.5

Source: IMPLAN calculations from BLM data

planning period, Alternative A would generate over $34 million dollars more in total spending, over $19 million more in value added, and about 104 more jobs than would Alternative C.

Table 4-80 breaks down this information for Mesa and Garfield Counties separately.

Table 4-80
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029 for Mesa and Garfield Counties
Based on 39 New Wells per Year (2014 dollars)

Mesa County	**2010 (Year 1)**		**2019 (Year 10)**		**2029 (Year 20)**	
	Alt. A (B & D)	**Alt. C**	**Alt. A (B & D)**	**Alt. C**	**Alt. A (B & D)**	**Alt. C**
Total Output (Spending)	$179,201,212	$162,404,378	$205,507,026	$186,244,491	$234,735,707	$212,733,504
Total Value Added (Income)	$100,997,923	$91,531,216	$115,798,474	$104,944,479	$132,243,532	$119,848,108
Employment	508.1	460.4	624.4	565.9	753.7	683.1
Garfield County	**2010 (Year 1)**		**2019 (Year 10)**		**2029 (Year 20)**	
	Alt. A (B & D)	**Alt. C**	**Alt. A (B & D)**	**Alt. C**	**Alt. A (B & D)**	**Alt. C**
Total Output (Spending)	$96,965,277	$87,876,554	$112,182,109	$101,667,082	$129,089,704	$116,989,891
Total Value Added (Income)	$54,210,054	$49,128,852	$63,366,188	$57,426,763	$73,539,674	$66,646,666
Employment	235.3	213.2	293.9	266.4	359.1	325.4

Source: IMPLAN calculations from BLM data

Table 4-81, Total Economic Impacts of Gas Drilling and Extraction by Alternative, 2010, 2019, and 2029, Based on 197 New Wells per Year (2009 dollars), reports the economic impacts if 197 wells were drilled each year during the planning period. As was the case for the scenarios with 11 and 39 wells drilled per year, the economic impacts of Alternatives B and D are similar to that of Alternative A. The Proposed Alternative is smaller than Alternative A by about 0.6 percent, and Alternative D is greater than A by 0.1 percent. Because of the large number of wells, that would be a few million dollars in 2029. Due to the small percent difference, Alternatives B and D are represented in the table as being equivalent to Alternative A. In 2029, Alternative A would generate about $177 million more in overall spending than would Alternative C. Value added would be greater by over $100 million for Alternative A, which would also be responsible for about 539 more jobs than would Alternative C.

Table 4-82 reports the same information broken down for Mesa and Garfield Counties individually.

Table 4-81
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029
Based on 197 New Wells per Year (2014 dollars)

	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$1,445,361,751	$1,309,885,542	$1,655,051,125	$1,499,920,376	$1,888,039,322	$1,711,070,193
Total Value Added (Income)	$812,299,545	$736,161,331	$933,280,799	$845,802,807	$1,067,704,456	$967,626,706
Employ-ment	3,889.9	3,525.3	4,773.5	4,326.1	5,755.4	5,215.9

Source: IMPLAN calculations from BLM data

Table 4-82
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029 for Mesa and Garfield Counties
Based on 197 New Wells per Year (2014 dollars)

	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
Mesa County	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$937,884,946	$849,975,399	$1,070,729,302	$970,368,028	$1,218,334,144	$1,104,137,618
Total Value Added (Income)	$528,592,842	$479,046,939	$603,335,623	$546,783,951	$686,383,178	$622,047,318
Employment	2,658.6	2,409.4	3,246.3	2,942.0	3,899.2	3,533.7
	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
Garfield County	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$507,476,806	$459,910,144	$584,321,823	$529,552,347	$669,705,177	$606,932,575
Total Value Added (Income)	$283,706,703	$257,114,392	$329,945,177	$299,018,855	$381,321,278	$345,579,387.2
Employment	1,231.3	1,115.8	1,527.3	1,384.1	1,856.2	1,682.2

Source: IMPLAN calculations from BLM data

The above three scenarios analyzed the impacts of three levels of drilling. Each of the scenarios assumed that NSO stipulations would increase drilling costs by ten percent. Below are analyzed the same three drilling patterns with the assumption that NSO stipulations double the costs of drilling in those areas. The economic impact in each scenario would be higher than the corresponding scenario when NSO costs were assumed to be ten percent. That outcome is related to initially higher costs for drilling on NSO acres. Those higher costs

show up in the regional economy as higher spending, which increases the economic impact.

Each of the three scenarios reduces the acreage of unleased land available for leasing under an NSO stipulation by some amount for the Proposed Alternative and for Alternatives C, and D compared to Alternative A. That reduction has three effects. The 15 percent of those NSO acres that could not be reached for drilling are now available, which would boost drilling. In addition, lower costs for drilling on acres that are no longer NSO would boost drilling. Both of these outcomes would tend to increase the economic impact. Offsetting these to some extent is the condition that lower costs for drilling on acres that are not now NSO would reduce spending and tend to lower the economic impact. For each of the three levels of drilling, The Proposed Alternative and Alternatives C and D would have the same relative effect compared to Alternative A as they did above, but the levels of spending would be different.

Table 4-83 illustrates the scenario of 11 new wells per year. Alternatives B and D are so similar to Alternative A that they are reported as having the same outcome. Alternative C shows a significantly smaller economic impact (about nine percent lower) than Alternative A, largely due to the number of acres withdrawn from leasing.

Table 4-84 reports the same information broken down for Mesa and Garfield Counties individually.

Table 4-85 illustrates the scenario of 39 new wells per year. Again, Alternatives B and D are so similar to Alternative A that they are reported as having the same outcome. Alternative C shows a significantly smaller economic impact (about nine percent lower) than Alternative A, largely due to the number of acres withdrawn from leasing.

Table 4-86 reports the same information broken down for Mesa and Garfield Counties individually.

Table 4-83
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029
Based on 11 New Wells per Year and High NSO Costs (2014 dollars)

	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$101,060,492	$91,266,744	$112,771,959	$101,911,282	$125,784,755	$113,738,546
Total Value Added (Income)	$56,793,964	$51,290,132	$63,550,948	$57,431,547	$71,058,743	$64,255,344
Employment	271.7	245.4	321.1	290.3	375.9	340.1

Source: IMPLAN calculations from BLM data

Table 4-84
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029 for Mesa and Garfield Counties
Based on 11 New Wells per Year and High NSO Costs (2014 dollars)

Mesa County	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$65,579,988	$59,224,572	$72,999,528	$65,968,199	$81,243,516	$73,461,117
Total Value Added (Income)	$36,961,045	$33,379,114	$41,135,532	$37,173,309	$45,773,882	$41,389,080
Employment	185.7	167.7	218.6	197.6	255.0	230.7
Garfield County	**2010 (Year 1)**		**2019 (Year 10)**		**2029 (Year 20)**	
	Alt. A (B & D)	**Alt. C**	**Alt. A (B & D)**	**Alt. C**	**Alt. A (B & D)**	**Alt. C**
Total Output (Spending)	$35,480,504	$32,042,172	$39,772,431	$35,943,083	$44,541,240	$40,277,429
Total Value Added (Income)	$19,832,919	$17,911,018	$22,415,417	$20,258,238	$25,284,861	$22,866,262
Employment	86	77.7	102.5	92.7	120.9	109.4

Source: IMPLAN calculations from BLM data

Table 4-85
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029
Based on 39 New Wells per Year and High NSO Costs (2014 dollars)

	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$358,305,209	$325,123,565	$399,827,858	$362,870,609	$445,964,134	$404,811,771
Total Value Added (Income)	$201,360,317	$182,712,959	$225,316,999	$204,491,289	$251,935,545	$228,689,443
Employment	963.4	874.2	1,138.4	1,033.3	1,332.8	1,210

Source: IMPLAN calculations from BLM data

Table 4-86
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029 for Mesa and Garfield Counties
Based on 39 New Wells per Year and High NSO Costs (2014 dollars)

Mesa County	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$232,510,698	$210,978,472	$258,816,511	$234,892,329	$288,045,193	$261,463,283
Total Value Added (Income)	$131,043,608	$118,907,989	$145,844,158	$132,362,743	$162,289,218	$147,312,474
Employment	658.5	597.5	774.9	703.3	904.2	820.8

Table 4-86
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029 for Mesa and Garfield Counties
Based on 39 New Wells per Year and High NSO Costs (2014 dollars)

Garfield County	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$125,794,511	$114,145,093	$141,011,346	$127,978,280	$157,918,941	$143,348,488
Total Value Added (Income)	$70,316,709	$63,804,969	$79,472,841	$72,128,546	$89,646,327	$81,376,969
Employment	276.7	60.1	363.5	330.0	428.6	389.2

Source: IMPLAN calculations from BLM data

Table 4-87 illustrates the scenario of 197 new wells per year. As was the case for the scenarios with 11 and 39 wells drilled per year, the economic impacts of Alternatives B and D are similar to that of Alternative A. Alternative B is smaller than Alternative A by about 0.1 percent, and Alternative D is greater than A by 0.6 percent. Because of the large number of wells, that would be a few million dollars in 2029. Due to the small percent difference, Alternatives B and D are represented in the table as being equivalent to Alternative A. Alternative C shows a significantly smaller economic impact (about nine percent lower) than Alternative A, largely due to the number of acres withdrawn from leasing.

Table 4-88 reports the same information broken down for Mesa and Garfield Counties individually.

Table 4-87
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029
Based on 197 New Wells per Year and High NSO Costs (2014 dollars)

	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C	Alt. A (B & D)	Alt. C
Total Output (Spending)	$1,875,375,038	$1,701,701,076	$2,085,064,412	$1,892,323,628	$2,318,052,609	$2,104,126,467
Total Value Added (Income)	$1,053,916,632	$956,316,248	$1,174,897,876	$1,066,296,801	$1,309,321,532	$1,188,497,464
Employment	5,041.8	4,575	5,925.5	5,378.3	6,907.3	6,270.8

Source: IMPLAN calculations from BLM data

Table 4-88
Total Economic Impacts of Gas Drilling and Extraction by Alternative
2010, 2019, and 2029 for Mesa and Garfield Counties
Based on 197 New Wells per Year (2014 dollars)

	2010 (Year 1)		2019 (Year 10)		2029 (Year 20)	
Mesa County	**Alt. A (B & D)**	**Alt. C**	**Alt. A (B & D)**	**Alt. C**	**Alt. A (B & D)**	**Alt. C**
Total Output (Spending)	$1,216,971,185	$1,104,270,114	$1,349,815,541	$1,225,035,081	$1,497,420,384	$1,359,218,379
Total Value Added (Income)	$685,888,251	$622,369,610	$760,631,025	$690,316,107	$843,678,581	$765,812,241
Employment	3,446.2	3,127.1	4,033.9	3,661.3	4,686.8	4,2549
	2010 (Year 1)		**2019 (Year 10)**		**2029 (Year 20)**	
Garfield County	**Alt. A (B & D)**	**Alt. C**	**Alt. A (B & D)**	**Alt. C**	**Alt. A (B & D)**	**Alt. C**
Total Output (Spending)	$658,403,853	$597,430,962	$735,248,871	$667,288,547	$820,632,225	$744,908,089
Total Value Added (Income)	$368,028,381	$333,946,638	$414,266,851	$375,980,694	$465,642,951	$422,685,223
Employment	1,595.6	1,447.9	1,891.6	1,717.0	2,220.5	2,016.0

Source: IMPLAN calculations from BLM data

In the scenarios analyzed for natural gas drilling and extraction, the magnitude of the economic impact varies depending on the number of wells drilled and the level of costs associated with NSO stipulations. However, within each scenario, the relative effects of Alternatives B, C, and D compared to Alternative A are the same since Alternatives B, C, and D make the same changes in each case. Alternatives A, B, and D are similar in their outcomes while Alternative C lowers the economic impact by about nine percent compared to Alternative A.

Despite Garfield County far exceeding Mesa County in overall natural gas activity, the RFD projects that 63 percent of wells drilled in the planning area over the planning period would be in Mesa County. In addition, a large share of the firms, workers, and income related to gas production find their home in Mesa County. A larger part of the socioeconomic impact would accrue to Mesa County.

Natural gas extraction also generates royalty (Federal Mineral Leasing Tax) payments to local counties and severance tax payments. Severance taxes are collected by the State of Colorado and some portion has traditionally been returned to the counties from which the resource, natural gas in this case, was extracted. In addition, the county government can levy property taxes for improvements to privately owned lands resulting from gas production when the mineral rights are owned by the federal government. A portion of the Federal Mineral Leasing (FML) royalties generated in Colorado is directed to the state and the state then directs a portion to school districts, counties, and

municipalities. **Table 4-89** Reports the total FML payments to entities in Mesa County over the past five years. Payments vary from year to year based on the value of mineral production and the number of mineral industry employees residing in the county and municipalities.

Table 4-89
Total FML Payments to entities in Mesa County 2009-2013 (In Dollars for the Year Received)

2009	2010	2011	2012	2013
$4,023,025	$2,318,780	$,870,545	$3,134,165	$1,793,767

It is also the case that some of the waste water generated is transported to Grand County, Utah for disposal. This would shift a small proportion of the economic impact to that county. Finally, the regional economic impacts in the analysis would be overstated to the extent that firms or workers from outside the planning area work in gas production but spend their earnings outside the area. An example could be workers from Utah, Wyoming, or other Colorado counties.

Social Impacts. As pointed out in Chapter 3 (Section 3.6.3, Socioeconomics) and in the Cumulative Economic Impacts section of this chapter, natural gas drilling and extraction on GJFO managed land is only a small part of the drilling and extraction that take place in the region overall. Chapter 3 (Section 3.6.2, Public Health and Safety and Section 3.6.3, Socioeconomics) identifies social conditions that can be affected by natural gas production. These include high wage jobs, increased housing demand (higher rents and housing prices), increased school enrollment, increased traffic (more congestion and higher maintenance costs), increased public safety costs, and increased likelihood of drilling and extraction operations interfering with recreation opportunities (Section 4.4.2, Recreation and Visitor Services). The natural gas industry also pays taxes that are intended to help offset increased social costs associated with their activity. It would be difficult to parse out the particular portion of the impacts on social conditions that are attributable to natural gas production on GJFO administered land versus the impacts from gas production in the region overall, but it is clear that they would be far less.

Two of the scenarios analyzed for natural gas production are based on historical levels of drilling on GJFO land. One assumes a base level of 11 wells per year (the 20 year average) while the other assumes 39 wells per year (the greatest number ever drilled in a single year). In these scenarios, Alternatives A, B, and D have roughly equivalent outcomes, which means that the impact on social conditions from those would be similar to those experienced recently -- no significant change from the situation described in Chapter 3. Alternative C would result in somewhat fewer wells drilled, with a corresponding decrease in impact on the social conditions previously identified.

A third scenario, which posited 197 wells drilled per year on GJFO land for the next 20 years, was also analyzed. This represents five times the number of wells ever drilled in a single year on BLM land. This level of drilling alone would dramatically alter the character of the communities in the planning area. The impact would still be only a small part of the larger regional impact, assuming that other drilling in the region also increased by five times.

Coal

There are two scenarios to consider with respect to the economic impact of coal mining under the different management alternatives: current applications being considered and future applications for mining operations. The approval or disapproval of current applications is not affected by the alternative that is chosen. These processes are already underway, but future operations and applications might be affected.

Two applications are under consideration at the time of this report: expansion of the McClane Canyon Mine and Book Cliffs coal leasing. The McClane Canyon mine's production had been tied entirely to the operation of the Cameo power plant in the northeastern part of the planning area. With the closing of the Cameo power plant in January 2011, the McClane Canyon Mine ceased production. Rhino Energy has proposed expansion of the mine to make continued operation commercially viable. In addition to expansion of its operation on GJFO land, continued operation of the McClane Canyon Mine would require construction of a railroad load out facility on private land. The ultimate approval or rejection of this expansion is not affected by any of the management alternatives. A socioeconomic impact assessment will be included in the Environmental Assessment for this project.

The second proposal seeks approval for the coal leasing that would eventually lead to the opening of the Book Cliffs Mine. That application is in the early stages with no Environmental Impact Statement yet available. Again, the management alternative chosen for the RMP would not affect the final decision on the application. In both cases, the coal mining represents a potential new revenue stream for Mesa County in terms of spending on the mine, jobs, and taxes.

Future mining operations on GJFO land are potentially affected by the choice of management alternative. Alternative A goes forward with 300,700 acres available for leasing. Each of the other alternatives reduces the acreage available somewhat compared to Alternative A. Alternative B includes 252,100 acres. Alternative C has the fewest acres, 251,200 while Alternative D makes 265,600 acres available. To the extent that fewer available acres limit the amount of coal mining activity, each of the other alternatives would reduce the economic impact of coal mining compared to alternative A.

Alternative C would place additional restrictions on coal extraction by managing for wilderness characteristics on 171,200 acres of areas acceptable for further

coal leasing. Wilderness characteristic management could limit future production by limiting such activities as methane venting or building exploration roads. Alternative B protects 44,100 acres as having wilderness characteristics while Alternative D identifies no lands with wilderness characteristics for management within the planning area. Applying NSO stipulations under Alternatives B, C and D could complicate coal development on future leases because it would prohibit construction of temporary roads required for exploration drilling in most of the Book Cliffs area unless an exception or waiver of the stipulation is granted. Most of acreage for NSO stipulations is attributed to steep slopes. The NSO for steep slopes allows specific exceptions for coal exploration and development under Alternatives B and D.

As is the case with any extractable resource, market forces would impact the ultimate level of production of coal given the allowable limits under the final RMP.

Opposition from environmental groups to coal leasing and production on GJFO lands can be expected. This would be true for the expansion of the McClane Canyon Mine and the Book Cliffs coal leasing process as well as any new applications, which would fall under the new RMP. The strongest objections are based on methane gas venting from mines and the burning of coal as fuel, both of which add greenhouse gases to the atmosphere. Court challenges could potentially delay, if not halt, coal mining operations. This can also lead to tensions between environmental groups and supporters of coal mining.

Locatable Minerals

Uranium

As discussed in chapter three, the lands within the GJFO have long been associated with radium, vanadium, and uranium extraction although no uranium is currently being mined on GJFO lands. Past booms encouraged local residents to stake claims, mostly in the area around Gateway in the southeastern portion of the GJFO. Many of those claims have not expired.

Energy Fuels, a Canadian energy company, has received permission to reopen the Packrat Mine and Urantah Decline under the combined designation Whirlwind Mine. Initial proposals planned for a 2008 opening, but operations ceased after a short period of mine preparation and have not recommenced as of August 2014. The 24 acres of surface disturbance included in the proposal straddle the Colorado/Utah border; so some impacts occur beyond the GJFO. Because the permitting process for Whirlwind has been completed, the operation is unaffected by any changes in BLM management plans (BLM, Whirlwind 2008). Socioeconomic impacts for this project were part of the Final Environmental Assessment that was completed and approved in 2008.

Similarly unaffected by BLM planning alternatives are the remaining existing claims across the Uncompahgre Plateau. None of the lands to be petitioned for

withdrawal from mineral entry include active mining claims, nor are they lands with uranium potential. At this time no uranium mining is taking place on GJFO land. For both the Whirlwind Mine and the other claims, future production depends largely on two factors: access to a nearby processing facility and a price high enough to make mining profitable. To remedy the lack of a processing facility, Energy Fuels Resources plans to build the Pinon Ridge uranium mill on private land in Paradox Valley, Montrose County. Energy Fuels Resources Corporation has received a radioactive materials license from the Colorado Department of Health and approval from the Environmental Protection Agency. That and other permitting lies outside BLM jurisdiction and would not be affected by any of the management alternatives. Some regional opposition to the Pinon Ridge mill has developed, and the granting of the Health Department license has been challenged in court. Four Colorado citizens groups, two groups from Utah, and the Telluride City Council are on record opposing the mill. At this time the legal proceedings are still underway. In addition, Energy Fuels Holding Company has applied for an indirect transfer of control of the Pinon Ridge facility. Energy Fuels Resources would continue to be licensed to operate the facility, but Energy Fuels Resources would be sold to the Pinon Ridge Corporation. The application and transfer process might introduce delays but would not alter plans for construction or operation of the facility. In the meantime, Energy Fuels also owns and operates the White Mesa Mill in Blanding Utah. This mill would be available to process production from the Whirlwind Mine and possibly from other mining operations on BLM land should the price for uranium rise to a level that would justify mining operations.

The current price for uranium is roughly one-third of the price in 2007 at the time that Energy Fuels was pursuing permission to begin operations at the Whirlwind Mine. Uranium prices can fluctuate wildly, but some analysts predict that they will rise sufficiently within 2 to 3 years to allow Whirlwind to begin operation. With its permits in hand, Whirlwind could begin operation on relatively short notice. Other claims on GJFO land would still have to go through a rather lengthy permitting process. That could mean a lag between the time that prices were right and the time operations could begin.

Should mining resume on land within GJFO land, the regional economic impact would manifest itself primarily through employee compensation and through materials and services purchased locally. The EIS for the Whirlwind Mine estimated 10 to 24 jobs and noted that they would pay in the $40,000 to $50,000 range at that time.

Gold

Recreational gold prospecting currently takes place on GJFO land on both the Dolores and Gunnison rivers. The activity on the Gunnison river is near the Redlands diversion dam. This area is withdrawn from mineral entry, but casual use prospecting activity (little surface disturbance, small-scale motorized

equipment) can still occur. Nothing in the RMP alternatives would change the availability for casual use.

The activity on the Dolores river near Gateway is both casual use and use under existing mining claims. The local chapter of the Gold Prospectors Association of America has about 100 members that use claims it has on the Dolores.

The current gold prospecting is recreational, and its economic impact would be the same as described below for recreational activities on BLM land. Commercial gold mining would impact the regional economy in a manner similar to that described for natural gas drilling and extraction. There is currently no commercial gold mining on GJFO land.

Under Alternative C, the Dolores River riparian ACEC would be petitioned for withdrawal. If withdrawn, GJFO would likely challenge the validity of existing mining claims. If they were found invalid, prospecting under the mining claims would no longer be allowed.

For both rivers under Alternatives B, C, and D – a No Surface Occupancy stipulation would be implemented. Larger scale, surface disturbing casual use prospecting may not be allowed under NSO (even if non-motorized) – however most casual use activities would likely continue to be allowed. The NSO stipulations can't be applied to gold prospecting activities on mining claims managed under the 1872 Mining Law, so only alt C would see an impact from applied NSO stipulations to lands where mining claims were found invalid.

Salable Minerals

Under the current RMP (Alternative A), 274,300 acres are closed to mineral development. 787,000 acres are open to mineral material sales. 281,200 acres are subject to NSO stipulations under Alternative A; however, under the current RMP, NSO stipulations only apply to fluid mineral leasing. Although mineral material sales are not subject to NSO stipulations under Alternative A, sales are unlikely to be permitted where the resources protected by NSOs for fluid minerals would be adversely affected by mineral material sales.

Under the Proposed Alternative 277,700 acres are closed to mineral material sales. 783,300 acres are open to mineral materials; however 332,800 of those acres are open to mineral material sales with an NSO stipulation. An NSO stipulation would not allow surface disturbance, effectively closing the area to mineral material sales unless an exception is granted. Exceptions can only be granted when the proposed activity would not adversely affect the resource protected by the specific NSO stipulation for the area.

Under Alternative C, 452,000 acres are closed to mineral material sales. 609,400 acres are open to mineral materials; however 365,600 of those acres are open to mineral material sales with an NSO stipulation. An NSO stipulation

would not allow surface disturbance, effectively closing the area to mineral material sales unless an exception is granted. Exceptions can only be granted when the proposed activity would not adversely affect the resource protected by the specific NSO stipulation for the area.

Under Alternative D, 155,300 acres are closed to mineral material sales. 906,200 acres are open to mineral materials; however 307,500 of those acres are open to mineral material sales with an NSO stipulation. An NSO stipulation would not allow surface disturbance, effectively closing the area to mineral material sales unless an exception is granted. Exceptions can only be granted when the proposed activity would not adversely affect the resource protected by the specific NSO stipulation for the area.

Sand and Gravel

At this time, one commercial sand and gravel operation is active on GJFO land, and a second has been active in the recent past. There are no known large unexploited gravel deposits left on private land in Mesa County. Sand and gravel are inexpensive materials; however they are expensive to haul long distances. As the supplies on private land are exhausted, sand and gravel resources on GJFO land would become increasingly important to the local economy. Considering the acres closed to mineral material sales and the NSO stipulations, the action alternatives would allow fewer acres to be available for sand and gravel sales than Alternative A.

Dimension Rock

Dimension rock is another commercial product in the salable mineral category. There are no commercial operations active on GJFO land but there have been several in the recent past. Dimension rock can be used in landscaping and building applications. Considering the acres closed to mineral material sales and the NSO stipulations, the action alternatives would allow fewer acres available for dimension rock sales than Alternative A.

Renewable Energy

Development of renewable energy sources is receiving worldwide attention for a variety of reasons. In Colorado, legislated mandates for electric utilities to generate increasing proportions of their energy from renewable sources provide an added incentive. Under Alternatives B, C, and D the RMP establishes emphasis areas for wind and solar energy development. These emphasis areas would be available for lease by private firms for energy production. It should be noted at the outset that ultimately the use or lack of use of these areas would depend on whether future legal and market conditions persuade energy producers that projects in these emphasis areas are economically viable.

At present, it is difficult to predict the impacts of such allocations except in the most general of ways because no formal proposals have been offered.

Wind Emphasis Area

The area reserved for wind power is located south of the Colorado River, south of Palisade in the East Orchard Mesa – Horse Mountain area. This area was chosen in part because of the availability of an already existing transmission line. Alternatives B and C establish the emphasis area at 2,600 acres while Alternative D sets it at 3,700 acres. Approximately 28 acres of land are required to produce one megawatt of wind energy. If increased acreage resulted in larger projects, Alternative D would generate the most wind-related jobs since the emphasis areas are the largest under this alternative. Alternative C would generate the fewest wind-related jobs since the emphasis areas are the smallest under this alternative.

With no clear commitment for development, however, quantitative socioeconomic impacts are impossible to predict. In general, development of a wind farm would likely produce positive economic impacts in the forms of a temporary impact from construction spending and longer term impacts from maintaining the wind farm. Construction of additional transmission lines, if necessary, would add positive economic impacts as well. Negative economic impacts could result from any lowering of property values in the area. One reason for property values to drop could be the effect of a wind farm on the viewshed. A changed viewshed could also reduce the value that others receive from this public land whether or not they own property nearby. This effect is discussed more fully in the recreation section and the non-market values section. Negative social impacts might result if sufficient opposition to a wind farm develops and begins to pit supporters and opponents against each other. Furthermore, opposition would almost certainly arise if construction of additional transmission lines was proposed since those lines would have to cross private lands. The impact of such a transmission line on the viewshed would likely generate opposition beyond the particular land owners affected. Even residents who would otherwise accept the wind farm might be less positively disposed toward the construction of another transmission line. This opposition would likely spread outside of the immediate planning area since the construction of the transmission line would likely extend beyond the planning area.

Solar Energy Development

Alternatives B, C, and D each set areas for solar development. There are two categories for these areas. Solar Emphasis Areas allow for development up to 20MW. Solar Energy Zones (SEZs) allow for development over 20MW. The total acres and specific locations vary by alternative. Alternative B provides for 8,700 acres of solar emphasis areas. Alternative C identifies 5,300 acres as solar emphasis areas at four sites: 21 Rd., Mitchell Rd., 2 Rd., and Q.5 Rd. Alternative D includes the largest number of acres, 36,300 as solar emphasis areas and 9,200 acres as SEZs, distributed among four sites: North Desert, 27 ¼ Rd., Mitchell Rd., and 2 Rd. These lands could be leased for development of solar energy projects. Solar development could occur in other areas within the field

office as well; however, the RMP identifies these areas as the most likely areas based on potential and relatively few resource conflicts.

Two possible options exist for the development of solar power: photovoltaic and mirrors. Either of these is possible on GJFO land. The socioeconomic impacts of solar development would depend on the type chosen. With no projects proposed, it cannot be known what type of, if any, development would take place. Approximately 9 acres of land are required to produce one megawatt capacity of photovoltaic energy. If increased acreage resulted in larger projects, Alternative D would have the potential to generate the most solar related jobs since the emphasis areas are the largest under this alternative. Correspondingly, Alternative C would generate the fewest solar- and wind-related jobs since the emphasis areas are the smallest under this alternative.

The same general observations about potential socioeconomic impacts as were made for the wind emphasis area can be made here. Construction spending would provide a temporary positive economic impact while ongoing operation would provide longer term economic impacts. Any construction of transmission lines would provide positive economic impact, but likely generate opposition, especially if those lines crossed private lands. There could be negative economic impact if those lines reduced recreational enjoyment of BLM lands. To the extent that greater acreage would result in larger projects, Alternative D has the greatest potential for socioeconomic impact, given the larger number of acres included as solar emphasis areas.

Alternative D has an additional feature likely to generate significant socioeconomic impacts. The emphasis areas at 27 ¼ Rd. and the North desert comprise the most heavily used area for off highway vehicle (OHV) recreational use. A solar project that used those acres, especially the North Desert acres, could virtually eliminate the space available for OHV use. There really are no alternative sites available on GJFO land to accommodate that level of use. As explained in the recreation section, the regional economic impact of this reduction in recreational activity would include the loss of spending by those OHV users who come to the area to use that land. The social impact might be proportionally greater due to the loss of an activity valued by local as well as out-of-area OHV enthusiasts. This would almost certainly show up at least as protests against proposed development that would put these areas off limits to OHV use.

Impact on Recreation

Estimate of Recreational Use

The regional economic impact from the use of recreational resources depends on the number of recreationists from outside the regional economy and their pattern of spending during their visit. Vehicle counters monitored at popular recreation sites provided an estimate of overall visitor numbers, and historical

patterns for visitor numbers were used to project visitation levels over the 20-year planning period. Precise estimates for numbers of current and future visitors are not possible to calculate. The estimates here were prepared as carefully as possible, but are intended to be used for the purpose of comparing the effects of the different alternatives, not as exact levels of visitation. The visitor numbers used here are higher than in the DRMP due to a recalculation. Recreation activities were categorized as motorized, mechanized, and non-mechanized. Mechanized activity consists primarily of mountain biking while non-mechanized activities include hiking, running, bird watching, dog-walking, shooting, etc. The proportions of those three categories of visitor activity were estimated through managerial expertise and surveys conducted on GJFO lands during spring, summer, and fall of 2009. The proportion of mechanized and non-mechanized visitors from outside the region was calculated from the 2009 surveys. Due to the low response rate from off highway vehicle (OHV) users, an alternative method was used to estimate the proportion of motorized visitors from outside the region. Motorized users were assigned the same proportion of out of region visitors as were the non-motorized visitors. Finally, spending profiles were calculated for motorized and non-motorized users from the 2009 surveys and from similar surveys conducted on BLM land in Routt and Moffat counties (Loomis, et al.).

The level of recreational activity is projected to vary between the alternative management plans due to differences in management practices. **Table 4-90**, Projected Change in Recreational Use by Alternative and Recreation Type, shows the effects of the Proposed Alternative and of Alternatives C and D on visitor use compared to Alternative A.

Table 4-90
Projected Change in Recreational Use by Alternative and Recreation Type

Activity	Proposed Alternative Change from Alt. A	Alternative C Change from Alt. A	Alternative D Change from Alt. A
Motorized	+1%	- 4%	- 1%
Mechanized	+1%	- 2%	+2%
Non-mechanized	+1%	+2%	- 2%

Source: BLM estimates

Table 4-91, Motorized, Mechanized, Non-mechanized, and Total Recreation Use (Number of Visitors) by Alternative, records projected visitor numbers for 2019 and 2029. Alternative A for 2010 is included as the baseline for visitor numbers. Comparing the values for Alternative A in each year illustrates the projected growth in visitors over the planning period under the current management plan. The numbers of visitors for Alternatives B, C, and D are calculated using the estimates in **Table 4-90**, Projected Change in Recreational Use by Alternative and Recreation Type. In each year, the Proposed Alternative anticipates more visitors than does Alternative A, with Alternatives C and D having fewer visitors than Alternative A.

Table 4-91
Motorized, Mechanized, Non-mechanized, and Total Recreation Use (Number of Visitors) by Alternative

Activity Type	2010	Annual Use in 2019 (Year 10)				Annual Use in 2029 (Year 20)			
	Alt. A baseline	Alternative				Alternative			
		A	Proposed	C	D	A	Proposed	C	D
Motorized	370,232	414,398	418,542	397,822	410,254	469,680	474,376	450,892	464,983
Mechanized	259,950	290,961	293,870	285,141	296,780	329,775	333,073	323,179	336,370
Non-mechanized	157,546	176,340	178,103	179,867	172,813	199,864	201,862	203,861	195,866
Total	787,728	881,669	890,515	862,830	879,847	999,319	1,009,311	977,932	997,219

Source: Calculations from BLM data

Economic Impact

The estimated economic impact of the various alternatives is calculated using the projected number of recreational visitors from outside the region paired with an estimated spending profile for those visitors. As described earlier, visitors from outside the region are estimated to be 50% of the total visitors. With that information, the IMPLAN program returned the results summarized in the following three tables. **Table 4-92**, 2010 (Year 1): Compare Economic Impacts from Recreation by Alternative (2014 dollars), shows the estimated impact on the regional economy in terms of the total spending that takes place, the total value added to the regional economy, and the number of jobs supported by the spending for 2010, the first year of the planning period. **Table 4-93**, 2019 (Year 10): Compare Economic Impacts from Recreation by Alternative (2014 dollars), and **Table 4-94**, 2029 (Year 20): Compare Economic Impacts from Recreation by Alternative (2014 dollars), report the same information for 2019 and 2029 respectively. The economic impacts reported here are greater than in the DRMP due to the higher estimates for visitor numbers mentioned above.

Table 4-92
2010 (Year 1): Compare Economic Impacts from Recreation by Alternative (2014 dollars)

Impact	Alternative A	Alternative Proposed	Alternative C	Alternative D
Total Output (Spending)	$12,489,994	$12,604,384	$12,226,773	$12,465,491
Total Value Added (Income)	$7,442,641	$7,510,406	$7,285,149	$7,427,767
Employment	133.5	134.7	130.8	133.3

Source: IMPLAN calculations from BLM data

Table 4-93
2019 (Year 10): Compare Economic Impacts from Recreation by Alternative (2014 dollars)

Impact	Alternative A	Alternative Proposed	Alternative C	Alternative D
Total Output (Spending)	$13,979,966	$14,108,087	$13,685,346	$13,952,541
Total Value Added (Income)	$8,330,498	$8,406,396	$8,154,218	$8,313,850
Employment	149.4	150.8	146.4	149.2

Source: IMPLAN calculations from BLM data

Table 4-94
2029 (Year 20): Compare Economic Impacts from Recreation by Alternative (2014 dollars)

Impact	Alternative A	Alternative B	Alternative C	Alternative D
Total Output (Spending)	$15,844,905	$15,990,022	$15,510,126	$15,813,822
Total Value Added (Income)	$9,441,794	$9,527,762	$9,241,400	$9,422,925
Employment	169.4	170.9	165.9	169.1

Source: IMPLAN calculations from BLM data

The increasing economic impact due to increasing visitation over the planning period can be seen by comparing Alternatives A for each of the three years shown. The effects of differing management plans can be seen by comparing the different alternatives for each year. The differences between alternatives result from different numbers of visitors and different mixes of recreational activity use under the different management plans. In each year, the Proposed Alternative has a greater impact than does Alternative A. Alternatives C and D have smaller impacts than does alternative A, with alternative C having the least impact.

Since economic impact analysis for recreation is based on spending in a local area by people from outside that local area, it is necessary to identify the local area. For this report, Mesa County is considered the local area for direct spending and visitors from outside Mesa County are considered to be from outside the county. Direct spending in Mesa County can have indirect and induced impacts in neighboring Garfield County. For example, businesses in Mesa County might buy supplies or services from businesses in Garfield County; workers who commute from Garfield County to Mesa County would spend their income in Garfield County. The following Tables, **4-95**, **4-96**, and **4-97**, break down the economic impacts from recreation spending into values for Mesa and Garfield Counties individually.

Table 4-95
2010 (Year 1): Compare Economic Impacts from Recreation by Alternative (2014 dollars) for Mesa and Garfield Counties

Impact	Alternative A	Alternative Proposed	Alternative C	Alternative D
Mesa County				
Total Output (Spending)	$ 12,336,822	$ 12,449,800	$ 12,076,846	$ 12,312,627
Total Value Added (Income)	$ 7,345,403	$ 7,412,274	$ 7,189,976	$ 7,330,726
Employment	132.4	133.6	129.8	132.2
Garfield County				
Total Output (Spending)	$153,172	$ 154,584	$ 149,927	$ 152,865
Total Value Added (Income)	$97,239	$ 98,132	$ 95,174	97,041
Employment	1.1	1.1	1.1	1.1

Source: IMPLAN calculations from BLM data

Table 4-96
2019 (Year 10): Compare Economic Impacts from Recreation by Alternative (2014 dollars) for Mesa and Garfield Counties

Impact	Alternative A	Alternative Proposed	Alternative C	Alternative D
Mesa County				
Total Output (Spending)	$ 13,808,521	$ 13,935,061	$ 13,517,532	$ 13,781,440
Total Value Added (Income)	$ 8,221,659	$ 8,296,557	$ 8,047,691	8,205,233
Employment	148.2	149.6	145.2	148.0
Garfield County				
Total Output (Spending)	$ 171,445	$ 173,026	$ 167,813	$ 171,101
Total Value Added (Income)	$ 108,839	$ 109,840	$106,528	$ 108,617.7
Employment	1.2	1.2	1.2	1.2

Source: IMPLAN calculations from BLM data

Table 4-97
2029 (Year 10): Compare Economic Impacts from Recreation by Alternative (2014 dollars) for Mesa and Garfield Counties

Impact	Alternative A	Alternative Proposed	Alternative C	Alternative D
Mesa County				
Total Output (Spending)	$ 15,650,589	$ 15,793,915	$ 15,319,933	$ 15,619,896
Total Value Added (Income)	$ 9,318,436	$ 9,403,270	$ 9,120,666	$ 9,299,818
Employment	168.0	169.5	164.6	167.7
Garfield County				
Total Output (Spending)	$ 194,316	$ 196,107	$ 190,192	$ 193,926
Total Value Added (Income)	$ 123,358	$ 124,492	$ 120,734	$ 123,107
Employment	1.4	1.4	1.4	1.4

Source: IMPLAN calculations from BLM data

A Comparison Economic Impact

The National Visitor Use Monitoring (NVUM) program collects information about visitors to National Forests. Among the data collected are spending profiles for various recreational activities available in National Forests. In this section of the report, NVUM spending profiles are used with the GJFO visitor levels to offer a comparison economic impact analysis. The NVUM spending profiles are national in scope, based on information from all National Forests. The NVUM spending profiles are also reported per party (rather than per person) and per trip (rather than per day); therefore, they must be adjusted to per person per day values. In addition, NVUM reports spending profiles for low, average, and high spending areas. It should be noted that the NVUM data can be adjusted to give higher or lower spending profiles than the ones used here. The spending profiles used here lie between the higher and lower possibilities. URLs for accessing the NVUM reports are provided for those who want to explore this more carefully.

The economic impacts reported in **Table 4-98** (for 2010), **Table 4-99** (for 2019), and **Table 4-100** (for 2029) using NVUM values are greater than for the corresponding years using the GJFO spending profiles. This is largely due to the substantially greater spending profile for bicyclists and hikers reported for the NVUM data. The adjusted NVUM spending profile used here for OHV visitors is $38.31 per visitor per day compared to the $27.31 figure calculated for GJFO. The spending profile for bicycling and hiking is $51.63 compared to the $25.43 value calculated for GJFO.

Table 4-98
2010 (Year 1): Compare Economic Impacts from Recreation by Alternative (2014 dollars) Using NVUM Values

Impact	Alternative A	Alternative Proposed	Alternative C	Alternative D
Total Output (Spending)	$ 23,690,421	$ 23,927,322	$ 23,288,986	$ 23,685,495
Total Value Added (Income)	$ 13,881,208	$ 14,020,017	$ 13,639,908	$ 13,875,737
Employment	256.6	259.2	252.4	256.6

Source: IMPLAN calculations from BLM and NFS data

Table 4-99
2019 (Year 10): Compare Economic Impacts from Recreation by Alternative (2014 dollars) Using NVUM Values

Impact	Alternative A	Alternative Proposed	Alternative C	Alternative D
Total Output (Spending)	$26,516,526	$26,781,691	$26,067,203	$ 26,511,015
Total Value Added (Income)	$15,537,141	$15,692,512	$15,267,057	$ 15,531,020
Employment	287.3	290.1	282.5	287.2

Source: IMPLAN calculations from BLM and NFS data

Table 4-100
2029 (Year 20): Compare Economic Impacts from Recreation by Alternative (2014 dollars) Using NVUM Values

Impact	Alternative A	Alternative Proposed	Alternative C	Alternative D
Total Output (Spending)	$ 30,054,918	$ 30,353,267	$ 29,545,651	$ 30,048,677
Total Value Added (Income)	$ 17,610,478	$ 17,785,136	$ 17,304,363	$ 17,603,545
Employment	325.6	328.8	320.1	325.6

Source: IMPLAN calculations from BLM and NFS data

Table 4-101, **Table 4-102**, and **Table 4-103** Break down the economic impacts for Mesa and Garfield Counties individually.

Table 4-101
2010 (Year 1): Compare Economic Impacts from Recreation by Alternative (2014 dollars) for Mesa and Garfield Counties Using NVUM Data

Impact	Alternative A	Alternative Proposed	Alternative C	Alternative D
Mesa County				
Total Output (Spending)	$ 23,394,419	$ 23,628,360	$ 22,997,826	$23,389,480
Total Value Added (Income)	$ 13,693,155	$ 13,830,085	$ 13,454,935	$13,687,678
Employment	254.5	257.1	250.3	254.5
Garfield County				
Total Output (Spending)	$296,002	$298,962	$291,160	$296,015
Total Value Added (Income)	$188,052	$189,933	$184,974	$188,059
Employment	2.1	2.1	2.1	2.1

Source: IMPLAN calculations from BLM and NFS data

Table 4-102
2019 (Year 10): Compare Economic Impacts from Recreation by Alternative (2014 dollars) for Mesa and Garfield Counties Using NVUM Data

Impact	Alternative A	Alternative Proposed	Alternative C	Alternative D
Mesa County				
Total Output (Spending)	$26,185,213	$26,447,065	$25,741,310	$26,179,688
Total Value Added (Income)	$15,326,655	$15,479,922	$15,060,017	$15,320,527
Employment	284.9	287.8	280.1	284.9
Garfield County				
Total Output (Spending)	$331,313	$334,626	$325,894	$331,327
Total Value Added (Income)	$210,486	$ 212,590.5	$ 207,040	$210,493
Employment	2.4	2.4	2.3	2.4

Source: IMPLAN calculations from BLM and NFS data

Table 4-103
2029 (Year 20): Compare Economic Impacts from Recreation by Alternative (2014 dollars) for Mesa and Garfield Counties Using NVUM Data

Impact	Alternative A	Alternative Proposed	Alternative C	Alternative D
Mesa County				
Total Output (Spending)	$29,679,395	$29,974,011	$29,176,270	$29,673,138
Total Value Added (Income)	$17,371,906	$17,544,192	$17,069,696	$17,364,964
Employment	322.9	326.1	317.5	322.9
Garfield County				
Total Output (Spending)	$375,523	$379,256	$369,381	$375,539
Total Value Added (Income)	$238,573	$240,944	$ 234,667	$ 238,581
Employment	2.7	2.7	2.6	2.7

Source: IMPLAN calculations from BLM and NFS data

Additional Economic Value to Recreation Users

The preceding analysis identifies the economic impact to the regional economy from visitors engaged in recreation activities on BLM land managed by GJFO. There is further economic value to recreationists that does not impact the local economy but has been demonstrated to exist. In economic terminology this value is identified as consumer surplus. Consumer surplus represents value that a consumer receives beyond the price paid for the good consumed. In this case, the price would best be thought of as an entrance fee and travel costs; consumer surplus would account for the additional amount a visitor would be willing to pay beyond those expenses. In most cases, the entrance fee for recreation sites administered by GJFO is zero; so travel costs would be the price for recreation.

The data necessary to calculate consumer surplus for recreation on GJFO land is not available. However, Loomis calculated such a value for recreation in the Little Snake River Resource Area in Moffat and Routt Counties (Loomis 2006). The consumer surplus was calculated by recreation site and activity and, thus, varied by location and activity. The estimates were reported as $29.00 average consumer surplus for a popular motorized recreation site and $8.33 for a collection of primarily non-motorized sites. The $8.33 figure is substantially lower than the consumer surplus calculated for similar activities at other locations in the larger intermountain region (Loomis 2006).

Given that the Fruita-Grand Junction area has become a destination site for mountain bikers, it is likely that consumer surplus for those users would tend toward the upper end of consumer surplus values. If, for purposes of illustration, we apply that lowest figure of $8.33 to all our 2010 visitor day numbers, the value would be over $3.6 million. If we use the mid-point of Loomis' estimates, $18.33, and our 2010 visitor day numbers, we calculate an overall consumer surplus of almost $7.9 million dollars. If we apply the high figure of $29.00, the calculation would be nearly $12.5 million.

A few points should be borne in mind. If $18.33, for example, is used as the average consumer surplus, it is just that: an average of what visitors would be willing to pay. Some would pay more; some would pay less. In addition, consumer surplus applies to all users not just those from outside the region. Furthermore, this does not represent money spent in the regional economy. It represents value for which recreationists would be willing to pay but don't have to. Finally, these figures were not calculated specifically for lands managed by GJFO. They were used for purposes of illustration because they were calculated for a nearby location. Other strategies exist for transferring consumer surplus estimations from one area to another. For example, the Forest Service periodically updates a manual and set of tables for that purpose (Forest Service).

Hunting, Fishing, and Wildlife Watching

Hunting and fishing attract visitors to Mesa County, and some of those visitors hunt and fish on land managed by GJFO. GJFO oversees more than a million acres open to hunting, but BLM does not collect information on the number of hunters and anglers who use their lands. Due to a combination of timing and locations surveyed, the surveys described earlier also did not collect information on hunting and fishing. The Colorado Parks and Wildlife (CPW) collects data on hunting and fishing for the state as a whole and provides information at the county level as well. In 2008, CPW released its latest report on the economic impacts of hunting and fishing. The report was prepared by BBC Research and Consulting.

The report divides spending on hunting and fishing into the categories of Colorado residents and non-residents. Spending in Mesa County by non-residents of Colorado would represent outside spending as described earlier but would underestimate the total amount of outside spending because some of the spending by Colorado residents would also come from outside Mesa County. Complicating matters further, the spending is not attributed to particular venues, for example, BLM, Forest Service, private, etc. Therefore, while we cannot report a precise figure for the economic impact from hunting and fishing that take place on BLM land, we can get some idea of the magnitude by looking at the figures for Mesa County overall.

According to the CPW report, the final economic impact in Mesa County from out-of-state hunters was just over $10.4 million. Fishing by out-of-state visitors added an impact of more than $2.1 million. Recalling that some of the nearly $9.8 million attributed to hunting by Colorado residents, and some of the more than $51 million attributed to Colorado anglers also comes from outside of Mesa County, it is clear that hunting and fishing contribute substantially to the local economy. What we can't do is determine how much of that is attributable specifically to lands overseen by GJFO. Finally, the impact of spending by CPW in Mesa County was estimated to be about $2.7 million. To the extent that the funds spent in Mesa County come from licenses and other fees collected from

people outside Mesa County, they also represents an economic impact for Mesa County from hunting and fishing.

Wildlife watching is an activity on public lands that can also contribute a regional economic impact. CPW reported an estimate for the state as a whole but not for individual counties. It can be noted that, according to the CPW report, the average non-resident wildlife watcher is estimated to spend $147 per day.

Non-market Values

Finally, recognition of non-market values is important in the assessment of GJFO planning alternatives. In Chapter 3 and above, recognition of the quality-of-life attraction for businesses, families, and individuals references this idea. In many cases, BLM professionals are aware of the importance of these values in planning land uses, but are challenged by their inability to operationalize them (i.e., define them in terms that allow for measurement). The incredible natural beauty and diversity of lands within the GJFO begs for some accounting of these non-market values since that beauty and diversity are likely to attract both residents and businesses to the planning area. The still small-town atmosphere of many locations within the GJFO, the increasing reputation of its agricultural products, particularly wine and peaches, and the ready accessibility of public lands for recreation are all significant aspects of the "character" of the area. Anecdotally it is acknowledged within the planning area that these factors have an economic impact by attracting businesses and permanent residents (including retirees and workers who seek employment here in order to enjoy the environmental amenities). Economists have attempted to measure these non-market values for some areas; however, the difficulty of measuring these values and the resources necessary to obtain them place such quantitative measurements beyond the purview of this RMP.

Recent studies have tried to assess the impact of such values on the socioeconomic trends in a specific region (Rasker et al. 2004, Duffy-Deno 1998). Where economies are making the shift from traditional or "Old West" activities, mining and ranching for example, to "New West" activities like tourism or services and professional industries, local economies appear healthier and the importance assigned to accessible public lands appears to increase. Non-market values are significant because the communities in the GJFO are in just such a transition.

Additionally, the linked impacts of decisions concerning public land use can create a cascading series of effects which affect this aspect of local economies. One such series might begin with increased natural gas drilling or implementation of a wind farm that impacts the viewshed. This has the potential to reduce the value of the public lands to those already in the area as well as reduce the attractiveness of the area to individuals and firms considering locating in the area. It might also have a direct economic impact if it discourages recreational use of the land. This impact could show up in food and beverage

establishments, accommodations, and other tourism-related industries. Where economies, as in the GJFO, are attempting to remedy the shocks of boom and bust cycles by diversifying their economies, alterations in these non-market values may produce adverse effects.

Social Impacts

Social impacts from recreation management would be generated by and accrue to both local and out of area visitors. Recreational opportunities provided by GJFO managed land add to the quality of life for residents in the planning areas. Many residents cite ease of access to BLM lands as a benefit of residing in the planning area. According to surveys (**Section 3.6.3**, Socioeconomics), some communities, notably De Beque and Fruita, also value the potential for recreation related economic development. Local development agencies tout the quality of recreational opportunities on GJFO managed land in campaigns to attract businesses, and businesses do the same to attract employees.

Population growth is a major factor generating social impacts from recreation activities on GJFO land. Population growth drives increasing use by local and out of area visitors. One consequence is that the nature of recreation experiences has changed from more natural to more developed, from less crowded to more crowded, and from less restricted to more governed by regulations (**Section 4.4.2**, Recreation and Visitor Services). In addition the interface between residential development and BLM boundaries has grown, resulting in more cases of trespassing on private land and impacts on BLM resources as residents enter directly from their properties rather than designated entry points (**Section 4.4.2**, Recreation and Visitor Services). Increased recreational use increases the chances of conflict with grazing operations and makes it more likely to encounter areas where viewsheds are degraded by natural gas drilling and extraction.

All the management alternatives anticipate increased visitation over the planning period, but each of the action alternatives projects lower visitation numbers than does Alternative A. The differences between visitor numbers in Alternatives A, B, and D are relatively small. Alternative C shows noticeably fewer visitors than the others. Each alternative manages for a somewhat different mix of recreation activities (**Section 4.4.3**, Recreation and Visitor Services).

Impact on Environmental Justice

An Environmental Justice assessment is a federally required part of each Resource Management Plan. It requires a determination of whether any alternative disproportionately affects low-income or minority populations. As indicated in **Chapter 3**, in both 1990 and 2008 Hispanics comprise Mesa County's largest racial minority group making up approximately 8 percent (US Census Bureau 1990) and 11.8 percent (US Census Bureau 2008) of the region's population, respectively. Comparatively, Mesa County's Hispanic population

trails the state's where Hispanics account for 19.9 percent of the population in 2008 (US Census Bureau 2008). Mesa County's poverty rate has ebbed and flowed between a low of 10.6 percent and a high of 12.5 percent between 2000 and 2008.

Neither Mesa County nor any of the communities of interest identified in Chapter 3 anticipate any significant changes in the percentage of minority populations over the next 20 years. Nor is there any reasonable expectation that management decisions made by BLM in relation to any of the four proposed alternatives would have dissimilar impacts on minority populations.

Impact on Taxes

Livestock production, natural gas production, and recreation spending all generate tax revenues. These revenues are collected and disbursed at the federal, state, and local government levels. Taxes represent revenue that is diverted from private to public spending. When the taxes collected are spent locally, they can have the same multiplier effects as other spending does. Local taxes are the most likely to remain and be spent in the region. State taxes are likely to initially leave the area, but might return in some proportion in the form of state spending in the region. Federal taxes also are likely to initially leave the area, but might eventually generate regional multiplier effects if they return as federal spending in the area.

Impact from Livestock Grazing

Table 4-104, Tax Impacts, Livestock Production (2009 dollars), shows the tax impact from livestock production on GJFO lands for the estimated actual AUMs used and the maximum AUMs. The tax picture would be the same in each of the 20 years, according to the analysis. The tax impacts reported here are adjusted to reflect the fact that subsidies also come into the region to support agricultural production.

Table 4-104
Tax Impacts for the Region, Livestock Production (2014 dollars)

Tax Impact	Actual AUMs Scenario			Maximum AUMs Scenario		
	Alt. A/D	Proposed Alt.	Alt. C	Alt. A/D	Alt. B	Alt. C
Federal	$83,752	$83,544	$48,521	$150,517	$149,257	$80,228
State and Local	$7,959	$9,515	$4,614	$14,310	$$14,190	$13,219

Source: IMPLAN calculations from BLM data

Natural Gas Production

Tax impacts are shown for each scenario for year 20 of the planning period. **Table 4-105** Tax Impacts of Natural Gas Production, Year 20 of the Planning Period; Based on 11 Wells per Year (2014 dollars), shows tax impacts from drilling and extraction operations for alternatives A/B/D and Alternative C in

Table 4-105
Tax Impacts of Natural Gas Production for the Region, Year 20 of the Planning Period; Based on 11 Wells per Year (2014 dollars)

Tax Impact	2029 (Year 20)	
	Alternative A (B/D)	Alternative C
Federal	$5,966,176	$5,406,568
State and Local	$3,964,344	$3,592,289

Source: IMPLAN calculations from BLM data

year 20 of the planning period for the 11 new wells per year scenario. **Table 4-106**, Tax Impacts of Natural Gas Production, Year 20 of the Planning Period; Based on 39 Wells per Year (2014 dollars), reports the same information for the 39 well per year scenario as was reported for the 14-well scenario. In both cases Alternative C's lower drilling and extraction levels result in lower tax revenues as well. These tax revenues are associated with the sales and income earned from drilling and operating the wells. They represent sales, income, property, and similar taxes. These figures do not include severance taxes or royalties.

Table 4-107 reports the tax impacts from the 197 wells scenario. Alternatives A, B, and D are reported as having the same effect because their outcomes are nearly the same.

Table 4-106
Tax Impacts of Natural Gas Production, Year 20 of the Planning Period; Based on 39 Wells per Year (2014 dollars)

Tax Impact	2029 (Year 20)	
	Alternative A (B/D)	Alternative C
Federal	$21,152,806	$19,170,115
State and Local	$14,055,397	$12,737,958

Source: IMPLAN calculations from BLM data

Table 4-107
Tax Impacts of Natural Gas Production, Year 20 of the Planning Period; Based on 197 Wells per Year (2014 dollars)

Tax Impact	2029 (Year 20)	
	Alternative A (B/D)	Alternative C
Federal	$109,644,721	$99,367,534
State and Local	$72,260,421	$65,487,328

Source: IMPLAN calculations from BLM data

The preceding three tables reported the tax impacts from natural gas drilling and extraction related to drilling 11, 39, and 197 wells per year. That analysis assumed that imposing NSO stipulations on some areas would increase drilling

costs by ten percent. The following three tables (see **Tables 4-108** through **4-110**) report the tax effect from the same drilling patterns but assume that the drilling costs double under an NSO stipulation. As reported in the natural gas section above, spending is higher in those scenarios and the tax impacts are correspondingly greater than under the lower cost scenarios. In each case, Alternatives A, B, and D are reported as having the same values because their outcomes are very similar.

Table 4-108
Tax Impacts of Natural Gas Production, Year 20 of the Planning Period; Based on 11 Wells per Year and High NSO Costs (2014 dollars)

Tax Impact	2029 (Year 20)	
	Alternative A (B/D)	Alternative C
Federal	$7,255,635	$7,018,224
State and Local	$4,549,301	$3,950,671

Source: IMPLAN calculations from BLM data

Table 4-109
Tax Impacts of Natural Gas Production, Year 20 of the Planning Period; Based on 39 Wells per Year and High NSO Costs (2014 dollars)

Tax Impact	2029 (Year 20)	
	Alternative A (B/D)	Alternative C
Federal	$25,724,522	$23,351,950
State and Local	$16,129,335	$14,647,529

Source: IMPLAN calculations from BLM data

Table 4-110
Tax Impacts of Natural Gas Production, Year 20 of the Planning Period; Based on 197 Wells per Year and High NSO Costs (2014 dollars)

Tax Impact	2029 (Year 20)	
	Alternative A (B/D)	Alternative C
Federal	$133,578,600	$121,257,222
State and Local	$83,117,915	$75,480,604

Source: IMPLAN calculations from BLM data

Natural gas extraction also generates royalty (Federal Mineral Leasing Tax) payments to local counties and severance tax payments. Severance taxes are collected by the State of Colorado and some portion has traditionally been returned to the counties from which the resource, natural gas in this case, was extracted. In addition, the county government can levy property taxes for improvements to privately owned lands resulting from gas production when the mineral rights are owned by the federal government. A portion of the Federal Mineral Leasing (FML) royalties generated in Colorado is directed to the state and the state then directs a portion to school districts, counties, and

municipalities. **Table 4-111** reports the total FML payments to entities in Mesa County over the past five years. Payments vary from year to year based on the value of mineral production and the number of mineral industry employees residing in the county and municipalities.

Table 4-111
Total FML Payments to entities in Mesa County 2009-2013 (In Dollars for the Year Received)

2009	2010	2011	2012	2013
$4,023,025	$2,318,780	2,870,545	3,134,165	1,793,767

Recreation

The tax impacts from recreational activities are shown in **Table 4-112**, Tax Impacts of Recreation Activities by Alternative: 2019 and 2029 (2014 dollars) and **Table 4-113**, Tax Impacts of Recreation Activities by Alternative for NVUM Values: 2019 and 2029 (2014 dollars). They vary in their magnitude in the same way that the economic impacts do. Alternatives B, C, and D each produce smaller tax impacts than does Alternative A. The tax impacts of Alternative C are the least.

Table 4-112
Tax Impacts of Recreation Activities for the Region by Alternative: 2019 and 2029 (2014 dollars)

Tax Impact	2019 (Year 10)				2029 (Year 20)			
	Alt. A	Proposed Alt.	Alt. C	Alt. D	Alt. A	Proposed Alt.	Alt. C	Alt. D
Federal	$1,074,632	$1,084,442	$1,051,880	$1,072,480.00	$1,217,990	$1,229,101	$1,192,122	$1,215,549
State and Local	$1,066,266	$1,076,206	$1,043,606	$1,064,092.00	$1,208,507	$1,219,768	$1,182,735	$1,206,044

Source: IMPLAN calculations from BLM data

Table 4-113
Tax Impacts of Recreation Activities for the Region by Alternative for NVUM Values: 2019 and 2029 (2014 dollars)

Tax Impact	2019 (Year 10)				2029 (Year 20)			
	Alt. A	Proposed Alt.	Alt. C	Alt. D	Alt. A	Proposed Alt.	Alt. C	Alt. D
Federal	$2,004,142	$2,024,182.00	$1,969,103	$2,003,265	$2,271,581	$2,294,110	$2,231,867	$2,270,589
State and Local	$1,967,514	$1,987,188	$1,932,585	$1,966,431	$2,230,074	$2,252,169	$2,230,074	$2,228,845

Source: IMPLAN calculations from BLM data

Land Parcel Model

This section was prepared for GJFO by researchers at USGS.

A simulation model, called Land Parcel Model (LPM), was developed to forecast community growth based on historical trends, and in response to land-use decisions on public lands. LPM uses land parcel data from county and city planning departments to spatially locate new housing types. City and county future land-use designations determine future types of housing units (single family, multi-family) that can be developed in each land parcel, and the ability to subdivide parcels (Mesa Countywide Land Use plan [vers. 2006], Mesa County community land use plans [community plans posted on the Mesa County Assessors web page], City of Grand Junction Comprehensive Plan [vers.2009]). Retrospective assessments of new housing types, sub-regional locations, and changes in human population provide a baseline for locating new houses with changes in population numbers. Sub-regional locations are the 21 planning regions or neighborhoods (e.g., Grand Valley, City Center, Redlands) recognized by the City of Grand Junction and Mesa County.

LPM selects parcels and modifies historical location preferences based on proposed public land uses, such as those that vary among the 4 GJFO resource management plan alternatives. Three groups of land uses are recognized in LPM. Planned surface disturbances such as energy and mineral development is one group, areas with high visual quality (Visual Resource Management Classes, Colorado National Monument, slopes of Grand Mesa, Natural Areas) form the second group, and designated recreation areas form the third group. There can be overlap among groups. Viewshed assessments determine the proportion of the total possible view of a parcel that contains planned surface disturbances. This proportion is translated to a relative score ranging from 0 to 1. This score is essentially a probability of a land parcel not being selected for new housing because of planned surface disturbances. A similar assessment is performed for areas of high visual quality, where the resulting score is a probability of a land parcel being selected for high-quality views. A distance-weighted score is used for recreational opportunities, where the resulting probability represents the chances of the parcel being selected for the establishment of a new house based on a recreational emphasis.

LPM simulates annual housing development due to new residents entering the GJFO planning area (termed in-migration). An assumption is that market demand parallels trends in number of new residents. That is, new residents either buy new homes or home owners who sell to new residents are buying new homes. For each new household, housing type and neighborhoods are randomly selected based on historical tendencies; then a parcel within the selected neighborhood that can accommodate the housing type is randomly selected. The percentage of the new-home buying population that exhibits preferences for any of the 3 groups of land uses (e.g., preference for high-quality views) is specified, and can range from 0 to 100 percent. Where a household is

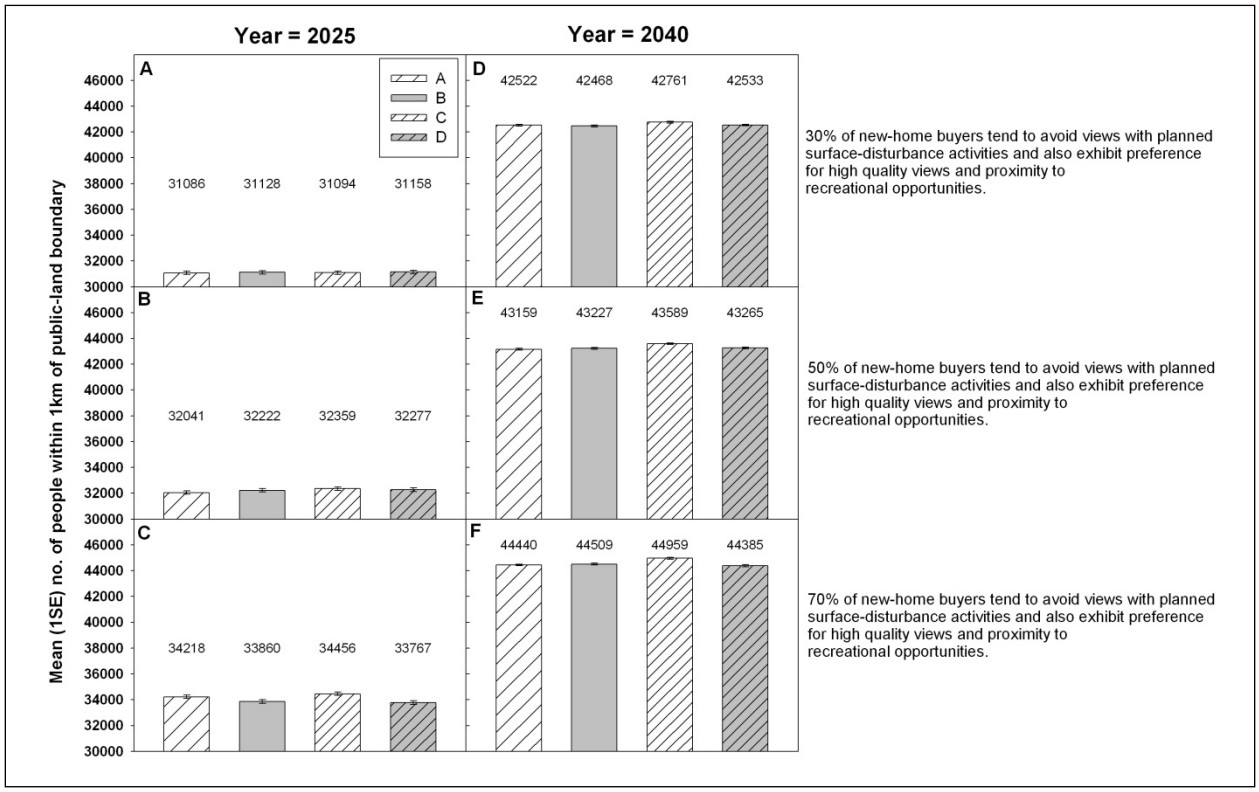
ascribed to have a preference, parcels are filtered by the probabilities generated in the viewshed and distance assessments described above. For example, if a household is deemed to have a preference for high-quality views, parcels with at least some high-quality view (probability >0) are evaluated first. Those with a higher probability value for quality views have a greater chance of being selected. This selection process uses the historical preferences for neighborhoods to order the search and selection of parcels.

Assessments of the four GJFO alternatives were based on 2010 parcel map information and future land-use plans noted above, in-migration over the next 30 years derived from the population projections of the CO State Demography Office and an assumption of 2.5 people per household (https://dola.colorado.gov/demog), and historical preferences of housing type and neighborhoods based on a retrospective assessment of new housing in Mesa County from 1970-2009. Probabilities related to viewshed conditions and recreational opportunities were derived for each land parcel using maps of proposed energy and mineral development, visual resource management areas, and recreational opportunities for each GJFO alternative. Additionally, surrounding non-BLM lands were included in the assessment of high visual quality and recreational opportunities (e.g., Colorado National Monument, Grand Mesa). The tendencies of future generations to select housing locations on the basis of public land-uses are difficult to reliably forecast. A feature of LPM, however, is the ability to evaluate a range of assumptions about these tendencies. For this assessment, a simplified experimental design was employed, where 30, 50, and 70 percent of the new home-buying population preferred not to have views of planned surface disturbances, and the same percentages were used for high-quality views and for proximity to recreational opportunities. All possible combinations were simulated over the next 30 years. Probabilities related to the three land-use groups were noticeably different among alternatives for parcels within one kilometer of public lands, reflecting the spatial locations and patterns of public lands and proposed land uses, and the topography of the GJFO planning area. For this reason, changes in the total number of people residing within one kilometer of public lands (e.g., BLM, USDA Forest Service, Colorado National Monument) were compared among experimental levels and land-use alternatives.

The use of probabilities and a random component for selecting housing types, neighborhoods, and parcels makes LPM a stochastic model. That is, a simulation represents only one possible outcome. As a standard, LPM uses 100 replications initiated with different random-number seeds with everything else held constant to generate annual averages of housing and population numbers.

Selected results of assessments are shown in **Diagram 4-2**. Results are for 30, 50, and 70 percent of the population selecting against views with surface disturbance and an equal percentage selecting for parcels with high-quality views

Diagram 4-2
Projected Mean (1 SE) Number of People Residing Within One Kilometer of the Public-land Boundary for Each of the Four Alternatives at 15 years (2025) and 30 years (2040) Since the Present

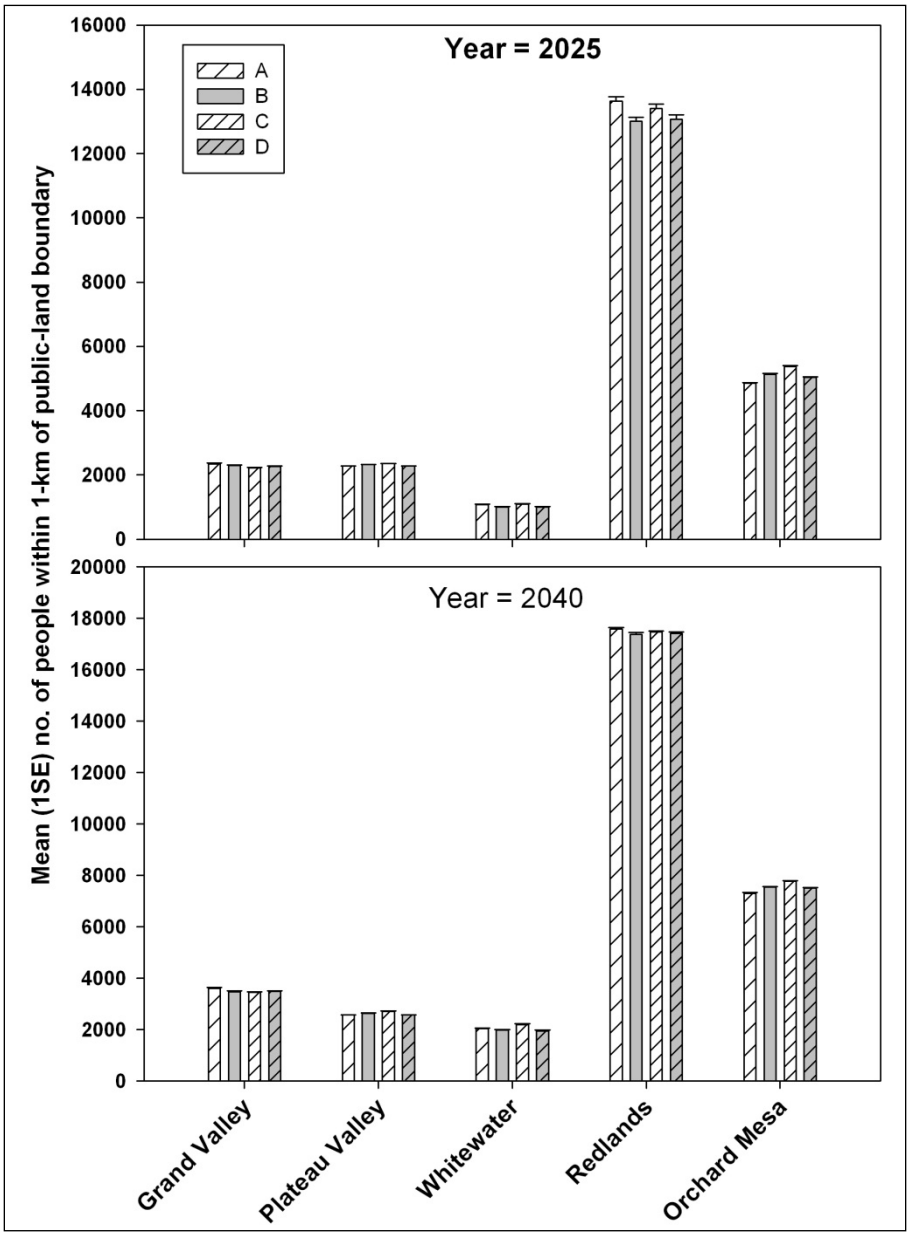


Note: For each set of graphs in Diagram 2 (A & D, B & E, C & F), the percentage of new-home buyers that exhibit preferences for viewshed conditions and proximity to recreational opportunities are noted at the right-hand side of each set. Number above each bar is the mean.

or proximity to recreational opportunities. Hereafter, these percentages are referred to as preference levels. At year 2025 (15 years since the present), population numbers along the public-land interface were similar among alternatives for the 30% preference level (Diagram 4-2A). Differences among alternatives become more apparent with increasing preference levels (Diagram 4-2B and C). At the 70% level, alternatives B and D had similar numbers of people in the 1-km interface; Alternative A and C also were similar but significantly ($P < 0.001$) higher (ca. 450-688 more people) than the other two alternatives (Diagram 4-2C). At year 2040 (30 years since the present), the population within the one-kilometer interface increased with increasing preference levels and was significantly ($P < 0.001$) greater (227 to 573 more people) for Alternative C than the other alternatives (Diagram 4-2D through F).

Differences among neighborhoods were prominent for only five of the 21 neighborhoods (see **Diagram 4-3**). Population numbers in these neighborhoods were similar among alternatives at year 2025 for 30 and 50

Diagram 4-3
Projected Mean (1 SE) Number of People Residing within One Kilometer of the Public-land Boundary in the Five Neighborhoods with Notable Differences Among the Four Alternatives



Note: Projections shown in Diagram 4-3 are for the assumption that 70 percent of new-home buyers exhibit preferences for viewshed conditions and proximity to recreational opportunities.

percent preference levels. At year 2025 with the 70 percent preference level and at year 2040 for all levels Alternative C had higher numbers in the Plateau Valley, Whitewater, and Orchard Mesa neighborhoods, and Alternative A had higher numbers in the Grand Valley and Redlands neighborhoods compared to the other alternatives. The greatest differences occurred for the 70 percent preference level in the Orchard Mesa and Redlands neighborhoods (see

Diagram 4-3). At year 2025, Orchard Mesa in Alternative C had up to 500 more people and the Redlands in Alternative A had up to 600 more people than other alternatives. These numbers dropped to 400 and 200, respectively, in year 2040.

Summary

Projected differences in total and neighborhood population size within one kilometer of public lands among the four GJFO resource-management alternatives were only apparent in year 2025 when a high percentage (>50 percent) of home buyers exhibited preferences for viewshed conditions and proximity to recreational opportunities. By year 2040, all experimental preference levels showed differences among alternatives in terms of total and neighborhood population size along the public-land interface. The tendency for Alternative C to have higher population numbers in this interface largely derives from the relatively lower amount of land-area planned for energy and mineral development compared to the other alternatives. However, even when 70 percent of the population exhibited preferences for viewshed conditions and proximity to recreational opportunities, projected mean total population size near public lands only differed among alternatives by up to 688 by year 2025 and 573 by year 2040, and the maximum difference among neighborhoods was 600 by year 2025 and 400 by year 2040.

Cumulative Impacts

Livestock Grazing

Cumulative Economic Impacts. The current status of livestock grazing in the Cumulative Impact Analysis Area (CIAA) is the result of an overall, century-long trend toward less grazing. Over the last ten years, livestock grazing on BLM-administered public lands has remained stable while grazing on surrounding private lands has also remained stable or slightly declined (**Table 4-1**).

In order to graze successfully on public lands, a grazing operation requires a stable base ranch on private lands from which to run its grazing program. Looking to the future, a continuing pattern of private ranchland being converted to housing development could result in less grazing on public lands (Section 4.4.2 Livestock Grazing, Cumulative Impacts). The alternative ultimately selected for the RMP would allocate a certain number of AUMs for grazing. The actual usage of AUMs would depend not only on the number of available AUMs but also on private economic decisions, including decisions about the overall amount of ranching in the CIAA. Conversion of ranchland to other uses can be influenced by local planning agencies that either encourage or discourage that process. A reduction in ranching activity would likely lead to a reduction in grazing on BLM-administered lands, which would reduce the economic impact of that activity.

On the other hand the alternative selected for the RMP could influence the cumulative economic impact if it affected the overall level of ranching activity. Of the action alternatives, only the reduced number of AUMs in Alternative C would significantly alter the level of available AUMs. The estimated economic impact of that reduction in grazing is reported in the livestock grazing section above. Should that reduction in AUMs under Alternative C cause even further cutbacks in ranching operations in the CIAA, the cumulative economic impact of ranching activity in the CIAA could be further reduced.

Cumulative Social Impacts. The same forces responsible for the cumulative economic impacts described above would also shape the cumulative social impacts. If the outcome is less ranching activity, the traditional ranching identity and culture would be less prominent in the planning area. The nature of the more rural ranching communities would change if ranching land is converted to residential developments for people whose work and other activities are focused outside those communities.

Natural Gas Drilling and Extraction

Cumulative Economic Impacts. The economic impact from natural gas drilling and extraction on GJFO administered lands is relatively small compared to the cumulative impact of those two activities across the CIAA as a whole. As described in Chapter 3, most of the natural gas activity in the region takes place on private land, and there is further activity on land administered by other Federal entities. The greatest part of the cumulative economic impacts from natural gas drilling and production in the CIAA does not stem from management decisions made by GJFO. Thus, while Alternative C is predicted to result in a somewhat lower economic impact than Alternatives A, B, and D, (analysis in the natural gas section above) the choice of alternative would have only a small effect on the cumulative economic impact in the region.

It can be noted that the cumulative economic impacts of natural gas drilling and extraction in the CIAA tend to disproportionally benefit Mesa County. As noted in Chapter 3, firms and workers in natural gas production are somewhat concentrated in Mesa County; therefore, income tends to flow into Mesa County even when the drilling and extraction are taking place in surrounding counties.

The current cumulative economic impact is closely related to two recent events. There is continued production from the large number of wells drilled during the boom in the earlier part of the past decade. Conversely, there has been a significant reduction in drilling activity related to the recession of the latter part of the last decade. A third factor at work is that as drilling activity has increased following the recession, it has shifted to other parts of the U.S.

Looking to the future, the level of natural gas drilling and extraction in the CIAA would be most affected by the price of natural gas and the relative

attractiveness of natural gas reserves in this region compared to those in other parts of the country. These considerations would influence drilling decisions on both private and federal land. The cumulative economic impact would be the result of the level of drilling and extraction, with activity on GJFO administered land being a limited factor in that impact.

Cumulative Social Impacts. As noted above, the cumulative impacts on the CIAA from natural gas operations are determined primarily by factors outside of the control of GJFO managers. Most drilling and extraction takes place on land not managed by GJFO, and even on BLM land the level of activity allowable might or might not be undertaken. Thus, while Alternative C is predicted to result in a somewhat lower economic impact than Alternatives A, B, and D, (analysis in the natural gas section above) the choice of alternative would have only a small effect on the cumulative social impact.

The likely types of social impacts from natural gas drilling and extraction are described earlier in the natural gas section of the socioeconomic discussion. During the recent boom of natural gas activity in the CIAA the cumulative effects of those social impacts were prominent. High paying jobs were created, and the industry tax payments were at high levels. But even so, local agencies were hard pressed to deal with the increased pressures on schools, public safety, and road maintenance. Housing prices and rents were high, which benefitted property owners but priced lower income residents out of both of those markets. One factor contributing to the high rent prices was the short supply of rental units compared to the number demanded.

The recent slowdown in natural gas production has altered the cumulative impacts in the expected way. Should natural gas activity return to levels consistent with one or the other of the two historically based scenarios, the cumulative impacts should resemble those seen during the recent high production period. Drilling and extraction at the levels of the high production scenario would generate cumulative impacts almost incomprehensible compared to historical experience.

Recreation

Cumulative Economic Impacts. It is important to remember that the economic impact of recreation is generated through spending by visitors from outside the CIAA. It is the additional spending that would not take place absent those visitors. The cumulative economic impact of recreation would include visitors drawn to the area not only by GJFO-administered land but, also, by other public lands and by private attractions. Conditions that affect the number of visitors would affect the cumulative economic impact of recreation.

The effect of management decisions on cumulative impacts might not always be clear cut. Recently, management plans for adjacent Forest Service and BLM lands have closed areas and routes for motorized use, shifting users onto BLM lands

in the planning area (Section 4.4.2, Recreation and Visitor Services, Cumulative Impacts). If all out of area users shifted to GJFO land, the economic impact from GJFO land would increase while the cumulative impact would be essentially unchanged. If, however, some users drop out, the cumulative impact could decrease even as the impact from GJFO land increased.

Local visitors on BLM land do not directly contribute to the economic impact of recreation, but they might affect the cumulative impact if increased visitor numbers began to discourage visitors from outside the region. Economic conditions might also affect the cumulative economic impacts of recreation. If economic conditions encouraged significant increases in drilling activity, that drilling activity might discourage recreation use and lower the cumulative economic impacts from recreation.

Projections for the economic impact of Alternatives A, B, C, and D are found in the economic analysis above. The action alternatives alter the mix of recreation activities, but only Alternative C has a noticeable effect on visitor numbers, lowering them somewhat compared to the other alternatives. The choice of management plan would not seem to significantly alter the cumulative economic impacts from recreation.

Cumulative Social Impacts. As is the case for cumulative economic impacts, cumulative social impacts would derive from the actions of recreation managers of both public and private venues. Cumulative social impacts would also be affected by factors that encourage or discourage use of these venues by both local and out of area recreationists.

Population growth is a major factor contributing to cumulative social impacts from recreation. On GJFO land, for example, population growth drives increasing use by local and out of area visitors. One consequence is that the nature of recreation experiences has changed from more natural to more developed, from less crowded to more crowded, and from less restricted to more governed by regulations (Section 4.4.2, Recreation and Visitor Services). In addition the interface between residential development and BLM boundaries has grown, resulting in more cases of trespassing on private land and impacts on BLM resources as residents enter directly from their properties rather than designated entry points (Section 4.4.2, Recreation and Visitor Services). Increased recreational use increases the chances of conflict with grazing operations and makes it more likely to encounter areas where viewsheds are degraded by natural gas drilling and extraction.

To the extent that similar outcomes are occurring on other public lands, these population effects would increasingly become features of the cumulative social impacts. The crowding might further contribute to cumulative effects if it alters the mix of recreational activities or discourages participation in recreation activities. Increased levels of recreation on public lands might also increase conflicts between recreation and grazing on public lands.

The various alternatives manage for different mixes of recreation activities and each is projected to result in different levels of overall use. To some extent the chosen alternative would contribute to the cumulative social impacts, but at the same time GJFO managers would be responding to the cumulative impacts.

4.7 UNAVOIDABLE ADVERSE IMPACTS

Section 102(C) of NEPA requires disclosure of any adverse environmental effects that cannot be avoided should the proposal be implemented. Unavoidable adverse impacts are those that remain following the implementation of mitigation measures or impacts for which there are no mitigation measures. Some unavoidable adverse impacts occur as a result of implementing the RMP. Others are a result of public use of the BLM-administered lands within the planning area. This section summarizes major unavoidable impacts; discussions of the impacts of each management action (in the discussion of alternatives) provides greater information on specific unavoidable impacts.

Surface-disturbing activities would result in unavoidable adverse impacts under current BLM policy to foster multiple uses. Although these impacts would be mitigated to the extent possible, unavoidable damage would be inevitable. Long-term conversion of areas to other uses such as mineral and energy development would increase erosion and change the relative abundance of species within plant communities, the relative distribution of plant communities, and the relative occurrence of seral stages of those communities. Wildlife emphasis areas would overlap areas with oil and gas development potential on 117,300 acres (69 percent) under Alternative B, 115,300 acres (79 percent) under Alternative C, and 33,400 acres (100 percent) under Alternative D, resulting in unavoidable long-term wildlife habitat loss where developed. These activities would also introduce intrusions, which could affect the visual landscape.

Designation of routes for public and/or administrative use near Colorado hookless cactus occurrences would result in the unavoidable long-term loss of some cactus and their habitat due to trampling, dust, erosion, and other direct and indirect impacts on cactus. Cross-country foot and horse travel may also result in inadvertent trampling of cactus.

Unavoidable damage to cultural and paleontological resources from permitted activities could occur if resources undetected during surveys were identified during ground-disturbing activities. In these instances, standard COAs would require ceasing further activities upon discovery and the resource would be mitigated to minimize data loss. Unavoidable loss or destruction of cultural and paleontological resources would also occur in areas open to cross-country or intensive motorized use, specifically in areas of high cultural sensitivity or areas containing vertebrate or scientifically significant fossil resources. Unavoidable loss of cultural and paleontological resources due to non-recognition, lack of information and documentation, erosion, casual collection, and inadvertent

destruction or use would also occur. Unavoidable damage to buried cultural resources could occur, particularly in construction situations. Under Alternatives B, C, and D, a CSU stipulation requiring sub-surface inventories (i.e., construction monitoring) for deep sub-surface-disturbing activities and buried ROWs in Indian Creek, Grand Mesa Slopes, and Sunnyside would be applied in an attempt to minimizing sub-surface disturbances in these areas. Under Alternative B, this CSU stipulation would also apply to additional areas where high potential for subsurface resources may be identified in the future. This would potentially minimize sub-surface disturbances across a greater portion of the decision area.

Wildlife, livestock, and wild horses would contribute to soil erosion, compaction, and vegetation loss, which could be extensive during drought cycles and dormancy periods. Conversely, unavoidable losses or damage to forage from development of resources in the planning area would affect livestock, wildlife, and wild horses. Some level of competition for forage between these species, although mitigated to the extent possible, would be unavoidable. Instances of displacement, harassment, and injury could also occur.

Recreational activities, development of mineral resources, and general use of the planning area would introduce additional ignition sources into the planning area that would adversely affect infrastructure, air quality, and some vegetation communities. Alternately, continued fire suppression would adversely affect overall composition and structure of some vegetation communities, which would increase the size and intensity of future wildfires

As recreation demand increases, recreation use would disperse, increasing the likelihood of incompatible uses as more users compete for a limited amount of space. In areas where development activities would be greater, the potential for displaced users would increase.

Numerous land use restrictions imposed throughout the planning area to protect sensitive resources and other important values, by their nature, affect the ability of operators, individuals, and groups who use the public lands to do so freely without limitations. These restrictions could also require the closing of roads and trails or limiting certain modes or seasons of travel. Although attempts would be made to minimize these impacts by limiting them to the level of protection necessary to accomplish management objectives, and providing alternative use areas for affected activities, unavoidable adverse impacts would occur under all alternatives.

4.8 Irreversible and Irretrievable Commitment of Resources

Section 102(2)(C) of NEPA requires a discussion of any irreversible or irretrievable commitments of resources that are involved in the proposal should it be implemented. An irretrievable commitment of a resource is one in which the resource or its use is lost for a period of time (e.g., extraction of any locatable mineral ore or oil and gas). An irreversible commitment of a resource

is one that cannot be reversed (e.g., the extinction of a species or disturbance to protected cultural resources).

The air quality resource in the planning area is not irreversible or irretrievable; however, committed actions that consume Prevention of Significant Deterioration increment would use up available Prevention of Significant Deterioration increment for other proposed sources. For this EIS, there are no actions by BLM that would require Prevention of Significant Deterioration permitting.

Implementing the RMP management actions would result in surface-disturbing activities, including dispersed recreation, mineral and energy development, and ROW development, which results in a commitment to the loss of irreversible or irretrievable resources. Mineral extraction or sale eliminates a non-renewable resource thereby resulting in irreversible and irretrievable commitment of the resource. The associated surface disturbance from energy development is reclaimed after the resource is removed. However, surface disturbances from gas storage, geothermal, ROWs for roads used for recreation and public or personal access, wind and solar development and recreational development are a permanent encumbrance of the land. Although new soil can develop, soil development is a slow process in many parts of the planning area. Soil erosion or the loss of productivity and soil structure might be considered irreversible commitments of resources. Surface-disturbing activities, therefore, would remove vegetation and accelerate erosion that would contribute to irreversible soil loss; however, management actions and BMPs are intended to reduce the magnitude of these impacts and restore some of the soil and vegetation lost. Primarily because of the number of acres available for recreational travel, energy and mineral development, and ROW development, such disturbances would occur to the greatest degree under Alternative A, with Alternative D similar, but with more stipulations for surface-disturbing activities. Alternative B, and to a greater extent Alternative C, contains additional conservation measures, mitigation measures, and stipulations to protect resources within the planning area.

Laws protecting cultural and paleontological resources would provide for mitigation of irreversible and irretrievable impacts on cultural resources from permitted activity. Across all alternatives, an irreversible commitment of nonrenewable fossil fuels (e.g., oil, gas, and coal), locatable minerals, and mineral materials would occur from development over the next 20 years.

4.9 Relationship Between Local Short-term Uses and Long-term Productivity

Section 102(C) of NEPA requires discussion of the relationship between local, short-term uses of human environment, and the maintenance and enhancement of long-term productivity of resources. As described in the introduction to this chapter, "short-term" is defined as anticipated to occur within one to five years

of implementation of the activity. "Long-term" is defined as following the first five years of implementation, but within the life of the RMP (projected to be 20 years).

Short-term use of the air quality resource would not affect long-term productivity, except that air quality emissions in high enough concentrations could reduce vegetation and plant vigor. Across all alternatives management actions would result in various short-term effects, such as increased localized soil erosion, fugitive dust emission, vegetation loss or damage, wildlife disturbance, and decreased visual resource quality. Surface-disturbing activities, including utility construction, mineral resource development, and developed recreation would result in the greatest potential for impacts on long-term productivity. Management prescriptions and BMPs are intended to minimize the effect of short-term commitments and reverse change over the long term. These prescriptions and the associated reduction of impacts would be greatest under Alternative C and are present to a slightly lesser extent under Alternative B for resources such as vegetation and wildlife habitat. However, BLM-administered lands are managed to foster multiple uses, and some impacts on long-term productivity might occur.

Short-term use of an area to foster energy and minerals, ROWs, and cross-country recreational use would result in long-term loss of soil productivity and vegetation diversity. Impacts would persist as long as surface disturbance and vegetation loss continue. In general, the loss of soil productivity would be directly at the point of disturbance, although long-term vegetation diversity and habitat value could be reduced due to fragmentation and the increased potential for invasive species to spread from the developments or disturbances. Alternatives A and D would have the greatest potential for short-term loss of productivity and diversity due to the high potential for development and the lack of stringent mitigation and reclamation standards contained under Alternatives B and C. Alternative C would provide the greatest long-term productivity by deferring development in many areas through closures or application of severe restrictions on development activities.

The short-term use of big game severe winter range, birthing areas, and/or migratory corridors for energy and minerals, ROWs, and cross-country recreational use could impair the long-term productivity of big game populations by displacing animals from primary habitats and removing components of these habitats that might not be restored for more than 20 years. These short-term uses could also affect the long-term sustainability of some special status species. Greater and Gunnison Sage-Grouse, as well as other terrestrial special status species, could be affected by habitat fragmentation associated with short-term resource uses and road construction and use. Likewise, habitat for special status fish species and aquatic wildlife could be degraded by sedimentation and pollution of waterways caused by short-term uses of nearby habitats.

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Chapter 5

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CHAPTER 5
CONSULTATION AND COORDINATION

5.1 INTRODUCTION

This chapter describes the public outreach and participation opportunities made available through the development of this RMP/EIS and consultation and coordination efforts with tribes, government agencies, and other stakeholders. This chapter also lists the agencies, organizations, and individuals that received a copy of the draft RMP and associated EIS.

The BLM land use planning activities are conducted in accordance with NEPA requirements, Council on Environmental Quality regulations, and US DOI and BLM policies and procedures implementing NEPA. The NEPA and associated laws, regulations, and policies require the BLM to seek public involvement early in, and throughout, the planning process to develop a reasonable range of alternatives to proposed actions and to prepare environmental documents that disclose the potential impacts of proposed actions and alternatives. Public involvement and agency consultation and coordination, which have been at the heart of the planning process leading to this RMP/EIS, were achieved through Federal Register notices, public and informal meetings, individual contacts, media releases, planning bulletins, and the GJFO RMP revision website (http://www.blm.gov/co/st/en/fo/gjfo/rmp.html).

5.2 COLLABORATION

Federal laws require the BLM to consult with certain federal and state agencies and entities and Native American tribes (40 CFR 1502.25) during the NEPA decision-making process. The BLM is also directed to integrate NEPA requirements with other environmental review and consultation requirements to reduce paperwork and delays (40 CFR 1500.4-5).

In addition to formal scoping (**Section 5.5.1**, Scoping Process), as summarized below, the BLM has implemented an extensive collaborative outreach and public involvement process that has included conducting a community assessment,

coordinating with cooperating agencies, and working closely with the Colorado Norwest RAC and a specially created subcommittee of the RAC. The BLM will continue to meet with interested agencies and organizations throughout the planning process, as appropriate, and will continue coordinating closely with cooperating partners.

5.2.1 Native American Tribe Consultation

The BLM began tribal consultation for cultural resources for the planning process through a Ute Ethnohistory Project, which involved three BLM field offices—Grand Junction, Uncompahgre, and Colorado River Valley—that are currently revising RMPs. Presentations were held for Tribal Councils in February, May, and August 2007, and letters of invitation were mailed to tribal cultural department staff in September 2007. Cultural representatives from the Ute Indian Tribe of the Uintah and Ouray Reservation (Ute Indian Tribe), Southern Ute Tribe, and Ute Mountain Ute Tribe attended a two-day meeting in Gateway, Colorado, in November 2007, and another meeting in Grand Junction, Colorado, in March 2008. The GJFO staff held tours to significant Ute sites in the GJFO decision area from September 9 through 11, 2008, with cultural department staff and traditional leaders from the Ute Indian Tribe and the Ute Mountain Ute Tribe. This was followed by a meeting between the GJFO Field Manager, RMP Project Manager, BLM cultural staff, and the cultural staff and traditional leaders from the Ute Indian Tribe and the Ute Mountain Ute Tribe on September 11, 2008, to discuss the RMP process and their involvement.

On August 30, 2010, the GJFO sent letters to 14 tribal governments (other than the three Ute tribes), to assess their interest in participating the RMP process. None of the 14 tribes expressed interested in participating.

Additional meetings to share progress on the RMP were held with the Ute Mountain Ute Tribe cultural staff in early 2011, with the Ute Mountain Ute Tribal Council March 13, 2012; with the Southern Ute Indian Tribal Council on July 22, 2011; and with the Ute Indian Tribe, Uintah and Ouray Reservation Business Committee on August 15, 2011.

No written comments were received from tribal agencies during the scoping period; tribal concerns or issues have been typically presented in oral format. Government-to-government consultation has continued throughout the RMP process to ensure that tribal groups' concerns are considered during RMP development.

An internal review version of the draft RMP/EIS was provided to the three tribes, and the draft RMP/EIS was provided to the three tribes concurrently with its release to the public.

5.2.2 Colorado State Historic Preservation Officer Consultation

The Draft RMP/EIS was provided to the SHPO in January 2013. The BLM is currently consulting with the SHPO regarding areas proposed as Open to cross-

country travel for all modes of travel. Consultation on the travel management plan (Appendix M) is ongoing. Additional information on SHPO consultation will be added to the Approved RMP and Record of Decision.

5.2.3 US Fish and Wildlife Service Consultation

To comply with Section 7(c) of the Endangered Species Act of 1973, the BLM consulted USFWS early in the planning process. USFWS provided input on planning issues, data collection and review, and alternatives development. The BLM has consulted with USFWS to develop the draft Biological Assessment, which was formally submitted to the USFWS on October 3, 2014. Copies of the Biological Assessment and the USFWS's Biological Opinion will be provided as appendices to the Approved RMP/Record of Decision.

5.2.4 Resource Advisory Council Collaboration

A RAC is a committee established by the Secretary of the Interior to provide advice or recommendations to BLM management (BLM Land Use Planning Handbook H-1601-1). A RAC is generally composed of 15 members of the public representing different areas of expertise. The Colorado Northwest RAC includes members appointed to represent constituent public land users and provides input on public management issues to the BLM's Northwest RAC Designated Federal Officers. Recommendations are based on consensus-building and collaboration.

The Colorado Northwest RAC was involved in developing the preliminary planning issues for the GJFO RMP. In addition, a RAC subcommittee was established to participate in the planning process, and in particular to assist the BLM with creating a range of reasonable alternatives for the EIS. To date, 17 meetings of the RAC subcommittee have been held at the GJFO. On November 3, 2011 the RAC subcommittee approved the range of alternatives as a reasonable range, at the next Northwest RAC meeting (December 1, 2011) the RAC disbanded the subcommittee because their task was fulfilled.

5.2.5 Community Assessment

Colorado Mesa University, in cooperation with the GJFO, facilitated 11 focus groups with community leaders and residents living in the GJFO planning area. The purpose of the focus groups, conducted between February 23 and April 22, 2009, was to ascertain what participants value about the communities they live in and the surrounding public lands; their concerns in achieving their community and public lands vision; the beneficial outcomes their visions would produce; the perceived impacts BLM decisions would have on their visions; and the appropriate role of collaborating partners in planning and managing public lands. These data have been used in the RMP/EIS preparation.

5.2.6 Recreation Planning Report

Colorado Mesa University prepared a Recreation Planning Report to provide GJFO with data on recreation user and user group preferences, trends, and concerns. Thirteen focus group meetings were held in summer 2009 with non-

motorized users, motorized recreation enthusiasts, hunters, and local service providers. Information derived from these meetings was compiled into the Recreation Planning Report and used during draft RMP/EIS preparation.

Collaboration with various entities will be necessary to successfully implement and monitor recreation management actions under the approved RMP. The GJFO will continue working with groups such as the Colorado Plateau Mountain Bike Trail Association, Colorado Off-highway Vehicle Coalition, Old Spanish Trail Association, and others. Area tourism promotional organizations such as the Grand Junction Convention and Visitors Bureau, City of Grand Junction, City of Fruita, Gateway Canyons Resort, Palisade Chamber of Commerce, and City of Palisade and Downtown Development Authority, gear retailers, and other recreation-tourism service providers all provided input during draft RMP/EIS preparation and/or will be collaboratively engaged in RMP implementation.

5.2.7 Wild and Scenic Rivers Public Input Process

Eligibility Phase

As detailed in **Appendix C**, public involvement for the GJFO WSR evaluation process began during the eligibility phase as part of initial scoping for the RMP from October 15, 2008 through January 9, 2009. Public outreach during the scoping period included: 1) a newsletter mailed to over 600 agency officials, organizations, and members of the public; 2) three scoping open houses in December 2008 in Grand Junction and Collbran, Colorado, and in Moab, Utah; and 3) a public website, http://www.blm.gov/co/st/en/fo/gjfo/rmp, which provides access to materials distributed at scoping meetings, as well as information on the public involvement process. The BLM presented the results of its initial identification efforts, provided educational materials regarding the WSR process, and solicited comments from the public and government agencies.

The public was invited to submit comments via US mail, facsimile, and/or electronic mail and comments were accepted until January 9, 2009. The BLM received 36 discreet comments in seven letters related to WSR during scoping. Comments were analyzed and incorporated as appropriate into the eligibility study. More detailed information on public involvement during the eligibility phase can be found in the Wild and Scenic River Eligibility Report for Bureau of Land Management, Grand Junction Field Office (BLM 2009a) and the Resource Management Plan Revision Scoping Summary Report (BLM 2009b).

Suitability Phase

In late-March of 2009, the suitability phase of the evaluation process began. Letters were mailed to potential stakeholders, seeking information on the eligible river segments. Stakeholders were specifically asked to provide data related to the suitability criteria. Letters to potential stakeholders were sent on March 31, 2009, and included a list of the suitability criteria, a question and

answer on WSRs analysis and water rights/water projects overview, and a WSRs guide for riverfront property owners. Data received were analyzed and incorporated into the suitability evaluation.

During stakeholder outreach for suitability, the BLM received 23 comment letters. Comments pertained to a range of topics from the eligibility of certain segments to opinions on the suitability of eligible segments. As intended, the stakeholders provided valuable information related to the suitability criteria which was incorporated into the evaluation when applicable.

A stakeholder group, named the Lower Colorado River Wild and Scenic Stakeholder Collaborative, formed independently of BLM's public outreach process. This stakeholder group included representatives from state government, local governments, conservation districts, water districts, organizations representing agricultural interests, and organizations representing environmental interests. The stakeholder group also included several private landowners. The objective adopted by the group was to provide collaboratively-developed management recommendations to the BLM that would support the identified outstandingly remarkable values on specific stream segments while also supporting stakeholder uses and values that exist along certain stream segments. At the request of the group, BLM provided information concerning the WSR Act, the BLM planning process, and stream-related natural resource values. The BLM did not participate in the group as a stakeholder, nor did BLM participate in decisions made by the group concerning management recommendations. The group sent a letter signed by all the parties conveying its recommendations to BLM. This letter is incorporated as part of the public comment record for the BLM planning effort. Stakeholder group recommendations are more fully discussed in **Appendix C**.

5.3 COOPERATING AGENCIES

A cooperating agency is any federal, state, or local government agency or Indian tribe that enters into a formal agreement with the lead federal agency to help develop an environmental analysis. More specifically, cooperating agencies "work with the BLM, sharing knowledge and resources, to achieve desired outcomes for public lands and communities within statutory and regulatory frameworks" (BLM Land Use Planning Handbook H-1601-1).

On April 8, 2008, the BLM wrote to 20 local, state, federal, and tribal representatives, inviting them to participate as cooperating agencies for the GJFO RMP. Twelve agencies agreed to participate in the RMP as designated cooperating agencies, eight of which signed MOUs with the GJFO. On February 4, 2013 Garfield County sent a letter to the GJFO requesting cooperating agency status. On March 11, 2013 Garfield County became the ninth cooperating agency to sign an MOU with the GJFO (**Table 5-1**, Cooperating Agencies). No formal MOUs have been established with cooperating agencies within the DOI, including US BOR and USFWS.

Table 5-1
Cooperating Agencies

Agencies and Tribes Invited to be Cooperators	Agencies that Accepted	Agencies that Signed MOUs
City of Delta		
City of Fruita	X	X
City of Grand Junction	X	X
Town of Collbran	X	X
Town of De Beque	X	X
Town of Palisade	X	X
Delta County		
Garfield County	X	X
Mesa County	X	X
Montrose County		
Colorado Department of Natural Resources	X	
Colorado Parks and Wildlife	X	
Colorado River Water Conservation District	X	X
DOI Bureau of Reclamation	X	
DOI Fish and Wildlife Service	X	
USDA Natural Resources Conservation Service		
USDA Forest Service	X	X
Ute Indian Tribe, Uintah and Ouray Reservation		
Southern Ute Indian Tribe		
Ute Mountain Ute Indian Tribe		

Starting on August 18, 2008, the BLM has conducted 22 meetings to date with cooperating agencies. Cooperating agencies were also encouraged to attend the scoping open houses and provide comments during the scoping period (**Section 5.5.1**, Scoping Process). These agencies have been engaged throughout the planning process, including during alternatives development. Cooperating agencies were invited to attend route designation meetings for the Draft RMP/EIS and for the Proposed RMP/Final EIS. In addition, BLM offered to meet with each cooperating agency individually to review the Draft RMP/EIS and answer any questions. Future cooperating agency meeting dates will be posted on the GJFO RMP revision website (http://www.blm.gov/co/st/en/fo/gjfo/rmp.html).

5.4 COORDINATION AND CONSISTENCY

The BLM's planning regulations (43 CFR 1610) require that its RMPs be consistent with officially approved or adopted resource-related plans of other federal, state, local, and tribal governments, to the extent that those plans are consistent with federal laws and regulations applicable to public lands. Plans formulated by federal, state, local, and tribal governments that relate to

management of lands and resources have been reviewed and considered as the RMP/EIS has been developed. These plans include the following:

City and County Plans

- Garfield County Sage-Grouse Conservation Plan (Garfield County 2013)
- City of Grand Junction Comprehensive Plan (City of Grand Junction 2009)
- Fruita Community Plan (City of Fruita 2008)
- Town of Palisade Comprehensive Plan (Town of Palisade 2007)
- Community growth and development plans
- Mesa County Noxious Weed Management Plan (Mesa County 2009a)
- Mesa County Master Plan, as amended (Mesa County 1996)
- Mesa County Mineral and Energy Resources Master Plan (Mesa County 2011)

State Agency Plans

- Colorado River Cutthroat Trout Conservation Agreement (CPW 2006b)
- Colorado Oil and Gas Conservation Commission's regulatory rules
- Gunnison Sage-grouse Conservation Plan, Piñon Mesa, Colorado (Piñon Mesa Gunnison Sage Grouse Partnership 2000)
- Gunnison Sage-grouse Rangewide Conservation Plan (Gunnison Sage-grouse Rangewide Steering Committee 2005)
- Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats (Connelly et al. 2004)
- Colorado Sagebrush: A Conservation Assessment and Strategy (Boyle and Reeder 2005)
- Colorado's Comprehensive Wildlife Conservation Strategy (CPW 2006)
- Parachute-Piceance-Roan Greater Sage-Grouse Conservation Plan (Parachute-Piceance-Roan Greater Sage-grouse Work Group 2008)

Other Federal Agency Plans

US Fish and Wildlife Service, Colorado

- ES/GJ-6-CO-08-F-0010 Programmatic Biological Opinion for Water Depletions associated with Bureau of Land Management Projects

(excluding Fluid Mineral Development) Authorized by BLM within the Upper Colorado River Basin in Colorado

- ES/GJ-6-CO-08-F-0006 Programmatic Biological Opinion for Water Depletions Associated with Bureau of Land Management's Fluid Mineral Program within the Upper Colorado River Basin in Colorado

US Forest Service

- Noxious and Invasive Weed Management Plan for Oil and Gas Operators (US Forest Service and BLM 2007)
- US Forest Service Roadless Inventory and associated EIS (US Forest Service 2001)
- White River National Forest Land and Resource Management Plan (US Forest Service 2002)
- Planning Rule for Land Management Planning for the National Forest System (US Forest Service 2012).
- White River National Forest Oil and Gas Leasing EIS (in progress)

Neighboring BLM Offices

- Northwest Colorado Greater Sage-Grouse Draft Resource Management Amendment and EIS (in progress)
- Colorado Division of Wildlife (now Colorado Parks and Wildlife [CPW]) Strategic Plan 2010-2020 (CPW 2009a).
- Colorado River Valley Field Office RMP revision (in progress)
- Dominguez-Escalante National Conservation Area RMP (in progress)
- McInnis Canyons National Conservation Area (BLM 2004e)
- Moab Field Office RMP (BLM 2008e)
- Uncompahgre Field Office RMP revision (in progress)
- White River Field Office RMP revision (BLM 1997c)
- White River Field Office Oil and Gas RMP amendment (in progress)

5.5 PUBLIC INVOLVEMENT

Public involvement is a vital and legal component of both the RMP and EIS processes. Public involvement vests the public in the decision-making process and allows for full environmental disclosure. Guidance for implementing public involvement under NEPA is codified in 40 CFR Section 1506.6, thereby ensuring that federal agencies make a diligent effort to involve the public in the NEPA process. Section 202 of the FLPMA directs the Secretary of the Interior to establish procedures for public involvement during land use planning actions on public lands. These procedures can be found in the BLM's Land Use Planning

Handbook (H-1601-1). Public involvement for the GJFO RMP/EIS includes the following four phases:

- Public scoping before NEPA analysis begins to determine the scope of issues and alternatives to be addressed in the RMP/EIS;
- Public outreach via newsletters and news releases;
- Collaboration with federal, state, local, and tribal governments, the BLM Colorado Northwest RAC, and cooperating agencies; and
- Public review of and comment on the draft RMP/EIS, which analyzes likely environmental effects and identifies the BLM's preferred alternative.

The public scoping phase of the process has been completed and is described in **Section 5.5.1**, Scoping Process. The public outreach and collaboration phases are ongoing throughout the RMP/EIS process. Information about the process can be obtained by the public at any time on the GJFO RMP revision website (http://www.blm.gov/co/st/en/fo/gjfo/rmp.html). This website contains background information about the project, a public involvement timeline and calendar, maps and photos of the planning area, and copies of public information documents released throughout the RMP/EIS process.

5.5.1 Scoping Process

The formal public scoping process for the GJFO RMP/EIS began on October 15, 2008, with the publication of the NOI in the Federal Register (Vol. 73, No. 200, page 61164). The NOI notified the public of the BLM's intent to develop an RMP for the GJFO; it also initiated the public scoping period, which closed on January 9, 2009.

News Release

A news release was provided to local news organizations on November 6, 2008. This press release announced the scoping period for the GJFO RMP/EIS process and provided information about the open houses.

Newsletter

On November 11, 2008, the BLM mailed a newsletter announcing the start of the scoping period for the GJFO RMP/EIS to more than 680 individuals from the public, agencies, and organizations who had participated in past GJFO BLM activities and had been included on past BLM distribution lists. The newsletter provided the dates and venues for three scoping open houses, included a comment form for submitting scoping comments, and described the various methods for submitting comments, including dedicated email and postal addresses. The BLM published additional newsletters at major project milestones and mailed them to individuals and organizations that requested to remain on or be added to the project mailing list. These newsletters are posted

on the GJFO RMP revision website (http://www.blm.gov/co/st/en/fo/gjfo/rmp.html).

Scoping Open Houses

The BLM hosted three open houses to provide the public with opportunities to become involved, learn about the project and the planning process, meet the GJFO RMP team members, and offer written comments. The public was notified of the open houses by news release and in the project newsletter. Information on the open houses is provided in **Table 5-2**, Scoping Open House Information.

Table 5-2
Scoping Open House Information

Venue	Location	Date	Number of Attendees
Two Rivers Convention Center	Grand Junction, Colorado	December 2, 2008	99
Grand Center	Moab, Utah	December 3, 2008	2
Collbran Auditorium	Collbran, Colorado	December 4, 2008	13
		Total	**114**

Note: All meetings were from 5:30 to 7:00 pm.

Scoping meetings were held in an open house format to encourage participants to discuss concerns and questions with BLM staff representatives. The BLM gave a short presentation to provide an overview of the RMP process and present information about public involvement opportunities. Site and resource maps illustrated the current situation and management techniques practiced among different resources and land areas. In addition, summaries of resource issues were available to provide an overview of current management practices and issues. Copies of the project newsletter and scoping comment forms were available. A total of 114 people attended the open houses.

Scoping Comments Received

The BLM received 149 unique written submissions containing 953 separate comments during the public scoping period. Detailed information about the comments received and about the public outreach process can be found in the Grand Junction Field Office RMP Revision Scoping Summary Report, finalized in April 2009 (BLM 2009a). The issues identified during public scoping and outreach helped refine the list of planning issues, included in **Section 1.6.2**, Issue Identification, which guided the development of alternative management strategies for the RMP.

5.5.2 Travel Management Scoping Process

To aid in the route designation process, GJFO also hosted a series of "travel management data collection workshops" in February 2009 to give the public the opportunity to review its route inventory for completeness and accuracy, as well as offer suggestions for possible reroutes or new routes that would

complement the existing system. The workshops were held in Delta, DeBeque, Collbran, Gateway, Fruita, and Grand Junction, with over 200 participants. A total of 118 written comments were received during this comment period.

From the input received at the travel management data collection workshops, GJFO identified the need and interest from the public to comment not only on the completeness and accuracy of the inventory but also to help evaluate the quantity and quality of the experiences and desired recreation setting available in the planning area. A second comment period was held, wherein the GJFO received 178 written comments. Viewpoints expressed in the comments reflected a wide spectrum of desires regarding appropriate levels of access. See **Appendix L**, Draft Travel Management Plan for the Grand Junction Field Office, for a full description of the travel management public involvement process.

5.5.3 Project Website

The BLM maintains an interactive website to provide the public with the latest information about the RMP/EIS process. The website, available on the Internet at http://www.blm.gov/co/st/en/fo/gjfo/rmp.html, provides background information about the project, a public involvement timeline and calendar, maps and photos of the planning area, and copies of public information documents such as the NOI and newsletter. The site also provided a link to the comment form for submitting scoping comments.

5.5.4 Mailing List

The BLM compiled a mailing list of over 680 individuals, agencies, and organizations that had participated in past BLM projects. Each entity was mailed or emailed the initial newsletter with project and scoping open house information. Attendees at the scoping open houses were added to the mailing list if they wanted to receive or continue to receive project information. In addition, all individuals or organizations who submitted scoping comments were added to the mailing list. Through this process, the mailing list was revised to include approximately 960 entries. Requests to be added to or to remain on the official GJFO RMP distribution list will continue to be accepted throughout the planning process.

5.5.5 Notice of Availability of the Draft RMP/EIS

On January 25, 2013, the BLM and EPA published a Notice of Availability in the Federal Register which marked the beginning of the formal 90-day public comment period. On March 6, 2013 the public comment period was extended 60 days. The formal public comment period ended on June 24, 2013.

The BLM provided paper copies of the Draft RMP/EIS directly to cooperating agencies, other federal, state, and local agencies, and tribal representatives. Paper copies were also available at community libraries in Grand Junction, Collbran, DeBeque, Gateway, and Fruita.

5.5.6 Future Public Involvement

The ROD will be issued by the BLM after the release of the Proposed RMP/Final EIS, the Governor's Consistency Review, and any resolution of protests received on the Proposed RMP/Final EIS. Section 5.5.8 describes the protest period.

5.5.7 Public Meetings

Five open houses were held during the 150-day comment period for the Draft RMP/EIS (See **Table 5-3**, Draft RMP/EIS Open House Information). The locations, dates, and times of the open houses were announced via email and in the RMP newsletter that was sent to over 1,400 people included on the mailing list. Press releases in local and regional newspapers and radio spots supplemented the mailing. In addition, the locations, dates, and times of the open houses were posted on the GJFO RMP website.

Table 5-3
Draft RMP/EIS Open House Information

Venue	Location	Date	Number of Attendees
Collbran Auditorium	Collbran, Colorado	January 29, 2013	7
DeBeque Community Center	DeBeque, Colorado	January 30, 2013	29
Clarion Inn	Grand Junction, Colorado	January 31, 2013	245
Gateway Community Center	Gateway, Colorado	February 5, 2013	46
Fruita Civic Center	Fruita, Colorado	February 7, 2013	181
		Total	**508**

Note: All meetings were from 5:30 to 7:00 pm.

The open houses were geared to provide information to the public on the content of the Draft RMP/EIS as well as to provide guidance on commenting on the document and answer questions. Each open house included a PowerPoint presentation which provided an overview of the planning process and a comparison of major elements contained in the Draft RMP/EIS. Attendees were then encouraged to visit with BLM representatives and managers regarding questions or concerns about the Draft RMP/EIS. The public was provided with the opportunity to submit written comments at the open houses.

5.5.8 Distribution and Availability of the Proposed RMP and Final EIS

A Notice of Availability will be published in the Federal Register to notify the public of the availability of the Proposed RMP/Final EIS. The Notice of Availability will also outline protest procedures during the 30-calendarday protest period. The Proposed RMP/Final EIS will be available for downloading from the RMP website at /www.blm.gov/co/st/en/fo/gjfo/rmp.html. The Proposed RMP/Final EIS will also be available for review at the GJFO and community libraries listed on the RMP website. Press releases will be issued to notify the public of the Proposed RMP/Final EIS availability. A list of entities

receiving paper copies of the Proposed RMP/Final EIS is available in the administrative record.

5.6 Summary of Comments Received on the Draft RMP/EIS

5.6.1 Process and Methodology

According to NEPA, the BLM is required to identify and formally respond to all substantive public comments received during the comment period for the Draft RMP/EIS. The BLM developed a systematic process for responding to comments to ensure all substantive comments were tracked and the content seriously considered. A description of this process follows.

First, the BLM developed a coding structure to help sort comments into logical groups by topics and issues. Codes were derived from resources covered in the Draft RMP/EIS or by common issues. Submissions (e.g., letters, emails, faxes, etc.) were given a unique identifier for tracking purposes and then each submission was carefully reviewed to capture all comments, if substantive (more description of this process is set forth below). All comments received can be tracked to the original submission.

Second, the BLM created a comment database. For each comment in a unique submission, the BLM captured the name and address of the Commenter, assigned a code to the comment, and captured the text of all substantive comments.

The coding and comment database processes aimed at assisting the GJFO in determining if the substantive issues raised by the public warranted modification of one or more of the alternatives or further analysis of issues and impacts. The criteria for determining whether a comment was substantive or nonsubstantive are described in detail in Section 6.1. With the information provided through the public review process, the BLM reconsidered the draft alternatives, made changes as appropriate, and developed the Proposed RMP/Final EIS. Factual or grammatical errors which led to a change in text are not summarized but were incorporated into the Proposed RMP/Final EIS.

Finally, the BLM used the comment database to prepare a narrative summary of the substantive comments. Opinions, feelings, and preferences for one element or one alternative over another, and comments of a personal and/or philosophical nature were all read, analyzed, and considered, but because such comments are not substantive in nature, the BLM did not respond to them.

5.6.2 Summary of Written Comments Received

The comment period closed on June 24, 2013. All written comments sent before 12:00 AM on June 25, 2013, were accepted as official comments. These included those sent by US mail postmarked on June 24, 2013, and email messages and facsimiles sent on June 24, 2013, regardless of when they were received. Some comments were duplicated with an email message and a letter

submitted via US mail. Identical comments from the same party were considered only once.

Table 5-4 displays a summary of the substantive public comments received on the Draft RMP/EIS. Responses to these comments are provided and discussed in detail in Chapter 6.

Table 5-5, Number of Substantive Submissions by Commenter Affiliation, displays the total number of submissions (e.g., letters, emails, faxes, comment forms) received by individuals, government agencies, organizations, businesses, and others. Note that one submission (e.g., a letter) may have multiple discrete comments within it; therefore, the number of submissions is less than the number of comments in Table 5-4.

In addition, 521 submissions were received that did not contain any substantive comments.

Finally, as of August 2014, 73 submissions were received after the comment period closed. These submissions were reviewed for consideration during development of the Proposed RMP/Final EIS, but are not included in the responses to substantive comments in Chapter 6.

Table 5-4
Summary of Substantive Comments Received on Draft RMP/EIS

Category	Number of Comments
Air Quality	80
Areas of Critical Environmental Concern	23
Cultural and Heritage Resources	8
Drought Management and Climate Change	3
Edits	73
Energy Development	57
Fire Management	5
Fish and Wildlife	29
FLPMA, NEPA, etc.	32
Forestry	3
General	12
Geology and Soils	7
GIS Data	5
Hazardous Materials	-
Land Use	-
Lands and Realty	14
Livestock Grazing	6
Minerals and Mining	13
National Trails and Byways	-
Noise	-
Paleontological Resources	2
Public Health and Safety	5

Table 5-4
Summary of Substantive Comments Received on Draft RMP/EIS

Category	Number of Comments
Recreation	87
Renewable Energy	-
Route Designations	1,645
Socioeconomics, Environmental Justice	91
Special Designation Areas – General	-
Special Status Fish	1
Special Status Plants	6
Special Status Species General	29
Special Status Wildlife	19
Stipulations	38
Traffic and Transportation	2
Travel Management	66
Tribal Interests and Native American Religious Concerns	-
Vegetation	9
Visual Resources	8
Water Resources	35
Weeds	2
Wetland and Riparian Vegetation	-
Wild and Scenic Rivers	21
Wild Horses	-
Wilderness and WSAs	4
Wilderness Characteristics	98
Total	**2,538**

Table 5-5
Number of Substantive Submissions by Commenter Affiliation

Affiliation	Number of Comments
Local Government Agency	7
State Government Agency	4
Business/Commercial Sector	14
Educational Institution	0
Elected Official	1
Federal Government Agency	5
Individual	683
Organization (non-profit, citizen's group)	269
Tribal Government	0
Total	**983**

5.7 LIST OF PREPARERS

Name	Role/Responsibility
Grand Junction Field Office	
Katie Stevens	Field Manager
Catherine Robertson	*Field Manager*
Wayne Werkmeister	Associate Field Manager
Christina Stark	Planning and Environmental Coordinator; Lands and Realty; Renewable Energy; Riparian; ACECs; Socioeconomics; Environmental Justice; Public Health and Safety
Collin Ewing	*Planning and Environmental Coordinator; ACECs; Socioeconomics; Environmental Justice; Public Health and Safety*
Matt Anderson	*Planning and Environmental Coordinator*
Michelle Bailey	Recreation; Travel Management; Interpretation and Environmental Education; National, Scenic, and Historic Trails; National, State; and BLM Byways; Wild and Scenic Rivers; Lands with Wilderness Characteristics; Wilderness Study Areas; Visual Resources
Terry Bridgman	*Livestock Grazing*
Julia Christiansen	Energy and Minerals
Natalie Clark	Cultural Resources; Native American Tribal Uses
Scott Clarke	Livestock Grazing
Bridget Clayton	*Energy and Minerals*
Forest Cook	Air Resources (Colorado State Office)
Doug Diekman	GIS
Nathan Dieterich	*Water Resources; Soils*
Jim Dollerschell	Livestock Grazing; Wild Horses
Robert Fowler	*Livestock Grazing; Riparian*
Scott Gerwe	Energy and Minerals; Paleontology; Geology
Chris Ham	*Recreation*
Bob Hartman	Energy and Minerals
Lathan Johnson	Wildland Fire Management
Mike Jones	Recreation
Robin Lacy	Lands and Realty
Aline LaForge	*Cultural Resources; Native American Tribal Uses*
Alissa Leavitt-Reynolds	*Cultural Resources; Native American Tribal Uses*
Anna Lincoln	Vegetation; Special Status Species
Jacob Martin	Forestry
Chad Meister	Air Resources (Colorado State Office)
Chris Pipkin	Recreation; Travel Management; Interpretation and Environmental Education; National, Scenic, and Historic Trails; National, State; and BLM Byways; Visual Resources
Heidi Plank	Fish and Wildlife; Special Status Species
Adam Straubinger	*Lands with Wilderness Characteristics Inventory*
Mark Taber	Weeds
Andy Windsor	Recreation
Cathy Ventling	*Energy and Minerals*
Aaron Young	*GIS*
US Geological Survey	
Steve Garman	Land Use Model

Name	Role/Responsibility
EMPSi Team	
David Batts	Principal in Charge
Drew Vankat	Project Manager; Recreation; Travel Management
Jennifer Whitaker	Deputy Project Manager; Energy and Minerals
James Bode	Wilderness Study Areas
Kevin Doyle	Cultural Resources; Paleontology; Native American Tribal Uses
Andrew Gentile	Renewable Energy
Zoe Ghali	Forestry; National, Scenic, and Historic Trails; National, State, and BLM Byways
Derek Holmgren	Water Resources
Julia Howe	Visual Resources
Cliff Jarman	Energy and Minerals; Geology
Jenna Jonker	GIS
Kate Krebs	Visual Resources; Wild and Scenic Rivers; Wilderness Study Areas; Lands with Wilderness Characteristics
Craig Miller	Fish and Wildlife
Rod Moraga	Wildland Fire Management
Ralph Morris	Air and Climate
Stephanie Phippen	Soils
Holly Prohaska	Livestock Grazing; Wild Horses
Marcia Rickey	GIS
Jennifer Thies	Lands and Realty
Meredith Zaccherio	Fish and Wildlife; Special Status Species; Vegetation; ACECs
Jim Zapert	Air and Climate
Colorado Mesa University	
Tim Casey	Socioeconomic Resources; Community Assessment; Recreation Planning Report
James Curtsinger	Socioeconomic Resources; Environmental Justice
Justin Gollob	Socioeconomic Resources; Environmental Justice
John Redifer	Socioeconomic Resources; Environmental Justice

Italicized text denotes former GJFO staff member

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