U.S. Department of the Interior
Bureau of Land Managment
Colorado State Office

GLENWOOD SPRINGS FIELD OFFICE

Roan Plateau Planning Area

Including Naval Oil Shale Reserves
Numbers 1 & 3

Resource Management Plan Amendment
& Environmental Impact Statement

Volume I

FINAL
August 2006

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Glenwood Springs Field Office
50629 Highways 6 & 24
Glenwood Springs, Colorado 81601

In reply refer to: 1610.5-2

August, 2006

Dear Reader:

Enclosed for your review is the Roan Plateau Proposed Resource Management Plan Amendment (RMPA) and Final Environmental Impact Statement (EIS) to the Glenwood Springs Resource Management Plan. This Proposed RMPA considers management for all Bureau of Land Management administered lands and resources in the planning area, including Naval Oil Shale Reserves 1 and 3. The Proposed RMPA was prepared by the Bureau of Land Management (BLM) in consultation with cooperating agencies, taking into account public comments received during this planning effort.

The planning area is administered by the BLM's Glenwood Springs and White River Field Offices in Garfield and Rio Blanco Counties, Colorado. Two Resource Management Plans (RMPs) will be amended within the planning area when the Record of Decision for the Roan Plateau Amendment is approved. The first is the Glenwood Springs RMP approved January 1984; maintained 1988; and amended in November 1991, November 1996, August 1997, March 1999, November 1999, and September 2002. The second is the White River Resource Area RMP, approved in July 1997.

This Proposed RMPA provides a framework for the future management direction and appropriate use of approximately 73,602 acres of Public Land (including both surface and sub-surface estate) located in Garfield and Rio Blanco Counties, Colorado. This document contains both proposed land use planning decisions for a variety of resources and proposed implementation decisions regarding management of specific motorized routes. This Proposed RMPA and FINAL EIS has been developed in accordance with the National Environmental Policy Act of 1969 (NEPA) and the Federal Land Policy and Management Act of 1976 (FLPMA). The Proposed RMPA is based on elements of Alternatives II and III of the Draft RMPA/ Draft EIS, Cooperating Agency input, and changes made in response to public comment. Alternative III was the Preferred Alternative in the Draft RMPA/Draft EIS which was released on November 19, 2004. This document contains the Proposed RMPA/Final EIS, changes made between the preferred alternative in the Draft RMPA/Draft EIS and the Proposed RMPA/Final EIS; impacts of the proposed plan, a summary of the comments received during the public review period of the Draft RMPA/Draft EIS, and responses to those comments. Land use planning decisions may be protested; implementation decisions regarding management of individual travel management routes may be appealed. Information on both the protest and appeals processes follows.

Protests must be in writing and filed with the BLM Director. All protests must be postmarked or received not later than 30 days after publication of EPA's Notice of availability in the *Federal Register.* Protests may be sent via U.S. mail to: U.S. Department of the Interior, Bureau of Land Management, Director (210), Attention – Brenda Williams, PO Box 66538, Washington DC 20035. Protests sent via express mail or overnight delivery service should be sent to: U.S. Department of the Interior, Bureau of Land Management, Director (210), Attention – Brenda Williams, 1620 L Street, NW, Suite 1075, Washington DC 20036.

The 30–day review and protest period for this Proposed RMPA will begin on the date the Environmental Protection Agency (EPA) publishes its Notice of Availability of the Proposed RMPA and Final EIS in the *Federal Register*, and continue for 30 days. During the 30-period protest period any person who (a.) participated in the planning process for this RMPA, and (b.) has an interest which is or may be adversely affected, may protest approval of this Proposed RMPA and land use planning decisions contained within it. For details refer to 43 Code of Federal Regulations (CFR) 1610.5-2. Only those persons or organizations who participated in the planning process leading to the Proposed RMPA may protest. The protesting party may raise only those issues submitted for the record during the planning process leading up to the publication of this Proposed RMPA. These issues may have been raised by the protesting party or others. New issues may not be brought into the record at the protest stage.

Email and fax protests will not be accepted as valid protests unless the protesting party also provides the original letter by either regular mail postmarked, or overnight mail received by, the close of the protest period. Under these conditions, BLM will consider the E-mail or fax protest as an advance copy and the protest will receive full consideration. If you wish to provide BLM with such advance notification, please direct E-mails to *Brenda_Hudgens-Williams@blm.gov* and faxes to (202) 452-5112 (Attn: BLM Protest Coordinator).

IMPORTANT: State that you are protesting a decision in the Roan Plateau Proposed Resource Management Plan Amendment/Final Environmental Impact Statement.
In accordance with 43 CFR 1610.5-2 the protest must contain the following information:

- **The name, mailing address, and telephone number of the person filing the protest.**
- **The "interest" of the person filing the protest (how will you be adversely affected by the approval or amendment of the resource management plan?)**
- **A statement of the part(s) of the Proposed RMPA and Final EIS, and the issue(s) being protested. (To the extent possible, this should reference specific pages, paragraphs, sections, tables, maps, etc., which are believed to be incorrect or incomplete.)**
- **A copy of all documents addressing the issue(s) that the protesting party submitted during the planning process (this is preferred) or a statement of the date they were discussed for the record.**
- **A concise statement explaining why the protestor believes the BLM State Director's proposed decision is incorrect.**

All of these elements are critical parts of your protest. Take care to document all relevant facts. As much as possible, reference or cite the planning documents, or available planning records (e.g. meeting minutes or summaries, correspondence, etc.) To aid in ensuring the completeness of your protest, use the above checklist, or the removable checklist that appears following this letter. A copy of the protest check list is also available online at *http://www.blm.gov/rmp/co/roanplateau*.

The BLM Director will make every attempt to promptly render a decision on the protest. The decision will be in writing and will be sent to the protesting party by certified mail, return receipt requested. The decision of the BLM Director shall be the final decision of the Department of the Interior.

BLM's practice is to make comments, including names and home addresses of respondents, available for public review. Individual respondents may request that BLM withhold their names and or home addresses; if you wish BLM to consider withholding this information, you must state this prominently at the beginning of your comments. In addition, you must present a rationale for withholding this information. This rationale must demonstrate that disclosure "would constitute an unwarranted invasion of privacy." Unsupported assertions will not meet this burden. In the absence of exceptional,

documentable circumstances, this information will be released. All submissions from organizations and businesses, and from individuals identifying themselves as representatives or officials of organizations and businesses, will be available for public inspection in their entirety.

Implementation decisions for travel management will be made in a separate decision document, announced via the Glenwood Springs Field Office NEPA notification process. Unlike land use planning decisions, implementation decisions are not subject to protest under planning regulations but are subject to administrative remedies and review, primarily through appeals to the Office of Hearings and Appeals (Interior Board of Land Appeals). Implementation decisions generally constitute BLM's final approval allowing on-the ground actions to proceed. Where implementation decisions are analyzed as part of the land use planning process, they are still subject to the appeals process or other administrative review as prescribed by specific resource program regulations. Implementation decisions will be made after BLM (a.) resolves the protests to land use planning decisions and (b.) makes a decision to adopt or modify the Proposed RMPA. Administrative remedies for implementation decisions regarding travel management will take the form of appeals to the Office of Hearings and Appeals. The appeals process for these decisions can be found at 43 CFR 4.21. This type of appeal should not be confused with the protest of land use planning decisions to the BLM Director.

Upon resolution of any protests, an Approved Plan Amendment and Record of Decision (ROD) will be issued. The Approved Plan Amendment will be available to all who participated in the planning process and the public. It will be available in downloadable, CD, and paper formats; either via download through the "Planning" page of the BLM national website (*http://www.blm.gov*), or by mail upon request from the Glenwood Springs Field Office, 50629 Highways 6 & 24, Glenwood Springs, Colorado 81601.

Sincerely,

Jamie E. Connell
Field Manager

Roan Plateau Proposed Resource Management Plan Amendment Protest Critical Item Checklist

As outlined at 43 CFR 1610.5-2 the following items MUST be included to constitute a valid protest.
You may use this optional form, or a narrative letter.
Please read the Privacy Notice and Where and When to Send Your Protest Statements on the reverse side of this form.

Proposed Resource Management Plan Amendment (RMPA) being protested:
Roan Plateau Proposed Resource Management Plan Amendment

Name:
Address:
Phone Number: ( )

What is your interest in filing this protest; how will you be adversely affected by the approval or amendment of this plan?:

Issue or issues being protested:

Detach Along line

Statement of the part or parts of the plan being protested:

Chapter:
Section:
Page:
(or) Map:

Attach copies of all documents addressing the issue(s) that were submitted during the planning process by the protesting party, or an indication of the date the issue(s) were discussed for the record.
List of documents attached:

Date(s) issues were discussed:

A concise statement explaining why the State Director's decisions is believed to be wrong:

Privacy Notice: **The Bureau of Land Management's practice is to make protests, including names and home addresses of respondents, available for public review. Individual respondents may request that we withhold their names and or home addresses, but if you wish us to consider withholding this information, you must state this prominently at the beginning of your protest. In addition, you must present a rationale for withholding this information. This rationale must demonstrate that disclosure would constitute an unwarranted invasion of privacy. Unsupported assertions will not meet this burden. In the absence of exceptional, documentable circumstances, this information will be released.**

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Proposed
Roan Plateau Resource Management Plan Amendment
and
Final Environmental Impact Statement

Draft ( ) **Final (X)**

Lead Agency: **United States Department of the Interior, Bureau of Land Management (BLM)**
Type of Action: **Administrative (X)** **Legislative ( )**

Abstract: The Roan Plateau Proposed Resource Management Plan Amendment (RMPA) and Final Environmental Impact Statement analyzes six alternatives for managing approximately 73,602 acres of federal land within the Planning Area in western Colorado in Garfield and Rio Blanco Counties. Alternatives I through V were presented in the Draft Resource Management Plan Amendment and Draft Environmental Impact Statement (Draft). Alternative I is the continuation of present management or No Action alternative. Alternatives II through V and the Proposed Plan present differing balances of land use allocations. The Proposed Plan is the agency-preferred alternative. The Proposed Plan is largely based on Alternative III, the Preferred Alternative in the Draft, although it incorporates changes made in response to public comments and Cooperating Agency input.

Major issues addressed include management of natural gas resources, visual resources/scenic quality, wildlife habitat, fisheries habitat, ecological values, livestock grazing, hunting, recreation, wilderness characteristics, transportation planning, Wild and Scenic Rivers eligibility, identification of watersheds with protective management prescriptions, and designation of special management areas.

How to Protest: Protests must be in writing and filed with the BLM Director. All protests must be postmarked or received not later than 30 days after publication of EPA's Notice of availability in the *Federal Register.* Protests may be sent via U.S. mail to: U.S. Department of the Interior, Bureau of Land Management, Director (210), Attention – Brenda Williams, PO Box 66538, Washington DC 20035. Protests sent via express mail or overnight delivery service should be sent to: U.S. Department of the Interior, Bureau of Land Management, Director (210), Attention – Brenda Williams, 1620 L Street, NW, Suite 1075, Washington DC 20036. Refer to the letter preceding this abstract for additional information.

The 30–day review and protest period for this Proposed RMPA will begin on the date the Environmental Protection Agency (EPA) publishes its Notice of Availability of the Proposed RMPA/FEIS in the *Federal Register*, and continue for 30 days. During the 30-period protest period any person who (a.) participated in the planning process for this RMPA, and (b.) has an interest which is or may be adversely affected, may protest approval of this Proposed RMPA and land use planning decisions contained within it. For details refer to 43 Code of Federal Regulations (CFR) 1610.5-2. Only those persons or organizations who participated in the planning process leading to the Proposed RMPA may protest. The protesting party may raise only those issues submitted for the record during the planning process leading up to the publication of this Proposed RMPA. These issues may have been raised by the protesting party or others. New issues may not be brought into the record at the protest stage.

For Further Information Contact:

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United States Department of the Interior
Bureau of Land Management
Colorado State Office
Glenwood Springs Field office

Roan Plateau
Proposed Resource Management Plan Amendment
and
Final Environmental Impact Statement

Recommended by:

Jamie E. Connell
Field Manager

Approved by:

Sally Wisely
State Director

August 2006

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Tables

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Chapter 6 Consultation and Coordination

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Acronyms

AADT	Average Annual Daily Traffic
AACL	Acceptable Ambient Concentration Levels
AAQS	Ambient Air Quality Standards
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ac	acre
ac-ft	acre-feet
AIRFA	American Indian Religious Freedom Act
AMP	Allotment Management Plan
AMS	Analysis of the Management Situation
ANC	Acid Neutralizing Capacity
APCD	(Colorado) Air Pollution Control Division
APD	Application for Permit to Drill
AQRV	Air Quality Related Values
ARPA	Archeological Resources Protection Act
ATV	All Terrain Vehicle
AUM	Animal Unit Month
BA	Biological Assessment
BACT	Best Available Control Technology
bbl	Barrel
BCC	Birds of Conservation Concern
BCF	Billion cubic feet
BLM	Bureau of Land Management
BMP	Best Management Practice
BO	Biological Opinion
C	degrees Centigrade
CALPUFF	CALifornia PUFF Dispersion Model
CBEF	Center for Business and Economic Forecasting, Inc.
CCR	Colorado Code of Regulations
CDNR	Colorado Department of Natural Resources
CDPHE	Colorado Department of Public Health and Environment
CDPHE-APCD	CDPHE – Air Pollution Control Division
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	CERCLA Information System
CESQG	Conditionally Exempt Small-Quantity Generator
CFR	Code of Federal Regulations
cfs	cubic feet per second
CGS	Colorado Geological Survey
CNAP	Colorado Natural Areas Program
CNHP	Colorado Natural Heritage Program
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COA	Condition of Approval
COGCC	Colorado Oil and Gas Conservation Commission
CR	County Road

CRCT	Colorado River Cutthroat Trout
CSU	Controlled Surface Use
CWCB	Colorado Water Conservation Board
CWD	Chronic Wasting Disease
CWP	Commercial Wood Products
DAU	Data Analysis Unit
DEIS	Draft Environmental Impact Statement
DEM	Digital Elevation Model
DEQ	Department of Environmental Quality
DO	dissolved oxygen
DOE	[U.S.] Department of Energy
DOLA	[Colorado] Department of Local Affairs
DPC	Desired Plant Community
DRMP	Draft Resource Management Plan
dv	Deciview
EA	Environmental Assessment
ECHO	Enforcement and Compliance History Online
ECR	Ecological Condition Rating
EIS	Environmental Impact Statement
EPA	[U.S.] Environmental Protection Agency
ERMA	Extensive Recreation Management Area
ERNS	Emergency Response Notification System
ESA	Endangered Species Act
ESI	Ecological Site Inventory
F	degrees Fahrenheit
FAR	Functioning At Risk
FLAG	Federal Land Managers' AQRV Workgroup
FLPMA	Federal Land Policy and Management Act
FMHN	Field Museum of Natural History
FMP	Fire Management Plan
FMZ	Fire Management Zone
FOOGLRA	Federal Onshore Oil and Gas Leasing Reform Act
FSEIS	Final Supplemental Environmental Impact Statement
ft	feet
GHGs	Greenhouse Gases
GIS	Geographic Information System
GMU	Game Management Unit
gpt	gallons per ton
GSFO	Glenwood Springs Field Office
GSRA	Glenwood Springs Resource Area
HAP	Hazardous Air Pollutants
HMP	Habitat Management Plan
hp	horsepower
I-70	Interstate 70
IB	Information Bulletin
IMPROVE	Interagency Monitoring of Protected Visual Environments
IRIS	Integrated Risk Information System
ISCST3	Industrial Source Complex – Short Term Dispersion Model, Version 3
IWAQM	Interagency Workgroup on Air Quality Modeling
kg/ha-yr	kilograms per hectare-year
LAC	Limit of Acceptable Change

LN	Lease Notice
LQG	Large Quantity Generator
MBF	Thousand Board-Feet
MBO	Thousand Barrels of Oil
MBTA	Migratory Bird Treaty Act
MCF	Thousand Cubic Feet
MCL	Maximum Contaminant Level
µS/cm	microSiemens per centimeter
MCU	University of Colorado Museum
MEI	Maximally Exposed Individual
mg/L	milligrams per liter
MLA	Mineral Leasing Act
MLE	Most Likely Exposure
MM5	Mesoscale Meteorological Model, Version 5
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MMCF	Million Cubic Feet
MSL	Mean Sea Level
MWC	Museum of Western Colorado
NA	not applicable
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NCP	National Contingency Plan
NDIS	National Diversity Information Source
NEPA	National Environmental Policy Act
NF	Non-Functioning
NGD	No [Long-term] Ground Disturbance
NHPA	National Historic Preservation Act
NI	no information
NMNH	National Museum of Natural History
NOA	Notice of Availability
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
NOI	Notice of Intent
NOSR	Naval Oil Shale Reserve
NOT	Not Meeting Standards
NPL	National Priority List
NPS	National Park Service
NRC	National Response Center
NRCS	Natural Resources Conservation Service
NREL	National Renewal Energy Laboratory
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
NSR	New Source Review
NSTC-AQ	[[BLM] National Science and Technology – Air Quality
NWPS	National Wilderness Preservation System
NWSRS	National Wild and Scenic River System
OHV	Off-Highway Vehicles (off-road vehicles)
OMP	Operational Management Plan
ONA	Outstanding Natural Area
ORV	Outstandingly Remarkable Values

PA	Programmatic Agreement
PBA	Programmatic Biological Assessment
PCRAMMET	PC Version of EPA Rammet Meteorological Preprocessor Program
PICA	PSD Increment Consumption Analysis
PFC	Proper Functioning Condition
PILT	Payment in Lieu of Taxes
PM	Particulate Matter
PNC	Potential Natural Community
ppbv	Parts per billion by volume
ppm	parts per million
PSD	Prevention of Significant Deterioration
R&PPA	Recreation and Public Purposes Act
RCRA	Resource Conservation and Recovery Act
RCRIS	RCRA Information System
RfC	EPA Reference Concentration
RFD	Reasonable Foreseeable Development
RMP	Resource Management Plan
RMPA	RMP Amendment
RNA	Research Natural Area
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
ROW	Right-of-Way
SCS	Soil Conservation Service
SH	State Highway
SHPO	State Historic Preservation Officer
SO_2	Sulfur Dioxide
SQG	Small Quantity Generator
sq mi	square miles
SRMA	Special Recreation Management Area
SSC	Species of Special Concern
SSR	Site-Specific Relocation
SVIM	Soil and Vegetation Inventory Method
TDS	Total Dissolved Solids
TL	Timing Limitation
TMA	Travel Management Area
TMDL	Total Maximum Daily Load
TSD	Technical Support Document (for Air Quality)
TSL	Toxic Screening Level
TSP	Total Suspended Particulates
TCF	Trillion cubic feet
UDEQ	Utah Department of Environmental Quality
USC	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound
VRM	Visual Resource Management
WFU	Wildland Fire Use
WMA	Watershed Management Area

WRIS	Wildlife Resource Information System
WRFO	White River Field Office
WRRA	White River Resource Area
WSA	Wilderness Study Area
WSR	Wild and Scenic River
WSRA	Wild and Scenic Rivers Act
µg/m^3	micrograms per cubic meter

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Name	Discipline	Qualifications and Experience	Area of Participation
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SUMMARY

SUMMARY

INTRODUCTION

This Proposed Roan Plateau Resource Management Plan Amendment and Final Environmental Impact Statement (Proposed Plan/Final EIS, or RMPA/EIS) presents management alternatives and resultant environmental impacts for lands administered by the U.S. Department of the Interior (USDI), Bureau of Land Management (BLM) in the Roan Plateau Planning Area of west-central Colorado. The management alternatives represent possible amendments to the current management direction under the 1984 Resource Management Plan (RMP) for the Glenwood Springs Resource Area (GSRA), maintained in 1988 and amended in 1991, 1996, 1997, 1999, and 2002, and the 1997 White River Resource Area (WRRA) RMP.

The Planning Area includes 73,602 acres of Federal lands (Federal surface, minerals, or both), of which all but 6,668 acres is also Federal surface. The Federals lands include 44,267 acres of Naval Oil Shale Reserves (NOSRs) Numbers 1 and 3 that are not currently available for oil and gas leasing and development but would become available under the Proposed Plan. The remaining area of Federal lands, including some BLM NOSR lands and some BLM non-NOSR lands, is already available for or actively undergoing oil and gas development. Responsibility for management of NOSRs 1 and 3 was transferred from the U.S. Department of Energy (DOE) to BLM in 1997.

The Planning Area is located primarily in western Garfield County, with a small portion in southern Rio Blanco County. It lies generally north of Interstate 70 (I-70) between the towns of Rifle and Parachute and consists of three visually, geologically, and ecologically distinct areas: (1) semi-desert habitats at lower elevations, (2) relatively moist montane and subalpine habitats at higher elevations, and (3) a band of high and mostly unbroken cliffs separating these areas. The Planning Area drains westward to Parachute Creek, eastward to Government Creek, or southward to the Colorado River.

PROPOSED PLAN FOUNDATION

Transfer of NOSRs 1 and 3 from DOE to BLM was effected by the National Defense Authorization Act for Fiscal Year 1998, Public Law 105-85 (the "Transfer Act"). The Roan Plateau RMPA/EIS analyzes options for implementing the Transfer Act, which directed BLM to enter into leases, as soon as practicable, with one or more private entities for the purpose of exploration, development, and production of petroleum. In addition, the Transfer Act stipulates that the transferred lands are to be managed in accordance with the Federal Land Policy and Management Act (FLPMA) and applicable laws.

FLPMA requires the preparation of land use plans for public lands managed by the BLM. The RMP Amendment (the "Plan") resulting from this RMPA/EIS process will establish management prescriptions, resource objectives, and land use allocations for the Roan Plateau Planning Area.

The Proposed Plan presented in this RMPA/EIS represents the "proposed action" within the context of the National Environmental Policy Act (NEPA). The Proposed Plan is the product of an iterative and collaborative process that began in November 2000 with public scoping, consistent with NEPA. This process provided an opportunity for the public, and representatives of Federal, State, county, and local governments and any affected Indian tribes to identify their issues and concerns.

BLM then developed six preliminary alternatives, which were presented to the public in October 2002, and subsequently refined to five alternatives. The five alternatives were published in the Draft RMPA/EIS in November 2004. Following the public comment period, BLM continued to work with Cooperating Agencies, including the Colorado Department of Natural Resources (CDNR) and its agencies (Colorado Division of Wildlife [CDOW], Colorado Oil and Gas Conservation Commission [COGCC], Colorado Geological Survey [CGS], and Colorado Division of Parks), Garfield County, Rio

Blanco County, City of Rifle, Town of Parachute, and City of Glenwood Springs. BLM also consulted with Mesa County.

The Consultation and Coordination process, following publication of the Draft RMPA/EIS, included compilation, review, and consideration of 74,907 comment submissions by individuals, citizen groups, industry groups, and other stakeholders, including the Cooperating Agencies. Of the total submissions, more than 97 percent were multiples of identical letters, most of which opposed oil and gas leasing atop the plateau. Most of the other 3 percent expressed general opinions or positions that may be grouped into the following four categories: (1) those against leasing and development of oil and gas on top of the plateau, primarily citing the need to protect natural resources and existing recreational opportunities; (2) those in favor of leasing, typically citing the energy and security needs of the nation; (3) those supporting a variety of management concepts in addition to no leasing atop the plateau, often using the term "community alternative" developed by some of the citizen groups; and (4) those expressing philosophical views on resource protection and/or resource development. A few submissions contained specific technical comments regarding data, methodologies, and conclusions.

Following compilation of the comments, BLM conducted a series of six work sessions with the Cooperating Agencies across a period of 6 months. During that process, it became clear that most of these agencies shared the concern expressed in the majority of public comments regarding impacts to sensitive resources and the socially and economically important recreational opportunities on top of the plateau. Other specific concerns generally focused on three components of the lower portion of the Planning Area (below and along the Roan Cliffs): the need to protect deer and elk winter range, the need to protect high-sensitivity viewsheds as seen from local communities and major travel corridors, and the need to maintain existing opportunities for off-highway vehicle (OHV) travel. Other concerns expressed and discussed during the Cooperating Agency meetings included (among others) impacts of oil and gas development on local economies, both directly and indirectly through increased traffic and infrastructure costs to the counties and communities; impacts on the regional culture, including hunting and livestock grazing; and impacts to air quality and local water supplies.

During the Consultation and Coordination process, the CDNR proposed an innovative approach to oil and gas development atop the plateau. The CDNR approach is intended to accommodate development of the underlying gas resource while providing substantial levels of natural resource protection. This approach, which received favorable support from other participants in the process, would minimize impacts to sensitive resources by requiring phased and clustered development within a Federal Unit on the upper plateau. Mitigation under the CDNR approach would also result from limiting the amount of land in a disturbed condition at any one time to approximately 1 percent of the total area of the upper plateau (350 acres).

In developing the Proposed Plan, BLM combined the basic components of the CDNR approach with other revisions to the Preferred Alternative (Alternative III) of the Draft RMPA/EIS. These other revisions consisted primarily of additional measures to increase the level of protection of ecological and other sensitive resources while allowing levels of oil and gas development comparable to the most intensive development scenario in the Draft. A key component of the Preferred Alternative of the Draft—deferral of leasing and drilling atop the plateau until 80 percent of the BLM lands at the lower elevations have been developed—was not incorporated into the Proposed Plan, both because it did not receive significant support among either the public or the Cooperating Agencies, and because it became moot upon incorporation of the CDNR approach for oil and gas leasing which would require phased and clustered development on the upper plateau.

PROPOSED PLAN COMPONENTS

The overarching goal of the Proposed Plan is to protect key ecological, visual, and recreational values while allowing for the leasing and subsequent development of oil and gas resources under strict and

performance-based standards. Although leasing decisions would allow for future development, additional analysis and permitting would be required prior to on-the-ground activities. The Proposed Plan was crafted by combining components primarily from Alternative II (Environmentally Most Protective Alternative) and Alternative III (Preferred Alternative) with the CDNR approach and other recommendations arising from the Consultation and Coordination process.

Major aspects of the Proposed Plan are summarized below, summarized in Tables S-1 and S-2, and depicted graphically on Maps 1 and 2 in Appendix A.

Leasing of Fluid Minerals

The Proposed Plan would allow oil and gas leasing on 100 percent of the Federal mineral estate lands within the Planning Area. However, various constraints on long-term ground-disturbing activities would cover 51 percent of the Planning Area (38,427 acres) and limit the area available for oil and gas surface facilities to 49 percent (35,175 acres) of the Federal lands in the Planning Area. A difference between the Preferred Alternative of the Draft RMPA/EIS and the Proposed Plan consists of replacing the concept of "vertical phasing" by deferring drilling on top of the plateau until 80 percent of the available lands below the cliffs have been developed with the concept of "horizontal phasing" through the CDNR concept of phased and clustered development from the outset. This approach includes the following basic components for areas on top of the plateau:

- Clustering of Facilities – Require a minimum separation between drill pads of 0.5 miles (2,640 feet), except where a closer distance would be preferable in terms of environmental protection (e.g., to avoid an otherwise unnecessary stream crossing). The resultant maximum surface density would be one pad per 160 acres. This requirement relies on directional drilling to access the 10-acre downhole spacing of Mesaverde wells and the 160-acre downhole spacing of Wasatch wells. Other facilities would be clustered along main roads in order to minimize surface disturbance.
- Development on Ridgetops – Focus development on slopes of less than 20 percent along ridgetops, consisting of drainage divides between the ecologically, hydrologically, visually, and recreationally more sensitive stream valleys.
- Limited Surface Disturbance – Limit the amount of disturbed land at any one time to 350 acres, representing approximately 1 percent of the BLM lands on top of the plateau. In this context, disturbed land would include drill pads, access roads, pipelines, and other areas of surface disturbance either not yet in the process of reclamation or, if in that process, not showing satisfactory progress toward reclamation criteria.
- Phased Development – Restrict drilling operations to only one of six "phased development areas" at a time, and prohibit shifting operations to the next development area if the amount of surface disturbance atop the plateau exceeds the 350-acre limit. Areas showing satisfactory progress toward successful reclamation would be subtracted from the running total of surface disturbance. The goal of this approach is to create an incentive for prompt and suitable reclamation.

These components would be implemented within a Federal Unit for the top of the plateau. The reason for this is to avoid simultaneous development on multiple and scattered lease parcels to meet the needs of individual lessees. Instead, all lessees (potentially fourteen or more based on a maximum lease size of 2,560 acres) would share in development costs and oil and gas revenues from the entire Federal Unit regardless of whether their parcels are undergoing development. The mechanism for distribution of costs and revenues would be determined prior to lease issuance.

A computer analysis based on the well-pad criteria under the phased and clustered development approach was conducted. Areas unavailable for drilling activities due to No Ground Disturbance/No Surface Occupancy (NGD/NSO) restrictions, and an assumed 2,500-foot horizontal reach using directional

drilling yielded an estimate that more than 90 percent of the Federal mineral estate atop the plateau could be accessed for recovery of the oil and gas resource.

For areas below the cliffs, BLM would require clustering of wells and facilities to achieve a management goal for surface densities of one pad per 160 acres. Clustering of wells and consolidation of facilities would also serve to minimize surface disturbance. Greater flexibility in placement and density of pads and facilities below the cliffs is warranted by the juxtaposition of private and Federal lands, existing Federal leases, irregular and restrictive topography, and extensive areas of NGD/NSO restrictions in this portion of the Planning Area.

Development of Oil Shale

Research-scale lease tracts for oil shale would be considered within the Planning Area and would be subject to the same restrictions and limitations on surface use as traditional oil and gas drilling operations. Approval of research tracts would be based on the merits of the technologies proposed. [Note: a number of oil shale research tracts have recently been sought and approved on BLM lands in the Piceance Basin north and northwest of the Planning Area, but none was sought within the Planning Area.] Oil shale leasing decisions which would allow for future development are also being considered in the Programmatic Environmental Impact Statement for Oil Shale and Tar Sands Leasing. Unless modified in future land use planning decisions, activities associated with oil shale development would comply with the stipulations and conditions outlined in this Proposed Plan/Final EIS.

Special Management Designations

Areas of Critical Environmental Concern – Another component of the Proposed Plan resulting from the Consultation and Coordination process is the designation of four Areas of Critical Environmental Concern (ACECs), including East Fork Parachute Creek and Trapper/Northwater Creek atop the plateau and Magpie Gulch and Anvil Points along and below the cliffs. The Preferred Alternative of the Draft RMPA/EIS designated only the two ACECs on top, while Alternative II incorporated the same ACECs as the Proposed Plan but with somewhat greater area.

Watershed Management Area – Proposed Plan would retain this component identifying almost the entire top of the plateau as the Parachute Creek Watershed Management Area (WMA). This WMA would be larger than the WMAs to be designated under Alternatives III and IV of the Draft RMPA/EIS. The WMA would be protected with Site-Specific Relocation/Controlled Surface Use (SSR/CSU) restrictions. These restrictions enable BLM to require that a proposed surface disturbance associated with a permitted land use or management action be relocated by more than 200 meters if necessary to protect watershed processes that support fisheries, botanical resources, and municipal water supplies.

Wild and Scenic Rivers – Protection of stream segments found eligible for designation as Wild and Scenic Rivers (WSRs) would be protected by an SSR/CSU restriction stipulation until a determination regarding suitability is made.

Wilderness Study Areas – No Wilderness Study Areas (WSAs) would be designated under the Proposed Plan, nor would any areas be managed specifically to protect and preserve wilderness values. However, NGD/NSO protections for the ecologically and visually more sensitive areas above and along the cliffs would tend to maintain some wilderness characteristics.

Resource Management

Anvil Points Cave – The scientific and historic values of the Anvil Points Cave would be protected and preserved by prohibiting long-term ground-disturbing activities, under all alternatives. By application of an NGD/NSO, no physical disturbance to the cave or karst system surrounding the cave would be allowed. Activities that could cause direct or indirect impacts (such as collapse or dewatering) to the cave system would be restricted.

Paleontological Resources – Paleontological resources would be managed as in Alternatives I through V. Specifically, paleontological clearances and mitigation would be required prior to ground-disturbing activities in areas with outcrops of formations that are known to contain, or have a high potential to contain, vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. Significant resources would be avoided or recovered through the authorization process. Paleontological resources in the Sharrard Park area would be protected from ground-disturbing activities through an SSR/CSU restriction.

Soils – Under all alternatives, soils would be managed on a watershed level to meet Land Health Standards, with an NGD/NSO restriction for slopes steeper than 50 percent and an SSR/CSU restriction for areas with highly erodible (erosive) soils on slopes steeper than 30 percent.

Surface Water and Groundwater – Surface water and groundwater resources would be managed to meet all State and Federal water quality standards under all alternatives. Based on NGD/NSO and SSR/CSU restrictions and best management practices (BMPs) to protect water quality, aquatic life, riparian/wetland habitats, and the Parachute Creek watershed, the Proposed Plan is not anticipated to result in exceedances of water quality standards for the designated uses. The potential for impacts from accidental spills or releases of pollutants associated with oil and gas operations exists, but BLM requirements are designed to minimize this potential and ensure an appropriate response. If exceedances of standards or spills or releases occur, remedial measures and stringent protections and mitigation would be required. BLM's requirements for groundwater protection during oil and gas development, combined with the very limited existing or potential use of groundwater aquifers, are expected to result in no exceedances of water quality standards for groundwater.

Air Quality – Air quality would be managed the same as under Alternatives I through V. Monitoring would be conducted and mitigation measures applied as required to meet applicable Federal and State air quality regulations and standards and any local standards. Potential mitigation measures could include methods to reduce fugitive dust from road construction and vehicular travel, emissions of pollutants from diesel engines, and gaseous emissions from wells and compressors.

Vegetation – Upland vegetation would be managed to achieve a diverse native species composition and productivity, characterized by specific objectives for the ten most extensive plant communities in the Planning Area. Vegetation would be maintained at, or restored to, at least a 70 percent Ecological Condition Rating (ECR). Ecological Site Inventories (ESIs), based on Natural Resources Conservation Service (NRCS) procedures and standards, or an equivalent monitoring system would be established to support assessments against these objectives and condition rating. BLM decisions regarding the permitting and siting of ground-disturbing activities would consider these vegetation standards and objectives.

Riparian/wetland communities would be managed to achieve Proper Functioning Condition (PFC) and late-seral stage community development, with a diverse structural and native species composition. Riparian/wetland vegetation would be protected with an NGD/NSO, while buffers of up to 500 feet would have an SSR/CSU. Within 500 feet of riparian/wetland vegetation, BLM may require a special design or mitigation of projects, as well as requiring that a project be relocated by more than 200 meters to minimize impact to the resource.

The Proposed Plan would also emphasize implementation of an integrated weed management program (including mechanical, biological, and chemical methods) to deter and control noxious weeds. This would include promoting healthy native plant communities as well as prevention, inventory, detection, monitoring, and specific project and control actions.

Protections for special status plant species would include an NGD/NSO for occupied habitat of the two candidate species known to occur in the Planning Area, the DeBeque phacelia and Parachute penstemon. This is in contrast to the Preferred Alternative of the Draft RMPA/EIS, which would provide NGD/NSO

protections for occupied habitat of all special status plants and significant plant communities. The Proposed Plan would provide SSR/CSU restrictions for most of the remaining special status plants and significant plant communities, including hanging garden species in the East Fork Parachute Creek and Trapper/Northwater Creek watersheds above the rim and large areas in the Anvil Points area or associated with old-growth Douglas-fir. The Proposed Plan would not include NGD/NSO or SSR/CSU protections for four populations representing two special status plants that are more common and widespread.

Fish and Wildlife – Another component incorporated into the Proposed Plan in response to the Consultation and Coordination process consists of NGD/NSO restrictions for areas mapped by the CDOW as big game security areas along and below the cliffs. Protection of these areas of rugged, wooded terrain was included under Alternative II but not the Preferred Alternative of the Draft RMPA/EIS. Big game movement corridors (i.e., passages through the Roan Cliffs) would also be protected with NGD/NSO restrictions. Additionally, the Proposed Plan would provide SSR/CSU protections to big game security areas mapped by CDOW along some of the steep, wooded stream valleys atop the plateau.

Under the Proposed Plan, a seasonal restriction (Timing Limitation, or TL) on ground-disturbing activities (including oil and gas drilling and road construction) would be applied in all areas mapped by CDOW as big game winter range (primarily for mule deer and secondarily for Rocky Mountain elk). Mapping of the TL has been updated to include all areas mapped as winter range. The winter range TL would cover the 5-month period of December through April of each year, consistent with Alternatives I through III of the Draft RMPA/EIS.

In addition to the benefits of phased and clustered development atop the plateau and the NGD/NSO restrictions for a variety of other resources, special status wildlife and their habitats would also benefit from specific protections for these species. Special status species include listed, proposed, or candidate Federal threatened or endangered species, BLM sensitive species, and State-listed threatened, endangered, or special concern species in Colorado. These would include an NGD/NSO for occupied and other high-value habitat for the genetically pure populations of the Colorado River cutthroat trout and an SSR/CSU for the entire Parachute Creek WMA, including areas identified as having a high value for watershed processes (i.e., upslope or upstream from areas of high-value trout habitat).

Restrictions on long-term ground-disturbing activities for other habitats and areas of wildlife use specific to special status species would include NGD/NSO restrictions for the Colorado River corridor, the Anvil Points Cave bat habitat, bald eagle nesting and winter roosting areas, other raptor and waterbird nesting and brood-rearing areas, and occupied or other habitats needed to sustain threatened or endangered species. Additional protections would include TLs for the bald eagle, other raptor nesting, and waterbird nesting areas, and an SSR/CSU (in addition to an NGD/NSO and a TL) for the peregrine falcon cliff-nesting complex. An SSR/CSU would also apply to habitats for any BLM sensitive species.

Visual Quality – Atop the plateau, visual resources would be managed as Visual Resource Management (VRM) Class I in the visually sensitive East Fork waterfall and box canyon (protected with an NGD/NSO) and as VRM Class III for the remainder of area (protected with an SSR/CSU). Below the rim, most of the lands would be managed as VRM Class II, except that the areas near the existing utilities corridor along State Highway (SH) 13 would be managed as VRM Class IV. The VRM Class II areas below the rim would have an SSR/CSU, but with an NGD/NSO for the highly sensitive I-70 viewshed.

Cultural Resources – As under Alternatives I through V, cultural resource management would involve a moderate level of proactive fieldwork and would comply with the National Historic Preservation Act (NHPA), Archaeological Resources Protection Act (ARPA), National Programmatic Agreement/State Protocol, WO-IB-2002-101, and other applicable laws, regulations, and policies. Specific goals include:

- Preserve and protect significant cultural resources and ensure that they are available for appropriate uses by present and future generations. This would include compliance with FLPMA Sections 103(c), 201(a), and 202(c); NHPA Section 110(a); and ARPA Section 14(a).
- Reduce imminent threats from natural or human-caused deterioration or potential conflict with other uses by identifying priority geographic areas for field inventories. This would be based on the probability of occurrence of unrecorded significant resources, as required by NHPA Sections 106 and 110 and ARPA Section 14(a).

Recreation and Travel – The Proposed Plan would differ from Alternatives I through V by not managing specifically for recreation, except in an area of Hubbard Mesa to be managed as an OHV Riding Area. Instead, recreational opportunities and outcomes would be shaped by oil and gas drilling, road construction, and other land uses and management actions. However, phased and clustered development on the top of the plateau, and the extensive areas of NGD/NSO protections for sensitive ecological and visual resources, would tend to preserve existing recreational uses in most of the area. The emphasis on recreation in the Hubbard Mesa OHV Riding Area, although not designated as a Special Recreation Management Area (SRMA) under the Proposed Plan, includes an SSR/CSU to minimize conflicts associated with oil and gas operations and recreation. While the Hubbard Mesa OHV Riding Area would be designated "open" for motorized and mechanized travel (i.e., cross-country travel permitted), the remainder of the Planning Area would limit this use to designated routes, except for over-snow travel by snowmobile with a minimum of 12 inches of snow cover.

A total of 163 miles of the existing 259 miles of routes within the Planning Area would be designated for mechanized or motorized use. The remaining routes would include 28 miles to be closed and reclaimed and 68 miles to be limited to administrative use. All new oil and gas access roads would be designated for administrative use except in the Hubbard Mesa area. Upon abandonment, all oil and gas roads would be reclaimed unless BLM deems it more appropriate to retain them for administrative or public use.

Lands and Realty – Approximately 120 acres of isolated parcels would be eligible for disposal, and BLM would allow continued use of the utility rights-of-way (ROWs) along I-70 and SH 13 as well as within 50 feet of designated and administrative travel routes, except where such placement would negatively impact other important resource values. In these instances, BLM would require that utilities be placed within the existing road ROW if practicable, or realigned to avoid important resource values. On a case-by-case basis, BLM may require that proposed utility projects be shifted more than 200 meters to avoid sensitive resources.

Grazing and Rangeland Management – As an outgrowth of the Consultation and Coordination process, and in cooperation with grazing permittees, allotment management plans (AMPs) would be developed, implemented, monitored, and evaluated on a regular basis, with priority for allotments not meeting Land Health Standards. A combination of administrative solutions (e.g., mandatory terms and conditions of the permit, season of use revisions, pasture rotation, deferred or rest rotation, livestock exclusion, and stocking level adjustments), rangeland projects (fences, ponds, etc. to direct livestock use), and guidelines and BMPs for resting and deferring grazing of riparian areas would be applied to meet resource objectives and Land Health Standards. Determinations of drought would be used when appropriate to adjust livestock management within allotments to provide long-term protection of ecological and forage values.

Reclamation – Also as an outgrowth of the Consultation and Coordination process, the Proposed Plan would implement a variety of BMPs and mitigation measures to avoid, minimize, or offset adverse impacts of ground-disturbing activities, including standardized reclamation practices. Annual monitoring and reporting of vegetation conditions in reclaimed areas would be used to evaluate progress toward attainment of performance-based criteria, identifying the need for corrective measures, and determining when success has been achieved. The annual monitoring would guide adaptive management decisions for existing and future ground-disturbing activities and help ensure restoration to productive, self-sustaining, and native conditions appropriate for the site.

Fire Management – For the Proposed Plan and all alternatives except No Action, the top of the plateau would be changed from Fire Management Zone (FMZ) "D" to "C." This change recognizes that the desirability of wildland fire as a management tool is offset by various ecological, social, or political constraints. These include an increased presence of oil and gas facilities, the presence of sensitive ecological resources that could be damaged by wildland fires, and the proximity to private property. The existing FMZ "B" and "C" designations below the cliffs would continue to apply.

ANTICIPATED IMPACTS

Table S-3 summarizes anticipated levels of environmental impacts associated with implementation of the Proposed Plan in comparison to Alternatives I through V. The qualitative impact levels in the table incorporate the surface-use restrictions and management prescriptions under each alternative, in addition to BMPs and mitigation measures. The qualitative terms used—major, moderate, minor, and negligible—are intended for comparative purposes only. General definitions of these terms are as follows:

- None – Unlikely to impair the resource.
- Negligible – May impair the resource, but not at levels that would be noticed by the public, cause the resource value to drop to a lower category, or violate a regulatory standard or environmental law. A more severe impact may be negligible if it is temporary (duration <2 years).
- Minor – Likely to impair the resource at levels that would be noticed by the public, but not to a degree that would detract significantly from the overall value of that resource or a specific use. Unlikely to cause the resource value to drop to a lower category or violate a regulatory standard or environmental law. Relatively few impacts are likely to be permanent (duration >50 years).
- Moderate – Likely to impair the resource at levels that would be noticed by the public and detract significantly from the overall value of that resource or a specific use. Could cause the resource value to drop to a lower category but unlikely to violate a regulatory standard or environmental law. Some impacts are likely to be permanent (duration >50 years).
- Major – Definitely would impair the resource at levels that would be noticed by the public and would eliminate most or all of the value of that resource or a specific use. Expected to cause the resource value to drop to a lower category and could violate a regulatory standard or environmental law unless mitigated. Many impacts are likely to be permanent (duration >50 years).

Technical definitions of the terms used to describe qualitative impact levels for specific resources are provided in Chapter 4.

Table S-1. Limitations and Resource/Management Designations Used in Impact Analysis

Limitation/Designation		*Alt. I No Action*	*Alt. II*	*Alt. III Preferred*	*Alt. IV*	*Alt. V*	*Proposed Plan*
Areas with Surface Stipulations or Other Restrictions, Limitations, or Special Requirements [1]							
No Lease for Oil and Gas[1]		44,267 acres (ac)	21,382 ac	0	0	0	0
Deferred Lease for Oil and Gas [2]		0	0	34,758 ac	0	0	0
NGD/NSO Restrictions		13,912 ac	31,200 ac	30,928 ac	30,928 ac	21,609 ac	38,411 ac
SSR/CSU Restrictions		8,256 ac	7,015 ac	29,594 ac	27,486 ac	21,517 ac	30,833 ac
Timing Limitation (TL) for Winter Range [3]		34,668 ac 5 months	34,668 ac 5 months	34,668 ac 5 months	34,668 ac 2 months	0 ac	34,668 ac 5 months
TL for Raptor and Waterbird Nesting [4]		5,279 ac	5,279 ac	5,279 ac	5,279 ac	5,279 ac	5,279 ac
Standard Stipulations and Restrictions		7,167 ac	14,006 ac	13,080 ac	15,188 ac	30,746 ac	4,358 ac
Areas with Protective Designations or Management Actions [1]							
Areas of Critical Environmental Concern		0	36,184 ac	11,529 ac	11,529 ac	0	21,034 ac
Areas Managed for Roadlessness and Naturalness [5]		0	21,382 ac	9,006 ac	0	0	0
Streams Managed for Wild and Scenic River Eligibility		0	7,883 ac	7,883 ac	7,883 ac	0	7,883 ac
Watershed Management Areas		0	0	29,073 ac	14,219 ac	0	33,575 ac
Motorized or Mechanized Travel [6]	Open	66,934 ac	0	0	2,460 ac	0	2,460 ac
	Limited to Designated Routes [7]	0	45,552 ac	66,934 ac	64,474 ac	66,934 ac	64,474 ac
	Closed	0	21,382 ac	0	0	0	0
Visual Resource Management [8]	VRM Class I	0	37,205 ac	925 ac	925 ac	0	1,612 ac
	VRM Class II	24,039 ac	13,428 ac	48,752 ac	48,752 ac	0	30,168 ac
	VRM Class III	37,115 ac	14,607 ac	15,563 ac	15,563 ac	63,022 ac	33,536 ac
	VRM Class IV	10,340 ac	8,350 ac	8,350 ac	8,350 ac	10,568 ac	8,274 ac
	VRM Class V	2,096 ac	0	0	0	0	0
Upland Vegetation Condition Rating		40%	70%	50%	50%	40%	70%
Riparian/Wetland Level of Protection		Maintain	Enhance	Enhance	Enhance	Maintain	Enhance
Colorado River Cutthroat Trout Habitat		Maintain	Enhance	Enhance	Enhance	Maintain	Enhance
Big Game Security Areas		22,885 ac	11,481 ac	--	--	--	22,885 ac

[1] Includes overlap between stipulations and protective designations on which they are based. See text for definitions of NGD, NSO, SSR, CSU, and TL. TLs include overlap with other stipulations, including no-lease area for oil and gas under Alternative I.

[2] For deferred leasing atop the plateau, the threshold criterion of completing 80 percent of anticipated wells below the rim as a trigger for development atop the plateau would be met in 10 to 20+ years (estimated at 16 years for this RMPA/EIS).

[3] Winter range TL applied as lease stipulation under Alternatives I through III and Proposed Plan and as a Condition of Approval (COA) under Alternative IV. Total acres include overlap with other TLs.

[4] Raptor TL includes bald eagle nesting and winter roosting areas, peregrine falcon cliff-nesting areas, and active nests of other species. Total acres include overlap with other TLs.

[5] For Alternative II, managed to protect roadlessness, naturalness, and solitude or primitive and unconfined recreation (i.e., wilderness character). For Alternative III, managed to protect roadlessness and naturalness; associated NGD/NSOs would allow no exceptions.

[6] The difference of 6,668 acres between combined areas and total of 73,602 acres reflects lands with Federal minerals but private surface.

[7] Over-snow travel by snowmobiles limited to designated routes under Alternative II only.

[8] Does not include 12 acres of "Urban" under all alternatives.

Table S-2. Anticipated Oil and Gas Development on BLM Lands During 20-Year Period

Component	*Alternative I No Action*	*Alternative II*	*Alternative III Preferred*	*Alternative IV*	*Alternative V*	*Proposed Plan*
Area Available for Pads, Other Surface Facilities, and Roads [1]	15,423 acres	21,021 acres	42,674 acres	42,674 acres	51,993 acres	35,191 acres
Pads (Wells) atop the Plateau [2,3]	7 (10)	66 (87)	39 (51)	126 (168)	175 (234)	13 (210)
Pads (Wells) below the Cliffs [3]	247 (845)	244 (818)	363 (1,273)	323 (1,156)	409 (1,348)	180 (1,360)
Total Pads (Wells) [3]	257 (852)	310 (905)	402 (1,324)	449 (1,324)	584 (1,582)	193 (1,570)
Long-term Ground Disturbance for Pads and Associated Facilities [4]	638 acres	745 acres	944 acres	988 acres	1,266 acres	482 acres
Area (length) and Miles of New or Upgraded Access Roads [4]	513 acres 152 miles	603 acres 186 miles	817 acres 241 miles	861 acres 270 miles	1,112 acres 350 miles	330 acres 124 miles
Total Long-term Ground Disturbance	1,151 acres	1,348 acres	1,761 acres	1,940 acres	2,495 acres	812 acres
Total Gas Produced by New Wells Drilled in 20 Years on BLM Lands [5]	974 billion cubic feet	1,031 billion cubic feet	1,510 billion cubic feet	1,510 billion cubic feet	1,803 billion cubic feet	1,790 billion cubic feet
Total Oil Recovered from New Gas Wells Drilled in 20 Years on BLM Lands [6]	1,900 barrels	2,100 barrels	3,000 barrels	3,000 barrels	3,600 barrels	3,600 barrels

Assumptions

Alternatives I – V	***Proposed Plan***
[1] *Leasable area minus areas with NSO stipulations.*	[1] *Leasable area minus areas with NSO stipulations.*
[2] *For Alternative III, leasing and drilling atop the plateau would be deferred until 80 percent of the total wells anticipated below the rim under Alternative III have been effectively completed to total depth and a production test performed.*	[2] *Atop the plateau: Leased as Federal unit specifying minimum spacing between pads, use of clustering, staged development, and placement of oil and gas facilities on ridgetops (<20% slopes).*
[3] *Based on 40-acre surface density, except 20-acre surface density for directional drilling below cliffs. Downhole spacing as follows: Mesaverde: above the rim: 40 acres; below the rim: 80 percent at 10 acres, 20 percent at 20 acres; Wasatch: 160 acres.*	[3] *Atop the plateau: Minimum of 0.5 mile between pads (160-acre surface density) and clustering of up to 17 wells per pad (10 Mesaverde with 10-acre downhole spacing, plus 1 Wasatch at 160-acre downhole spacing, and net 160-acre surface density).* *Below the rim: Management goal of 160-acre surface density for unleased portions; assumed average of existing and new leases of 80-acre surface density; 10-acre downhole spacing for Mesaverde and 160-acre downhole spacing for Wasatch.*
[4] *Pad impacts as follows: 1.9 acres for single-well pads, 2.5 acres for multi-well pads. Road impacts as follows: 0.6 mile of new or widened road per pad; above the rim: 80% new roads 30 feet wide and 20 percent existing roads widened by 20 feet; below the rim: 20% new roads 30 feet wide and 80 percent existing roads widened by 20 feet.*	[4] *Pad impacts as follows: 2.5 acre for multi-well pads. Road impacts as follows: 20 percent new roads 30 feet wide and 80 percent existing roads widened by 20 feet.*
[5] *Natural gas produced over operational life of wells drilled on BLM lands in Planning Area during 20-year period of analysis. Based on Reasonable Foreseeable Development (RFD) (Appendix H). Assumes 1.17 billion cubic feet (BCF) per Mesaverde well and 0.7 BCF per Wasatch well; weighted average approximately = 1.14 BCF per well.*	[5] *Natural gas produced over operational life of wells drilled on BLM lands in Planning Area during 20-year period of analysis. Based on RFD (Appendix H). Assumes 1.17 BCF per Mesaverde well and 0.7 BCF per Wasatch well; weighted average approximately = 1.14 BCF per well.*
[6] *Oil recovered at an average rate of 0.002 thousand barrels (MBO) per BCF of gas.*	[6] *Oil recovered at an average rate of 0.002 MBO per BCF of gas.*

Table S-3. Overall Level of Potential Adverse Impacts Compared to Existing Conditions [1, 2, 3]

Resource		*Alt. I No Action*	*Alt. II*	*Alt. III Preferred*	*Alt. IV*	*Alt. V*	*Proposed Plan*
Anvil Points Cave		Minor	Negligible	Minor	Minor	Minor	Minor
Fossils		Minor	Negligible	Negligible	Negligible	Negligible	Negligible
Soils		Minor	Minor	Minor	Minor	Minor	Minor
Groundwater		Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Surface Water	Quality	Minor to Moderate	Minor	Minor	Minor to Moderate	Moderate	Minor
	Quantity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Air Quality	Hazardous Air Pollutants, Priority Pollutants, Visibility	Minor	Minor	Minor	Minor	Minor	Minor
	Sulfur and Nitrogen Deposition, Acid Neutralizing Capacity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Vegetation		Minor	Negligible	Minor to Moderate	Moderate	Moderate	Minor
Fish and Wildlife		Minor	Minor	Minor to Moderate	Moderate to Major	Major	Minor to Moderate
Special Status Species		Minor	Minor	Minor to Moderate	Moderate	Major	Minor to Moderate
Visual Quality		Moderate	Minor	Moderate	Moderate	Major	Minor
Cultural Resources		Minor	Minor	Minor	Minor	Moderate	Minor
Recreation and Travel		Minor	Minor	Minor to Moderate	Moderate	Major	Minor to Moderate
Livestock Grazing		Minor	Minor	Minor to Moderate	Moderate	Moderate	Minor

[1] *Limited to impacts on BLM lands during 20-year period of analysis. Overall impact summary compared to current condition; specific impact levels may vary by resource and area. Assumes implementation of specified or legally required mitigation measures. Resource categories are not weighted. Does not consider socioeconomic impacts or management conflicts.*

[2] *Ranges of impacts reflect impact levels for different components of the larger categories or different portions of the Planning Area. For Alternative III, ranges also reflect the estimated 16-year deferral period during which no oil and gas development would occur on top of the plateau.*

[3] *Qualitative impact levels defined for individual resources in Chapter 4.*

CHAPTER 1

PURPOSE AND NEED

1 PURPOSE AND NEED

1.1 OVERVIEW OF THE RMPA/EIS

This Proposed Resource Management Plan (RMP) Amendment (RMPA) and Final Environmental Impact Statement (EIS) evaluates the environmental consequences of amending existing RMPs for the Glenwood Springs Resource Area (GSRA) and White River Resource Area (WRRA) as they pertain to the Roan Plateau Planning Area (Planning Area) of west-central Colorado. Figures 1-1, 1-2, and 1-3 show the location, land ownership status, and topography of the Planning Area, respectively.

The U.S. Department of the Interior (USDI) Bureau of Land Management (BLM) is amending existing RMPs for the Planning Area in accordance with the Federal Land Policy and Management Act (FLPMA), which specifies periodic updates to guide management of public lands within BLM's jurisdiction. In this case, an amendment is needed to incorporate lands for which management was transferred to BLM from the U.S. Department of Energy (DOE). BLM-administered lands within the Planning Area include 73,602 acres with a Federal surface and mineral estate or with a Federal mineral estate and private surface estate.

Management of the Planning Area is currently guided by the following documents:

- Glenwood Springs Resource Area Oil and Gas Leasing and Development Final Supplemental Environmental Impact Statement (FSEIS), January 1999 (BLM 1999a), hereafter referred to as the 1999 FSEIS
- Glenwood Springs Resource Area Oil and Gas Leasing & Development Record of Decision (ROD) and RMP Amendment, March 1999 (BLM 1999b), hereafter referred to as the 1999 ROD and RMPA
- Glenwood Springs Resource Area RMP, January 1984 (Revised 1988)(BLM 1988a), hereafter referred to as the 1984 GSRA RMP. The 1984 date is retained because the 1988 revision consisted only of updating certain data.
- White River Resource Area RMP (BLM 1996a)(ROD issued July 1997), hereafter referred to as the 1997 WRRA RMP.
- Operational Management Plan for Naval Oil Shale Reserves 1 and 3 (DOE 1988)
- Colorado Public Land Health Standards and Guidelines for Livestock Grazing Management Decision Record and Finding of No Significant Impact (BLM 1997a)

The Planning Area boundary shown on Figures 1-1 through 1-3 and Maps 1 through 29 in Appendix A encompasses a total 127,007 acres. This total includes 66,934 acres with Federal surface and minerals, multiple parcels totaling 6,668 acres with private surface and Federal minerals, and a total of 53,405 acres of lands with both private surface and private minerals. Since lands with both private surface and private minerals are not subject to BLM planning or management, approximately 42 percent of the total Planning Area shown on the figures and maps is not subject to BLM planning or management decisions. However, these lands were included in the total Planning Area boundary because of the close spatial relationship with Federal lands and the many ways in which uses and conditions in either private or Federal lands affect, both directly and indirectly, uses and conditions in the other.

The 73,602 acres of Federal lands in the Planning Area include 55,354 acres in Naval Oil Shale Reserves (NOSRs) Numbers 1 and 3 (Figure 1-2). Management responsibility for the NOSRs was formally transferred to BLM from DOE in 1997. The NOSRs have not previously been the subject of a

coordinated planning process and are currently managed under the guidance of DOE's Operational Management Plan (OMP), the 1984 GSRA RMP, and the 1997 WRRA RMP.

Non-NOSR BLM lands are located primarily below the Roan Cliffs (Figure 1-2). Lands with a "split estate" (private surface but Federal minerals) are located both atop the plateau and below the cliffs and include some disjunct parcels in the southwestern and west-central portions of the Planning Area. As shown by Figure 1-2, the split-estate lands differ as to which mineral resources are Federally owned. Federal ownership may be limited to fluid minerals (oil and gas), limited to one or more other minerals (e.g., oil shale, coal), or inclusive of all economic minerals. Management by BLM of split-estate lands is limited to activities related to the mineral estate (e.g., oil and gas development). BLM authority arising from the nexus created by Federal minerals includes management of activities that occur on the privately owned surface and associated with the mineral estate. Examples include the location, design, operation, and reclamation of well pads, roads, pipelines, and other surface facilities.

In recent years, the Planning Area and nearby areas have been subject to rapid growth of the human population and oil and gas development. These factors cause competing pressures on land use management and thus warrant a consistent, coordinated planning approach. Updating the existing RMPs will also permit BLM to incorporate the required Colorado Public Land Health Standards and Guidelines for Livestock Grazing (Land Health Standards) and Travel Management Designations into their land management program for the Planning Area. Another reason to amend the existing RMPs is that FLPMA requires BLM to inventory public lands, giving priority to the designation and protection of Areas of Critical Environmental Concern (ACECs). Such inventories have been completed as part of the current planning process but did not previously exist for the transferred lands.

FLPMA provides the authority for BLM to formulate land use plans and requires that an RMP be emplaced to guide management decisions. FLPMA states that BLM land management shall be guided by the principles of multiple use and sustained yield. In addition, FLPMA Section 302(a) requires that where a tract of land has been dedicated to a specific use according to law, such as Public Law 105-85 that transferred NOSRs 1 and 3 to BLM, the tract shall be managed in accordance with the provisions of FLPMA. The primary purpose of this RMPA/EIS is to ensure that BLM manages the Planning Area in accordance with FLPMA as well as all other applicable laws and regulations.

The National Environmental Policy Act (NEPA) requires the preparation of the EIS component of this document, because implementation of a selected RMP Amendment would constitute a major Federal action significantly affecting the environment. The "proposed action" under NEPA is the implementation of the selected RMP Amendment, referred to throughout this document as the "Proposed Plan."

The remaining portions of Chapter 1 describe the purpose of the action (Section 1.2), the need for the action (Section 1.3), the Planning Area (Section 1.4), agency roles and responsibilities (Section 1.5), BLM's land use planning process (Section 1.6), the NEPA process and related topics (Section 1.7), and the scoping process that helped shape the process and this document from its inception.

Chapter 2, Alternatives, describes the five alternatives evaluated in detail in the Draft RMPA/EIS, as well as the Proposed Plan resulting from BLM's consideration of input by the public and Cooperating Agencies through the Consultation and Coordination process. Chapter 2 also discusses the alternatives selection process and the alternatives that were considered but eliminated from detailed analysis.

Chapter 3, Affected Environment, describes the current physical, biological, human, and land use environments of the Planning Area. The description provides a baseline against which to compare the impacts of the alternatives. The baseline described in this Chapter represents environmental and social conditions in the Planning Area at the time this document was being prepared.

Chapter 4, Environmental Consequences, evaluates how and to what extent baseline conditions would be altered by the Proposed Plan and, with reference to the Draft RMPA/EIS, by the five alternatives

previously analyzed. These changes include direct and indirect; onsite and offsite; short-term, temporary, and long-term; and adverse and beneficial impacts, both individually and cumulative to other impacts.

Chapter 5, References, lists the sources of information used in preparing this RMPA/EIS. Not all references reviewed by BLM and included in Chapter 5 are cited in the body of the document.

Chapter 6, Consultation and Coordination, describes the process for receiving and, as deemed appropriate by BLM, incorporating comments and other information provided by the public and Cooperating Agencies following publication of the Draft RMPA/EIS.

Appendices A through M provide supporting information for the chapters described above. These include the original appendices (A through H) provided with the Draft RMPA/EIS, as well as new appendices I through M. Note that to avoid confusion, the new appendices are added to the end of the previous group rather than incorporated into the position they would occupy based on subject content. Thus, references to appendices in the body of the document are not necessarily in alphabetical order. Additionally, Appendix G was removed from the Proposed Plan/Final EIS, however, the title page is included to maintain the order of the appendices.

1.2 PURPOSE OF THE ACTION

The purpose of amending the existing RMPs for the Planning Area is to provide an integrated plan that guides future site-specific analysis and decisions in accordance with the following goals and objectives:

- Implement BLM's mission to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.
- Facilitate management of the natural resources of the Planning Area for multiple-use and long-term value, recognizing that the mix of permitted and allowable uses will vary from area to area and over time.
- Comply with the provisions of Public Law 105-85 transferring the approximately 55,354 acres within NOSRs 1 and 3 from DOE to USDI.
- Ensure a consistent, coordinated approach to managing lands within the Planning Area.

To achieve these goals, BLM must:

- Identify desired outcomes and allowable uses and actions that restore and maintain the health of the land; preserve natural and cultural heritage; reduce threats to public health, safety, and property; and provide for environmentally responsible recreational and commercial activities.
- Evaluate the need for designation of ACECs for areas that contain resource values that meet BLM's criteria for relevant and important values.
- Evaluate the need for designation of Special Recreation Management Area (SRMAs) or other management determinations, as applicable, such as for stream segments eligible for designation as Wild and Scenic Rivers (WSRs), Watershed Management Areas (WMAs), areas having wilderness character, and Back Country Byways.
- Establish travel designations that replace interim travel designations on transferred lands and affirm or change travel designations on lands in the rest of the Planning Area.
- Establish conservation measures for all species listed as threatened, endangered, proposed, candidate, or BLM sensitive. Conservation measures are designed to prevent the need for listing of additional species under the Endangered Species Act (ESA) and to improve the condition of all special status species and their habitats to a point where their special status recognition is no longer warranted. (See August 30, 2000, Interagency Memorandum of Agreement (MOA) for Programmatic

Endangered Species Act Section 7 Consultation and BLM Manual 6840, Special Status Species Management.)

- Apply BLM Rangeland Health Standards (BLM Manual 4180)(BLM 2001c) to recommendations and information from land health assessments to develop direction that enhances or restores physical function and biological health and achieves Land Health Standards at the watershed scale.
- Recognize valid existing rights including oil and gas leases, mineral leases, mining claims, and lands and realty actions.
- Integrate the management of the Planning Area with the GSRA and WRRA by applying management techniques that are successful in other portions of these areas.

These goals and objectives are based on the direction provided by numerous laws, mandates, policies, and plans, including:

- National Environmental Policy Act (NEPA)
- Federal Land Policy and Management Act (FLPMA)
- Public Law 105-85 (Department of Defense Authorization Act of 1998)
- Mineral Leasing Act of 1920, as amended
- National Historic Preservation Act of 1966, as amended
- Federal Onshore Oil and Gas Leasing and Reform Act of 1987
- Endangered Species Act, Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act, Clean Water Act, Clean Air Act, and other environmental laws
- BLM Planning Regulations (40 Code of Federal Regulations [CFR] 1600)
- BLM Grazing Administration Regulations (43 CFR 4180)
- BLM Land Use Planning Handbook, H-1601-1, updated January 5, 2001 (BLM 2001a) and March 11, 2005 (BLM 2005a)
- BLM Manual 1613 (Areas of Critical Environmental Concern)(BLM 1988b)
- BLM Manual 6840 (Special-Status Species Management)(BLM 2001b)
- BLM Manual 4180 (Rangeland Land Health Standards)(BLM 2001e)

The previously published Draft RMPA/EIS for the Roan Plateau Planning Area was prepared in compliance with guidance provided by the then-current version of the BLM Land Use Planning Handbook (BLM 2001a). The most recent update to this handbook was released in March 2005 (BLM 2005a), after publication of the Draft. In order to avoid confusion when referring to elements of the Draft RMPA/EIS, some aspects of the updated guidance were not incorporated into this document. For example, the suggested outline and organization of this Proposed Plan/Final EIS follow the earlier version of the handbook. However, more substantive aspects of the revised handbook, such as guidance for trails and travel management and socio-economic analysis, were complied with in this document.

1.3 NEED FOR THE ACTION

1.3.1 Transfer of NOSRs 1 and 3 from DOE to BLM

Public Law 105-85 (the "Transfer Act") transferred management authority of NOSRs 1 and 3 from the DOE to the USDI (specifically BLM) in 1997. The total of 55,354 acres of land involved in the transfer comprised 36,362 acres in NOSR 1 and 18,992 acres in NOSR 3. These lands were added to the 18,248

acres (including Federal surface or mineral estate) previously managed by BLM in the Planning Area. The primary need for the current RMPA/EIS process is to develop an integrated land use plan that incorporates the transferred NOSRs into the remainder of BLM land in the Planning Area and establishes a unified set of goals, objectives, and land use or management actions.

The Transfer Act states, "Beginning on the date of the enactment of this section, or as soon thereafter as practicable, the Secretary of the Interior shall enter into leases with one or more private entities for the purpose of exploration for, and development and production of, petroleum (other than in the form of oil shale) located on or in public domain lands in Oil Shale Reserves Numbered 1 and 3 (including the developed tract of Oil Shale Reserve Numbered 3). Any such lease shall be made in accordance with the requirements of the Mineral Leasing Act (30 U.S.C. 181 et seq.) regarding the lease of oil and gas lands and shall be subject to valid existing rights" (Section 3404, Public Law 105.85). In addition, the act stipulates that the transferred lands be managed in accordance with FLPMA and other applicable laws that guide BLM's management efforts.

Another provision of the Transfer Act mandated that the developed track of NOSR 3, located below the rim, be leased within one year. At the time NOSR 3 was transferred, a planning process was underway to evaluate increasing levels of oil and gas development in the western portion of the GSRA. As a result of the short timeframe mandated to lease NOSR 3 and the similarity in ecological characteristics of the area below the rim to adjacent BLM lands, an area of 12,029 acres within NOSR 3 already leased and being developed for oil and gas ("the production area") was folded into that planning process. On March 24 1999, a ROD approved the RMP Amendment as analyzed in the 1999 FSEIS and pertaining to the 12,029 acres in the current production area of NOSR 3. The remaining lands in NOSR 3, all of the lands in NOSR 1, and non-NOSR Federal lands within the Planning Area would be subject to an additional planning process, specifically this RMPA/EIS process.

This RMPA/EIS focuses on currently unleased BLM lands in the Planning Area, comprising NOSR 1, portions of NOSR 3 outside the production area, and the non-NOSR Federal lands. However, certain resource and land use management decisions—specifically those not in conflict with vested property rights under existing oil and gas leases—would apply to the entire 73,602 acres of BLM lands.

The impact analyses of Chapter 4 also consider the currently leased areas. Most of the unleased portions of BLM lands lie in NOSR 1 above the Roan Cliffs. The area above the cliffs, including both Federal and private lands, is the area generally referred to in the vernacular as the "Roan Plateau." The Roan Plateau Planning Area includes these areas of higher elevation as well as areas of lower elevation below the Roan Cliffs. The area transferred from DOE was historically managed by BLM, although under the authority of DOE and in accordance with the DOE's OMP (DOE 1988). The OMP specified the administrative procedures and resource management direction for the areas.

1.3.2 Demographic and Economic Changes in the Planning Area

The rate of population growth of Garfield County has been faster than that of Colorado as a whole since 1970 (Sonoran Institute 2002). For the most recent decade (1990 – 2000), growth in Garfield County was 3.9 percent, compared to 2.7 percent for Colorado. More localized growth of western Garfield County was even higher – 4.5 percent during the 1990s. The I-70 corridor, where most of the population is concentrated, is growing for several reasons, including an influx of residents attracted to the rural character, natural beauty, and recreational and, increasingly, economic opportunities of the area. While the economy of the area was historically based on ranching, hunting and related services, and oil and gas development, the influx of new residents from other areas and associated with other economic sectors has brought different expectations about future development of the Planning Area.

Opinions expressed during public scoping for this document indicated that some residents would prefer a low level of development, while others would prefer that the RMP Amendments emphasize commodity

production to support economic growth. Conflicting community goals for the Planning Area have contributed to the need for an open, coordinated planning process.

1.3.3 Oil and Gas Leasing

The 1999 FSEIS addressed increasing levels of oil and gas development in the western portion of the Glenwood Springs Field Office (GSFO), including portions of NOSR 3 and, to a minor extent, NOSR 1 within the production area. Oil and gas leasing decisions, lease stipulations, and mitigation measures for public lands were included in the subsequent ROD of March 24, 1999.

At the time the 1999 FSEIS was prepared and the ROD issued, much of western Garfield County was already leased. The ROD established lease stipulations that apply to subsequent leases to the extent that they are consistent with existing lease rights or can be applied as Conditions of Approval (COAs) during permitting. The bulk of NOSRs 1 and 3 are not currently leased for oil and gas. Increasing demand and subsequent increases in drilling for oil and gas in western Colorado have resulted in the need for a management plan that facilitates orderly economic and environmentally sound exploration and development of oil and gas resources in these lands, using principles of multiple use.

In preparing the Proposed Plan, the BLM acknowledges, and has carefully considered, many public comments to the Draft RMPA/EIS that expressed concerns about potential impacts of oil and gas leasing and drilling to other land uses and natural resources in the Planning Area. A large number of comments state a preference for no leasing or drilling, especially on top of the plateau. BLM has concluded that to not make this area available for oil and gas development would fail to comply with the intent of the Transfer Act, as well as the agency mission of multiple use management. However, BLM has taken into consideration public comments, input by the Cooperating Agencies, and the most current technological information and data in preparing a Proposed Plan that would be as responsive as possible to these concerns while allowing significant recovery of the oil and gas resources of the Federal lands.

1.3.4 Interim Travel Designations

BLM land use planning regulations require the designation of public lands as open, closed, or limited for off-highway vehicle (OHV) use (43 CFR 8342.1). The purpose of travel designations is to protect fragile and unique resource values from damage by OHVs while providing opportunities for this type of use where appropriate. Permanent travel designations have not yet been made for the transferred lands (NOSRs 1 and 3), but interim closures and restrictions were established and published in the Federal Register on July 3, 2000 (volume 65, no. 128, pages 41081 – 41082). The interim management included closing the NOSRs to cross-country motorized and mechanized travel and restricting OHV travel to designated routes. These interim measures did not apply to other BLM lands in the Planning Area. For purposes of impact analysis, only the No Action Alternative assumed that the interim closures and restrictions would be vacated and that permanent designations for NOSRs 1 and 3 would allow cross-country OHV travel throughout the Planning Area.

1.3.5 Wilderness Character and Roadless Inventory

A wilderness inventory of the transferred NOSR lands was conducted during 1998, 1999, and 2000 to determine whether they contain the characteristics of wilderness as defined by the Wilderness Act of 1964. All other lands within the Planning Area had already been inventoried. The information contained in the wilderness inventory has been considered in the development and analysis of alternatives.

The Draft RMPA/EIS included an analysis of alternative management prescriptions for three areas (totaling 21,382 acres) found by BLM to contain wilderness characteristics. On April 14, 2003, a settlement agreement was reached between the USDI and the State of Utah, Utah School and Institutional Trust Lands Administration, and Utah Association of Counties. Consistent with that settlement and subsequent policies issued by BLM, neither the Draft RMPA/EIS nor the Proposed Plan/Final EIS

considers the designation of new Wilderness Study Areas (WSAs) or the classification or management of BLM lands as if they are, or may become, WSAs. However, the protection and management of wilderness characteristics was considered and analyzed for Alternatives II and III in the Draft RMPA/EIS.

1.3.6 New Information from Land Health Assessments

Land health assessments were conducted in portions of the Planning Area atop the plateau in 1999 and in the eastern portion of lands below the rim in 2001. These assessments were conducted in accordance with BLM statewide standards that describe the natural resource conditions needed to sustain public land health as adopted by BLM in Colorado and approved by the Secretary of the Interior in February 1997 (Land Health Standards, Appendix F). Information included in the assessments used to support this analysis, and ultimately the selection of a RMP amendment alternative, address upland soils, riparian systems, plant and animal communities, special status (threatened, endangered, candidate, or sensitive) species, and water quality.

1.4 PLANNING AREA

The Planning Area is generally bounded on the east by State Highway (SH) 13, on the south by the Colorado River, on the west by Parachute Creek, and on the north by the line between Township 4 South and Township 5 South of the Sixth Principal Meridian. A small area in the northeastern portion of the Planning Area extends into Rio Blanco County (Figure 1-2). The 73,602 acres of public land within the Planning Area includes 73,282 acres managed by the GSFO. This total includes 68,447 acres with BLM surface and minerals and an additional 4,455 acres with private surface but Federal minerals. An additional 320 acres of BLM surface and mineral estate is managed by the White River Field Office (WRFO) out of Meeker in Rio Blanco County.

Although the Planning Area includes both public and private lands, the RMPA guides only BLM efforts on the public lands that it administers. "Public lands" in this context include lands with a split estate (viz., private surface but Federal minerals), although BLM management authority on these lands is limited to activities (both surface and subsurface) related to exploration and development of the minerals. About 58 percent of the Planning Area (73,602 acres) is public land in the sense of either Federal surface, Federal minerals, or both. The proportion of public land is higher on top of the plateau (65 percent) than below the rim (53 percent).

The relationship between the Planning Area and the entire area managed by the GSFO is shown in the insert on Figure 1-2. The total area managed by the GSFO includes approximately 568,000 acres. The WRFO manages about 1.5 million acres.

Figure 1-3 shows the location of the line used to differentiate areas referred to throughout this RMPA/EIS as lying "above the rim" or "atop the plateau" versus "below the rim" or "below the cliffs." This distinction is important for the Planning Area because of the very different resources and existing land uses associated with these two topographically and ecologically disparate areas. Note from Figure 1-3 that this line ("the rim") is not present along the northern edge of the Planning Area, which is separated from adjacent lands to the north by a gradual slope rather than a sheer escarpment.

1.5 AGENCY ROLES AND RESPONSIBILITIES

NEPA requires that Federal agencies give appropriate consideration to environmental impacts in all their decision-making processes. BLM is the lead agency (as defined in NEPA) for the Proposed Plan and is therefore responsible for preparing an EIS that evaluates the effects of amending the two existing RMPs and conforms to the guidance set forth in the Act. BLM will use the evaluation in this RMPA/EIS to make an informed selection of resource management options and amend the existing RMPs.

The resource management plan amendments and their ultimate implementation are the sole responsibility of BLM. However, other agencies have authority under other laws to which BLM must adhere, and/or have special expertise or knowledge that is required for complete analysis and coordination of the alternatives. BLM is consulting with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the ESA regarding potential adverse effects of the Proposed Plan/Final EIS.

BLM has entered into Cooperating Agency agreements with Garfield County, Rio Blanco County, the City of Rifle, the Town of Parachute, and the Colorado Department of Natural Resources (CDNR), which includes the Colorado Division of Wildlife (CDOW), the Colorado Oil and Gas Conservation Commission (COGCC), Colorado Geologic Survey (CGS) and the Colorado Department of Parks. BLM has also consulted with Mesa and Rio Blanco Counties and the City of Glenwood Springs.

1.6 BLM LAND USE PLANNING PROCESS

FLPMA mandates that public lands under the jurisdiction of BLM be managed according to land use plans that are developed with public input through a coordinated planning process. FLPMA further mandates that BLM lands are to be managed on the basis of "multiple use and sustained yield unless otherwise specified by law." The set of regulations that implement FLPMA is found in 43 CFR 1600. These regulations outline the interdisciplinary, cooperative approach that BLM must take in preparing, maintaining, and using resource management plans, amendments, and revisions. The planning process outlined in these regulations consists of the following steps, not necessarily undertaken in a linear fashion:

- **Identify Issues** – BLM conducted public meetings and invited written comments early in the planning process. Comments from interested agencies and the public helped BLM identify key issues (i.e., concerns, conflicts, or opportunities pertaining to the management of public lands).
- **Develop Planning Criteria** – Planning criteria are the considerations that guide the overall planning process, the development of a reasonable range of alternatives, and analysis needed to address the planning issues. Planning criteria were formulated based on applicable laws and regulations, land use plans, coordination with other agencies, and public input.
- **Collect and Consolidate Data** – Based on the issues identified and the planning criteria, BLM reviewed and evaluated available data, including results of field surveys, published and unpublished studies, and consultations with staff from other agencies and organizations.
- **Prepare an Analysis of the Management Situation (AMS)** – The AMS provides a baseline for developing and evaluating management alternatives. It describes existing management plans and documents, current management approach, site characteristics and setting, resource condition and capabilities, and opportunities. The AMS for the Planning Area was published August 2002 (BLM 2002a).
- **Formulate Alternatives** – BLM planning team reviewed the issues raised during scoping by the public, other agencies, and within BLM. Based on the AMS, planning criteria, and goals and objectives of the RMP Amendment, five alternatives were formulated for detailed analysis. These alternatives described a reasonable range of management options to assist decision-makers and the public in understanding the positive and negative effects of future actions in the Planning Area.
- **Estimate Effects** – Each of the five alternatives analyzed in detail in the Draft RMPA/EIS, as well as the Proposed Plan presented in this document, have been evaluated for potential environmental consequences. The analysis addresses short-term (temporary) and long-term, onsite and offsite, direct and indirect, and positive (beneficial) and adverse (negative) impacts expected to result from each alternative. The analysis addresses these impacts individually as well as cumulative to past, present, or reasonably anticipated future impacts.

- **Select the Preferred Alternative and Conduct Public Review** – As required by NEPA and BLM planning regulations, the Draft RMPA/EIS identified a preferred alternative. Following consideration of public comments during a 90-day (extended to 120-day) review period for the Draft, BLM initiated a Cooperating Agency process that spanned an additional 6 months and included six formal meetings with the Cooperators (see Chapter 6). The Proposed Plan/Final EIS was developed following completion of the public comment and Cooperating Agency processes.
- **Prepare the Record of Decision (ROD)** – At the end of a 30-day protest period that follows publication of the Proposed Plan/Final EIS, BLM's Colorado State Director will issue a ROD documenting the completion of the environmental review and adoption of a selected RMPA to be implemented. Issuance of the ROD may be delayed until protests are resolved.
- **Monitor and Evaluate** – As the approved RMPA is being implemented, BLM will monitor and evaluate how well the plan is guiding the Planning Area toward desired or acceptable resource conditions. If management issues are not being resolved or suitable conditions not being met, the RMPA may be further amended or revised within the constraints of valid existing rights.

1.7 NEPA PROCESS, DECISION-MAKING, SCHEDULE, AND PROTESTS

The NEPA process is intended to provide BLM with a detailed account of the environmental consequences that are associated with the alternative management plan amendments for the Planning Area. Regulations promulgated by the Council on Environmental Quality (CEQ)(40 CFR 1500 et seq.) provide guidance for all Federal agencies to comply with NEPA. BLM's NEPA Handbook (H-1790-1) (BLM 1988c) provides the specific guidance for BLM implementation of NEPA.

Any person who participated in the planning process may protest an RMP Amendment within 30 days of the date of the Notice of Availability (NOA) for the Proposed Plan/Final EIS containing the amendment published in the Federal Register by the U.S. Environmental Protection Agency (EPA). The protest may raise only issues that were submitted for the record during the planning process. Protests must be in writing and addressed to the BLM Director. Letters of protest must fulfill the content requirements established in 43 CFR 1610.5-2 (a). The protest must contain:

- the name, mailing address, phone number, and interest of the person filing the protest
- a statement of the part or parts of the plan and the issues being protested
- a copy of all documents addressing the issue(s) that the protesting party submitted during the planning process or a statement of the date they were discussed for the record
- a concise statement explaining why the protestor believes that the State Director's decision is wrong

A 30-day protest period and 60-day Governor's Consistency Review period will follow the NOA for the Proposed Plan/Final EIS. Once any protests are resolved, the State Director will issue a ROD that sets forth the Resource Management Plan decisions.

1.8 SUMMARY OF SCOPING ISSUES

1.8.1 Overview of Scoping and Issue Identification Process

NEPA requires that Federal agencies hold an open and early process for determining the scope of issues to be addressed in an EIS and for identifying the significant issues that could be associated with the action. The term "scope" is defined as the range of actions, alternatives, and impacts to be considered in an EIS.

BLM initiated formal scoping for this RMPA/EIS on November16, 2000, with a notice in the Federal Register inviting the participation of affected Federal, State, and local agencies, any affected Indian tribe, the proponent of the action (BLM), and other interested persons. The formal scoping period ended on January 31, 2001. A public open house was held on December 13, 2000, during which BLM accepted verbal comments. BLM received written comments throughout the period.

An additional public comment period, publicized by legal notices, was held for 30 days beginning October 14, 2002. During this comment period, BLM summarized amended planning criteria and preliminary alternatives and requested additional comments on the scope of the RMPA/EIS. During this period, BLM held public meetings in Rifle on October 22, in Parachute/Battlement Mesa on October 23, and in Glenwood Springs on October 24, 2002.

Beginning in November 2001, BLM launched a public website with information about the planning process for Planning Area. An additional public website was created on December 4, 2002, to provide specific information on the RMPA/EIS process.

Based on the comments received during scoping, BLM identified environmental issues to be analyzed in the EIS. The scoping comments also guided BLM in determining the appropriate depth of analysis for each issue and which issues were outside of the scope of the Proposed Plan. As discussed in Chapter 2, the issues identified during the scoping process were taken into consideration during alternative formulation.

1.8.2 Planning Issues Considered in this Proposed Plan/Final EIS

Table 1-1 summarizes issues raised by interested parties and agency staff during the scoping process, including those considered in the RMPA/EIS and those eliminated from further consideration. It also lists the planning criteria used in developing the Draft RMPA/EIS and Proposed Plan/Final EIS. These issues were considered in formulating the alternatives, and the evaluation of those alternatives, as well as in developing a Proposed Plan. Table 1-2 summarizes BLM's planning criteria as applied to the process.

1.9 CHANGES AND CORRECTIONS TO THE DRAFT RMPA/EIS

To enhance readability of the document by reducing its length, most of the text and tables in Chapter 4 (Environmental Consequences) pertaining specifically to Alternatives I through V were removed. Therefore, the Proposed Plan/Final EIS focuses heavily on the Proposed Plan. However, reference is made throughout Chapter 4 to components of Alternatives I through V where helpful to an understanding of key differences and a comparison of impacts among alternatives.

In addition to removing much of the detailed information on the previous alternatives, preparation of the Proposed Plan/Final EIS included incorporating a number of other changes and corrections and updating some new information. These are described below.

1.9.1 Expanded or Updated Information

Expanded or updated information incorporated into the Proposed Plan/Final EIS includes the following:

- Information on existing oil and gas development was updated to incorporate more recent data on number of wells already completed in the Planning Area and to reflect other oil and gas development in the region.
- The sections on socioeconomic (3.4.3 and 4.4.3) were expanded to include additional information on impacts to local communities, including an expanded discussion of hunting-related revenues.

- Information regarding big game security areas mapped by CDOW on BLM lands was updated to include 11,404 acres along stream valleys atop the plateau as well as the previously included 11,481 acres in rugged, wooded terrain along and below the cliffs.

Table 1-1. Planning Issues Raised by Interested Parties and BLM Staff during Scoping

Primary Issues	• Oil and Gas Development • Wilderness and Roadless Areas • Recreational Opportunities • Travel and Transportation • Influences of Changing Population, Growth, and Development to Public Lands • Fish and Wildlife Habitat • Livestock Grazing Management • Visual Aesthetics • Economic Benefits from Gas Leasing, Grazing, Recreation, and/or Tourism • Ecological Richness/Uniqueness/Diversity
Related Topics	• Watershed, Water Resources, and Water Pollution • Vegetation/Forest Management • Air Quality • Local Quality of Life/Livelihoods • Loss of Traditional Uses and Activities • Maintaining Current Activities, Setting, and Management • Areas/Routes Open for Motorized Use, Mountain Bikes/Seasonal Restrictions • Protection of Rare and Sensitive Species • Protection of Natural Features • Protection of Paleontological/Archeological Resources • Wildland Fire and Prescribed Fire Management • Conflicts between Users • Rights-of-Way, Communication Sites, Utility Corridors • Reclamation of Unneeded Routes, Improvements, and Human Impacts • Meeting Land Health Standards • Livestock Grazing Carrying Capacity and Conflicts • Soils/Erosion • Reclamation of Spent Shale Pile and DOE Facilities
Implementation Topics	• Connecting Trails to Rifle • Level of Maintenance on Routes • Recreational Facilities • Signage • Litter and Trash Dumping • Livestock Distribution and Improvements • Enforcement of Regulations • Gas Development Spacing, Directional Drilling, and Stipulations • Partnerships/Involving Users in Implementation • Habitat Improvement Projects • Gas Development Mitigation
Planning Topics	• Reconfirming Existing RMP Decisions • Multiple-Use Management • Increased and Changing Demands of Public Lands • Sustainability • Cumulative Impact of Oil and Gas Development • Balance of Recreational Opportunities • Intent of Transfer Legislation • Need to Revise Reasonable Foreseeable Development Scenario for Gas Leasing

Table 1-2. Planning Criteria Used by BLM in Developing and Implementing the RMPA/EIS

Area of Analysis	• The planning process will address all BLM-administered lands, including lands with Federal surface and/or mineral estates within the Planning Area. This area can generally be described as being between Parachute Creek, SH 13, and the Colorado River, totaling 73,602 acres of Federal lands.
Decisions to be Made	• Establish travel designations that replace interim travel designations on transferred lands and affirm or change travel designations on lands in the rest of the Planning Area. • Establish conservation/mitigation measures if any, and as appropriate, for all species listed as sensitive, candidate, proposed, threatened, or endangered in order to prevent the listing of sensitive, candidate, and proposed species. Adopt measures as appropriate to conserve species currently listed under the Endangered Species Act as Threatened or Endangered (see August 30, 2000, Interagency MOA for Programmatic Endangered Species Act (ESA) Section 7 Consultation). • Adopt, modify, or discard previous land use planning decisions as appropriate. • Identify areas, conditions, and criteria where resource activities and development (oil and gas development, range improvements, vegetation treatments, recreation developments and other surface-disturbing activities) are appropriate. • Designate special management areas, as appropriate, potentially including ACECs and SRMAs. • Establish management prescriptions for those areas BLM has determined to contain wilderness characteristics. • Provide management direction to maintain, enhance, or restore physical function and biological health and achieve Land Health Standards at the watershed scale. This will include adoption of the Standards for Public Land Health and Livestock Grazing Management in Colorado.
Process Criteria of Note	• Comply with all applicable laws, regulations, manuals, handbooks, and policies, including but not limited to the Federal Land Policy and Management Act, Public Law 105-85 (Defense Authorization Act of 1998), Mineral Leasing Act of 1920 as amended, Onshore Oil and Gas Leasing and Reform Act of 1987, ESA, Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act, Clean Water Act, Clean Air Act, and other laws. • Provide for a balance and diversity of resource uses while realizing that some uses may not be compatible and may not be offered within the Roan Plateau area. • Base decisions on the relative values of resources present, not necessarily to the combination of uses that will give the greatest economic return (Planning Regulations, 43 CFR 1600) in development of management prescriptions. • Recognize valid existing rights. • Use multiple geographic scales to assess the results of various alternatives that may differ from the Planning Area for analysis, appropriate to specific resources and to address complex issues. • Consider budget when analyzing the feasibility of implementation.

- A new chapter (Chapter 6) was created to describe the Consultation and Coordination process that followed publication of the Draft RMPA/EIS.
- Information regarding BLM's Reasonable Foreseeable Development (RFD) (BLM 2003a) was updated to reference the version dated November 2005 (replacing the earlier version of February 2004). The current RFD is provided in Appendix H of this document.
- A new appendix (Appendix I) was added to provide information regarding BMPs, and three new appendices (Appendices J, K, and L) were added to describe resource monitoring programs to be implemented under the Proposed Plan. Appendix M was added and it describes financial and programmatic resources available to local governments. Appendix G was removed, but the title page remains so that the order of the appendices is not changed.

1.9.2 Substantive Corrections, Clarifications, and Additional Analyses

Notable corrections of typographical errors and incorrect or misleading statements, clarifications or changes in terminology, and other substantive revisions in going from the Draft RMPA/EIS to the Proposed Plan/Final EIS included the following:

- Replacement of Terms "High-Risk" and "Moderate-Risk" with "High-Value" – At multiple places in the Draft, these terms were used to describe relative habitat importance for specific resources, particularly Colorado River cutthroat trout, riparian/wetland areas, and watershed processes. The word "risk" was used to connote the likelihood that impacts to one resource would adversely affect another resource. For example, damage to "high-risk" habitat for the Colorado River cutthroat trout would have a high likelihood of impacting the trout. To avoid confusion with a more common usage of the term—viz., that "high-risk" habitat has a high risk of being damaged—"risk" has been replaced with "value."

  In addition to substituting the word "value" for "risk," the Proposed Plan/Final EIS combines areas previously described as high-risk and moderate-risk habitats into a single ("high-value") category. This change arose from the Consultation and Coordination process following publication of the Draft RMPA/EIS. Furthermore, in the case of the Colorado River cutthroat trout, the Proposed Plan protects the entire "high-value" area for this species with an No Ground Disturbance/No Surface Occupancy (NGD/NSO) restriction (as was done under Alternative II), rather than reserving the NGD/NSO for the high-risk portion and applying a less restrictive Site-Specific Relocation/Controlled Surface Use (SSR/CSU) to the moderate-risk portion (as was done under Alternative III).

- Correction of Erroneous Number Regarding Loss of Big Game Winter Range – The discussion of wildlife impacts under Alternative III of the Draft stated correctly on page 4-83 that the Preferred Alternative would result in a decrease of approximately 22.3 percent of the big game winter range on BLM lands below the rim, including both direct and effective habitat loss. Unfortunately, the summary statement on page 4-87 described the loss as approximately 33 percent, which was meant to apply to all lands in the Planning Area, not just BLM lands. The correct estimate of 22.3 percent was the basis for assigning an impact level of "moderate" in Tables 4-14 and 4-17 of the Draft. In the same tables, the impact summary for deer and elk winter range under Alternative IV reported the level as "moderate," when it should have been described as "moderate to major" based on an estimated 36 percent habitat loss. The versions of these tables in the Proposed Plan/Final EIS (Tables 4-12 and 4-13) correct these errors.

- Correction to Area of Winter Range Protected by Seasonal Restriction – For the Proposed Plan and other alternatives except Alternative V, a seasonal restriction on ground-disturbing activities, including oil and gas drilling and other construction, would be applied to the 34,668 acres of big

game (deer/elk) winter range mapped on BLM lands by CDOW. Although the Draft RMPA/EIS stated that this protection would apply to 24,978 acres of "crucial" winter range (severe winter range plus winter concentration areas), the impact analysis was based on protecting all winter range.

- Clarification of Winter Range Losses versus Population Declines – Some language in the Draft RMPA/EIS was imprecise in describing estimated impacts to deer from reductions in winter range. To equate decreases in habitat with decreases in deer populations requires a number of assumptions meant to ensure that impacts are not underestimated. Among these is the assumption that all of the winter range is currently at carrying capacity and that unaffected areas are unable to absorb any increase in use. Another assumption is that the impact of habitat loss accruing over 20 years is the same as if it happened all at once, with no opportunity for the wildlife to adjust their patterns of habitat use. Because of the compounding of these and other such assumptions, the potential decrease in winter range under the Proposed Plan or any other alternative would be very unlikely to result in the same decrease in deer numbers.

- Re-analysis of Disturbance-Avoidance Impacts – Another issue involving winter range in the Draft RMPA/EIS is the method used to calculate effective habitat loss (i.e., habitat that remains intact but receives less use by wildlife due to human activity). The method used in the Draft multiplied the area of long-term surface disturbance at Year 20 by a factor of 3.5 and applied that number for the entire 20-year period. That method was derived from a publication describing effective habitat fragmentation resulting from roads and timber clearcuts in a forest. CDOW commented that the method was likely to underestimate impacts and recommended use of larger disturbance-avoidance zones, such as reported in studies of impacts of oil and gas development in Wyoming. Because the method recommended by CDOW results in somewhat greater impact estimates, the Proposed Plan/Final EIS uses this method to estimate effective habitat loss for both big game winter range below the cliffs and elk summer range atop the plateau.

- Correction to Table 4-34 (Table 4-27 of Proposed Plan/Final EIS) – The right-hand column of Table 4-34 of the Draft RMPA/EIS lists the typical number of average daily vehicular trips associated with drilling 80 gas wells. Unfortunately, the numbers in that column are too high by a factor of 10 due to an arithmetic error. The replacement table corrects the error and also differs by using the actual estimate of the number of wells per year under the Proposed Plan (78.5) instead of the more generic value of 80 wells per year used in the Draft.

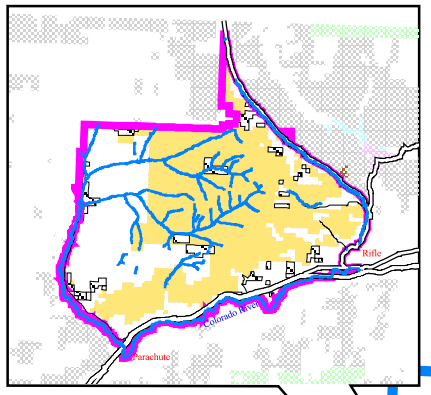
- Correction to Vehicular Traffic on Nearby Highways – Because of the error in calculating average daily vehicle-trips described above, calculations related to impacts on selected highways discussed for each alternative in Section 4.4.4 of the Draft RMPA/EIS are also too high by a factor of 10. The discussion regarding the Proposed Plan in the Proposed Plan/Final EIS uses the correct figures.

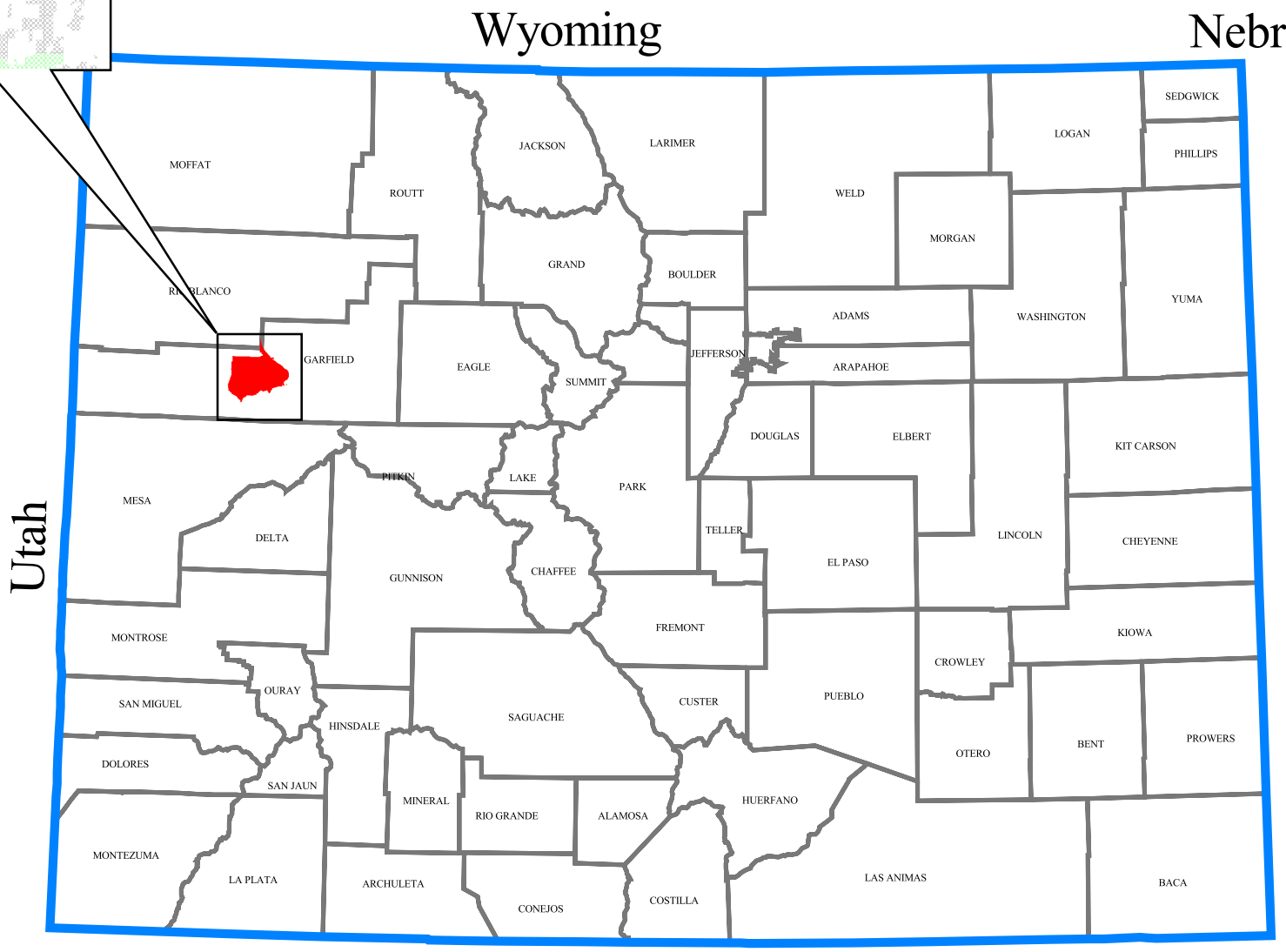
- Correction to Table 4-18 (Table 4-20 of Draft RMPA/EIS) – The viewshed analysis summarized in Section 4.4.1 in the Proposed Plan/Final EIS differs from that in the Draft in two ways:

    - First, the analysis no longer includes wells below the rim as being visible from the Rim Road. This aspect of the Draft was an artifact of pixel size (spatial scale), which treated the Rim Road as essentially identical to the rim (top of the cliffs). The actual closest approach of the road to the rim is about 50 feet, and the typical separation is more than 100 feet. This makes it impossible to see the lower area from a vehicle on the road.

    - Second, well pads visible from both Interstate 70 (I-70) and SH 13 are no longer double counted. Considerable overlap in these viewsheds (see Maps 24 and 25) results because the two roads intersect, with long sections having the same view across open country toward distant cliffs. To avoid this double-counting, the revised table and text are based on an analysis in which visible lands below the cliffs are divided into two distinct areas: (1) sites visible only or primarily from I-

Figure 1-1
General Location Map
Roan Plateau RMPA/EIS





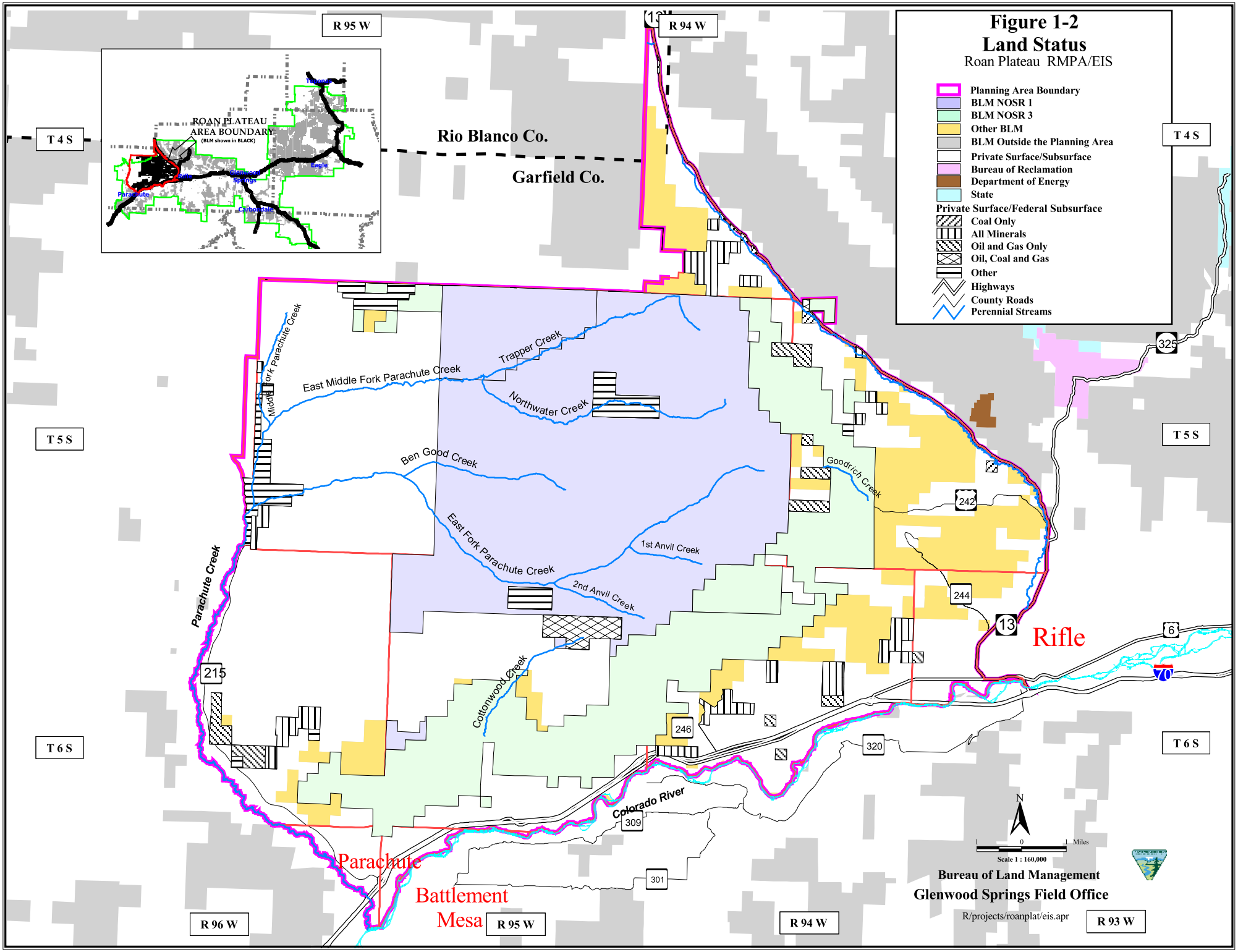
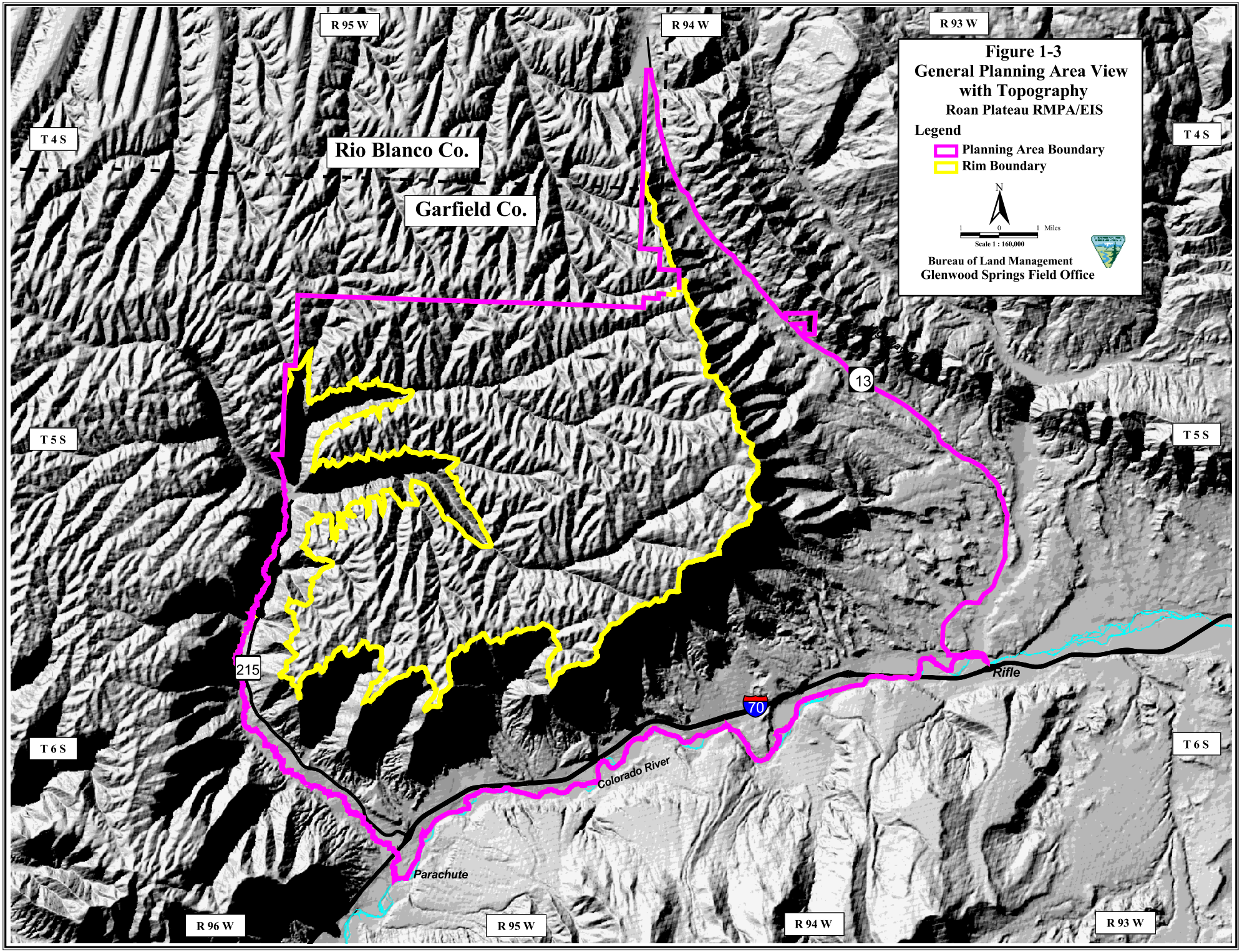


Figure 1-2
Land Status
Roan Plateau RMPA/EIS
Planning Area Boundary
BLM NOSR 1
BLM NOSR 3
Other BLM
BLM Outside the Planning Area
Private Surface/Subsurface
Bureau of Reclamation
Department of Energy
State
Private Surface/Federal Subsurface
Coal Only
All Minerals
Oil and Gas Only
Oil, Coal and Gas
Other
Highways
County Roads
Perennial Streams
ROAN PLATEAU AREA BOUNDARY
(BLM shown in BLACK)
Rio Blanco Co.
Garfield Co.
R 95 W
R 94 W
T 4 S
T 5 S
T 6 S
R 96 W
R 93 W
Middle Fork Parachute Creek
East Middle Fork Parachute Creek
Trapper Creek
Northwater Creek
Ben Good Creek
East Fork Parachute Creek
1st Anvil Creek
2nd Anvil Creek
Goodrich Creek
Parachute Creek
Cottonwood Creek
Colorado River
215
242
244
246
309
301
320
325
13
6
70
Rifle
Parachute
Battlement Mesa
N
1 0 1 Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
R/projects/roanplat/eis.apr


R 95 W
R 94 W
R 93 W
T 4 S
T 5 S
T 6 S
Rio Blanco Co.
Garfield Co.
13
215
70
Rifle
Colorado River
Parachute
R 96 W
R 95 W
R 94 W
R 93 W
Figure 1-3
General Planning Area View
with Topography
Roan Plateau RMPA/EIS
Legend
Planning Area Boundary
Rim Boundary
N
0
1 Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office

CHAPTER 2

ALTERNATIVES

2 ALTERNATIVES

2.1 INTRODUCTION

Chapter 2 describes the Proposed Plan resulting from this planning process and summarizes the five other alternatives analyzed previously in the Draft RMPA/EIS. The chapter also explains how the alternatives were developed and briefly describes additional alternatives that were considered but not analyzed in detail. Major management elements of the Proposed Plan and five previously analyzed alternatives are presented in the following subsections and depicted on maps provided in Appendix A. A comparison of the No Action Alternative, Preferred Alternative, and Proposed Plan is presented in Table 2-1.

One of the goals for this RMPA/EIS process is to ensure a consistent, coordinated approach to managing lands within the Planning Area. The Proposed Plan and alternatives integrate management of the GSRA and WRRA portions of the Planning Area and consider management techniques that have proven successful in other parts of these resource areas. The Proposed Plan and alternatives also address multiple-use mandates of FLPMA and the Transfer Act.

2.2 ALTERNATIVES DEVELOPMENT AND SELECTION PROCESS

The alternatives selection process included a public scoping process that allowed interested members of the public, as well as resource and land use agencies, to comment on the appropriate scope of issues to consider for the Planning Area. The formal scoping period began December 13, 2000, and ended January 31, 2001. At this time, BLM staff reviewed the issues identified during scoping and collected pertinent resource information for the Planning Area. This resource information is found in BLM's (AMS)(BLM 2002a). In developing and refining alternatives, BLM sought to accomplish two things: (1) reduce the number of alternatives and the amount of overlap among alternatives to ensure clear and distinct choices while maintaining a reasonable range of potential actions, and (2) ensure that all of the alternatives would be consistent with Public Law 105-85 (the Transfer Act) of November 1997, which transferred NOSRs 1 and 3 from DOE to BLM. The Proposed Plan would continue these two objectives.

The Transfer Act states:

> "The Secretary of the Interior shall enter into leases with one or more private entities for the purpose of exploration for, and development and production of, petroleum (other than in the form of oil shale) located on public domain lands in the Oil Shale Reserves Numbered 1 and 3 (including the developed tract of Oil Shale Reserve Numbered 3)."

It further states:

> "The Secretary of the Interior, acting through the Bureau of Land Management, shall manage the lands transferred in accordance with the Federal Land Policy and Management Act of 1976 (FLPMA) and other laws applicable to the public lands."

Although the Transfer Act does not apply to other public lands within the Planning Area, the management of those lands is also directed by FLPMA and other applicable laws.

Resource management activities described for each alternative could have been combined in many different ways to create a large number of alternatives. The five alternatives analyzed in detail in the Draft RMPA/EIS were selected to represent a reasonable range of implementable alternatives. These alternatives were derived from six preliminary alternatives, described in Section 2.4. In addition to the six preliminary alternatives and the five alternatives analyzed in detail were other possible alternatives dropped from consideration early in the process. In general, alternatives considered but not carried further into the process were dropped because BLM concluded that they would not comply with the intent

of the Transfer Act, fulfill the requirements of FLPMA or other applicable laws, or appropriately address the various resource values, or were redundant with alternatives being analyzed in detail.

As allowed under NEPA and anticipated in the Draft RMPA/EIS, the Proposed Plan presented in this document has been developed by selecting components of the five alternatives that were analyzed in the Draft RMPA/EIS, in response to public comments and Cooperating Agency input during the Consultation and Coordination process following publication of the Draft. Thus, the Proposed Plan differs from the Preferred Alternative identified in the Draft. See Table 2-1 for a comparison of the management components under the Proposed Plan, the Preferred Alternative of the Draft RMPA/EIS, and the No Action Alternative.

Considerations in the formulation of the Proposed Plan and the five previous alternatives (Sections 2.3 and 2.4, respectively) include the following:

- All would comply with all existing laws and regulations. Nothing presented as a component or outcome should be construed as exempting activities from applicable regulatory requirements.
- All are considered by BLM to be implementable from both technical and management perspectives.
- Oil and gas leasing would be consistent with the Transfer Act and FLPMA.
- Resource management actions would be consistent with FLPMA and BLM guidance and standards.
- ACECs would be designated only where relevant and important values were found to be present.
- No WSAs would be designated.
- Stream segments found through inventories to be eligible for determination of suitability for designation as WSRs would be managed to protect and maintain those values until a suitability decision is made.
- Other energy sources, including fossil fuels (coal, coalbed methane, and oil shale) and alternative sources (wind, solar, geothermal, and biomass) were considered but not addressed in detail. Exploration, research and development, or production of other energy sources, would be considered within the context of the management prescriptions resulting from this RMPA/EIS process. If and when a proposal is made, and details of potential development are provided, additional analysis may be required for compliance with NEPA and BLM guidance.

It is important to note that the actions constituting the Proposed Plan and five alternatives would not specifically be permitted upon adoption as the RMP Amendment. For example, oil and gas development would occur only after an area has been leased and proposed well locations, road and pipeline alignments, and other facilities have gone through a permitting process. Furthermore, while the assumptions associated with the Proposed Plan and five previous alternatives represent reasonable projections of what could occur, it is impossible to predict with certainty the precise outcome of any of the actions due to the large number of variables involved.

Using oil and gas development again as an example, the number of wells could be larger or smaller, drilling of wells could occur at a faster or slower rate, and the pace and success of reclamation and other mitigation measures may prove greater or less than anticipated. Additionally, it should be noted that the number of wells assumed to be developed under each alternative was derived by subtracting the number of existing wells from the total number of wells that could be developed given the assumed surface and downhole spacing, assumed annual drilling rates, and surface-use restrictions. This document uses the number of existing wells referenced in the Oil and Gas RFD (BLM 2005b)(Appendix H).

Because of land use and resource management considerations, BLM would apply various stipulations and other restrictions on use to protect specific resource values in conjunction with management, development, or other activities, including those undertaken by oil and gas lessees. Terminology for oil

and gas leases has specific definitions. The following oil and gas leasing terminology is taken from the *Uniform Format for Oil and Gas Lease Stipulations*, dated March 1989 (Appendix B):

- **No Surface Occupancy (NSO) –** Prohibits long-term use or occupancy of the land surface for fluid mineral exploration or development to protect identified resource values. This means that an area is protected from permanent structures or long-term ground-disturbing activities (i.e., lasting longer than 2 years). For example, an NSO designation would preclude construction of a well pad (because it would last longer than 2 years) but not a typical pipeline (because it would be revegetated within 2 years). Also, an NSO does not preclude the extraction of underlying fluid minerals if they can be accessed from outside the area by directional drilling. Except for specified situations, individual NSOs may include exceptions that would allow a ground-disturbing activity if it meets specific, stated criteria. In situations where a ground-disturbing activity is permitted by an exception, the activity would be subject to the BMPs and reclamation standards in Appendices I and J, respectively.
- **Timing Limitation (TL) –** Prohibits exploration, development, construction, and major maintenance (e.g., workover) activities during a specified time period to protect identified resource values and habitat uses. This means that an area may be subject to long-term impacts, but that the impacts cannot occur during a specified season (e.g., raptor nesting, bald eagle winter roosting, and use of winter range by big game). The TLs do not apply to minor activities associated with ongoing operation and maintenance of production facilities or to emergency responses required to avoid, minimize, or mitigate a risk to human health and safety, private property, or vulnerable resources and permitted uses on public lands.
- **Controlled Surface Use (CSU) –** Allows surface use and occupancy (unless restricted by another stipulation), but identified resource values require special operational constraints and may modify the lease rights. For example, a CSU stipulation for a specific area would allow BLM to require that a proposed well pad or other facility be shifted by more than the standard distance of 200 meters to protect a specific resource, but without precluding the activity.
- **Standard Lease Terms –** Comprise the suite of restrictions and limitations related to environmental protection in areas not subject to an NSO, TL, or CSU stipulation. Chapter 6 of the Sample Oil and Gas Lease (Appendix B, excerpted from the 1999 ROD) gives BLM the authority to require that oil and gas activities be conducted in a manner that minimizes adverse environmental impacts. Examples of measures that may be required under this authority, normally applied as lease notices or conditions of approval (see below), include shifting the location of the proposed facility or activity by up to 200 meters or prohibiting the activity for a period of up to 60 days to minimize impacts.
- **Lease Notice (LN) –** Provides more detailed information concerning limitations that already exist in law, lease terms, regulations, or operational orders. An LN also addresses special items the lessee should consider when planning operations but does not impose additional restrictions.
- **Condition of Approval (COA) –** Conditions or provisions (requirements) under which an Application for a Permit to Drill (APD) is approved.

BLM's goal is for oil and gas development to incorporate measures such as the clustering, collocation, and consolidation of surface facilities and other ground-disturbing activities. The intent of these measures is to reduce habitat fragmentation, disruption of natural ecosystem processes, soil erosion, water quality impacts, air quality impacts, visual impacts, and disruption of other land uses such as recreation and livestock grazing. BLM's experience in other areas, and the consensus of comments by the public and Cooperating Agencies, indicate that the benefit of these measures generally outweighs any negative consequences of larger, more centralized facilities. Section 2.3 describes the approaches under the Proposed Plan to require (for new leases) and encourage (for existing leases) implementation of phased

and clustered development, the consolidation of facilities, and other methods for minimizing the amount of surface disturbance or expediting reclamation.

Regardless of the details of the RMP Amendment adopted at the conclusion of the RMPA/EIS process, existing stipulations for existing oil and gas leases would continue to apply to existing leases. New stipulations would apply only to lands leased pursuant to this RMPA/EIS. COAs developed through this RMP Amendment would apply to both new leases and, to the extent that they do not infringe on existing rights, existing leases.

The reader should note that:

1. Many of the stipulations (i.e., restrictions on surface facilities and other ground-disturbing activities) that would apply to any new leases under the Proposed Plan or other alternatives are based on existing stipulations, although they may differ somewhat in one or more details.
2. Statements in this document to the effect that certain existing stipulations would be applied, extended, retained, or dropped under the Proposed Plan or other alternatives are meant to describe the extent to which these new stipulations would include the same types and levels of resource protection as current management. While correct as a practical matter, these statements are imprecise as a procedural matter because, as noted above, existing stipulations would not technically be applied to new leases. Instead, new stipulations may mirror existing stipulations.
3. Stipulations are referred to by the resources to which they would be applied (e.g., slopes greater than 50 percent, bald eagle nest or winter roost sites, etc.).

Appendix C lists and describes the proposed stipulations which would be applicable to new leases in the Planning Area.

New restrictions under the Proposed Plan would be applied not only to new oil and gas leases, but also to other types of land uses and management actions such as livestock grazing, range improvement actions, recreation, travel management, and use of rights-of-way. The following terminology is used to refer to these generally applicable restrictions:

- **No Ground Disturbance (NGD) –** Essentially equivalent to NSO. For example, an NGD designation would preclude construction of a new stock pond or communications tower, unless specific exception criteria were met. As with NSO stipulations for oil and gas operations, application of NGDs does not preclude temporary ground disturbances such as construction of a pipeline, except for the constraint on excessive or protracted disturbance that could affect a seasonally sensitive wildlife use.
- **Site-Specific Relocation (SSR) –** Essentially equivalent to CSU. For example, an SSR designation would allow BLM to require that a proposed stock pond or communications tower be shifted by more than 200 meters from its proposed location to protect a specific resource.
- **Standard Restrictions and Limitations –** Essentially equivalent to Standard Lease Terms, which allows BLM to require that the activity be conducted in a manner that minimizes adverse impacts.

Note that activities related to the underlying minerals (e.g., exploration and development of oil and gas) create a nexus for management by BLM. Because that authority includes managing surface activities such as constructing well pads, access roads, pipelines, or other surface facilities related to the Federal minerals, the types of restrictions listed above, as well as TLs, apply to split estates with Federal minerals and private surface ownership.

For all alternatives, BLM will require the use of BMPs (Appendix I) needed to protect resource values. As technologies improve, new BMPs may also be developed and implemented. BMPs would be applied to oil and gas operations as COAs and would include a variety of measures to minimize impacts over both the short term and long term. Examples include measures to:

- Reduce the footprint of roads to the smallest safe standard.
- Implement dust suppression to minimize impacts to air, water, vegetation, and wildlife.
- Use appropriate color, shape, size, and location of surface facilities to reduce visual impacts.
- Install low-emission engines at compressor facilities to reduce air quality impacts.
- Use centralized or automated facilities to reduce the length and frequency of travel.
- Collocate utilities in common corridors and align them along roadways to reduce habitat loss and fragmentation.
- Incorporate powerline and pole or tower designs to minimize the risk of raptor electrocution.

In addition to these generally applicable measures, BLM may require BMPs intended for specific resources and situations. Examples include requirements to:

- Use culverts at stream crossings (culverts would have to be sized to avoid creating a barrier to along-stream movement of aquatic species or impede runoff conveyance of the channel).
- Use gravel or other surface material on roads, or use other dust-suppression techniques for the abatement of particulate emissions.
- Use protective fencing to exclude livestock from sensitive areas or areas being revegetated.
- Use biodegradable erosion blankets to stabilize disturbed soil and enhance revegetation.
- Seed with native species.
- Include native shrubs in reclamation seed mixes.
- Plant containerized shrubs during reclamation.

Where appropriate, these or other BMPs (Appendix I) would be specified at the time of permitting of oil and gas drilling or related operations (as COAs) or of other activities (e.g., range improvements, road reclamation, etc.). For oil and gas development, the potential for these requirements may be specified in the lease documents as LNs.

2.3 PROPOSED PLAN

This section summarizes the Proposed Plan resulting from BLM's response to public input and the Consultation and Coordination process. Although the term "Proposed Plan" is used throughout this Proposed Plan/Final EIS, it is more correctly referred to as the "Proposed Resource Management Plan Amendment." The term Proposed Plan is used as a type of shorthand and to avoid confusion with the Preferred Alternative (Alternative III) of the Draft RMPA/EIS

In developing the Proposed Plan, BLM's intent was to increase the amount of environmental protection compared to the Preferred Alternative of the Draft RMPA/EIS while accommodating a comparable level of development of the underlying natural gas resource. Many of the specifics of the Proposed Plan incorporate revisions and refinements arising from the "Consultation and Coordination" process with State, county, and local governmental "Cooperating Agencies," following the public comment period for the Draft RMPA/EIS. The Consultation and Coordination process is described in Chapter 6.

Table 2-1 provides a detailed comparison of the resource and management components of the Proposed Plan in comparison to the No Action and Preferred Alternatives. Management of ACECs and the Parachute Creek WMA are summarized in Tables 2-2 and 2-3, respectively. Table 4-1 in Chapter 4 summarizes the level of oil and gas development expected, based on land availability and resource

management restrictions. Maps 1 and 2 depict the distribution of land availability and restrictions for the Proposed Plan, while Maps 3 through 12 provide analogous information for Alternatives I through V.

2.3.1 Emphasis on Phased and Clustered Development

An important aspect of the Proposed RMP Amendment is the incorporation of a requirement atop the plateau, and management emphasis below the rim, for phased and/or clustered oil and gas development, including extensive use of directional drilling to reduce surface disturbance. These requirements resulted from (1) comments by the public and Cooperating Agencies on the Draft RMPA/EIS that these measures could reduce surface disturbance, particularly in the more sensitive habitats atop the plateau, while allowing similar or greater recovery of oil and gas; and (2) experience of oil and gas operators in the region in both reducing the impacts and increasing the efficiency of drilling operations through greater use of multi-well pads and directional drilling.

During the Cooperating Agency process, the CDNR—which includes such agencies as the CDOW, CGS, Colorado Division of Parks, and COGCC—proposed a conceptual framework for implementing phased and clustered oil and gas development atop the plateau. The CDNR concept, which was viewed favorably by other participants in the Cooperating Agency process, was adopted and incorporated by BLM as a basic component of the Proposed Plan. Use of an undivided unit was intended to facilitate orderly development of the fluid mineral resource beneath the top of the plateau as a means of optimizing recovery of that resource while minimizing impacts to sensitive ecological and hydrological resources and encouraging rapid and effective reclamation. Major aspects of its adoption are as follows:

- Development Considerations. The maximum size of BLM oil and gas leases is 2,560 acres. The upper plateau area, with nearly 35,000 acres available for leasing, could contain at least 14 separate leases with an unknown number of separate operators. With separate leases there would be an incentive for each operator to maximize its own oil and gas production; simultaneous drilling operations across widely dispersed portions of the plateau, and redundant facilities for each operator. Economies of scale could more easily be met by distributing both costs and revenues associated with this environmentally sensitive area across the top of the plateau as a whole; while at the same time promoting development of all economically recoverable oil and gas resources within the Planning Area, rather that just those portions with the highest economic return
- Federal Unit atop the Plateau. A lease stipulation would require participation in a Federal Unit for all leases issued on top of the plateau. In an undivided unit, all lessees have an interest in oil and gas production atop the plateau and share proportionately in the costs and revenues of oil and gas development. By eliminating competition among lessees, the Federal Unit would allow for more orderly development of the entire area and for consolidation of facilities and infrastructure by a single operator.
- Existing Leases. Because the area below the rim already has oil and gas development underway in the production area and adjacent private lands, new leasing within this portion of the Planning Area would not be subject to a stipulation requiring participation in a unit with undivided interest, but instead would continue to be leased as individual tracts and may be unitized on a voluntary basis or through forced pooling orders. Mandatory requirements for developing the top of the plateau in an environmentally sensitive manner may encourage use of many of the same approaches for areas below the cliffs.
- Phased Development. Requiring 100 percent participation in a Federal Unit would allow the top of the plateau to be developed in a phased or staged progression. Phased development would be achieved through sequencing the exploration and development operations conducted within six geographic areas, referred to as phased development areas (Figure 2-1). These six areas would be defined by the tops of ridges between the major drainages atop the plateau. Drilling and production would be allowed in only one geographic area at a time, providing an incentive to ensure that drilling

is complete prior to moving to the next area. Exploratory wells may be drilled in other areas as needed to plan future drilling operations.

The six phased developed areas may be refined by BLM in collaboration with CDNR. Development in any new area would be predicated on substantial completion of diligent drilling in the preceding area sufficient to recover the oil and gas resource and satisfactory attainment of mitigation and interim reclamation requirements. For purposes of this document, it is assumed that exploration and development would occur first in the area immediately north of the Roan Cliffs, since this is the area closest in terms of horizontal distance to existing oil and gas development below the cliffs. [Generally, the closer an area is to a known reserve, the more likely it is to have the same conditions in the hydrocarbon-bearing strata.] Only when the first development area is nearing full development would BLM allow the operator to move to the next development area. Thus, impacts related to direct habitat loss, vehicular traffic, drill rig operation, and other sources would be limited to only one portion of the upper plateau at any given time.

The concept of phased and clustered development was discussed in the Draft RMPA/EIS. The Proposed Plan further refines this concept to as a way to ensure orderly development across the top of the plateau. Of particular importance in developing a phased approach to development was the desire to reduce impacts to wildlife by leaving large portions of the plateau relatively unaffected until reclamation had been completed in previously disturbed areas.

- Clustered Development and Directional Drilling. Another component of the Proposed Plan is the requirement for using directional drilling and multiple well pads on top of the plateau to reduce the surface disturbance footprint and landscape fragmentation. Discussions with CDNR and industry representatives indicate that, with existing proven technology, directionally drilled wells could "reach" a horizontal distance of 2,500 feet to access hydrocarbon resources. The Proposed Plan requires that pads atop the plateau be separated by a minimum distance of 2,640 feet (0.5 mile) within areas where disturbance would be allowed. With 10-acre downhole spacing for Mesaverde formation wells and 160-acre spacing for Wasatch wells, this would result in sixteen Mesaverde wells and one or more Wasatch wells per pad. Some minor variation to the minimum separation distance could be authorized.

  An additional component of clustered development as proposed by CDNR is to focus development along ridgetops. The top of the plateau is characterized by relatively flat ridges separated by relatively steep stream valleys. Focusing development on ridgetops would reduce impacts to the ecologically and hydrologically sensitive drainages. Through Geographic Information System (GIS) analysis, areas of drainage divides with slopes of 20 percent or less were found to be a reasonable basis for defining "ridgetops."

  GIS was then used to systematically project hypothetical locations of pads meeting the criteria of a minimum separation of 0.5 mile, in non-NGD/NSO areas, and with slopes of 20 percent or less. By applying a 2,500-foot horizontal reach for directional drilling to the hypothetical pad locations, GIS analysis indicates that more than 95 percent of the area of hydrocarbon-bearing formations beneath the upper plateau could be accessed at full-field development. This includes more than 90 percent in areas with an NGD/NSO restriction. Since the NGD/NSO areas atop the plateau under the Proposed Plan are relatively narrow features (associated with the stream drainage pattern) (Map 2), pads located near the edges of the NGD/NSOs would allow directional drilling to access the entire underlying area in most cases. If drilling technology develops to allow a greater horizontal reach, recovery beneath the NGD/NSO areas could be higher, potentially allowing surface density to be reduced further.

Clustered development would not only reduce surface impacts due to fewer pads, it would also reduce the need for new roads and vehicular travel associated with operation and maintenance of the wells.

Below the rim, BLM would encourage clustering for future development of currently leased lands and require it for new leases. The goal below the rim would be to reduce surface well pad density to achieve an average of one pad per 160 acres for all lands below the rim including those covered with NGD/NSO and SSR/CSU restrictions. This would achieve an overall density similar to the 0.5 mile separation mandated atop the plateau but with greater flexibility in pad location.

The existing lease terms and conditions and varied ownership of Federal and private lands below the rim makes it impracticable to specify spatially (geographically) phased development such as would be done atop the plateau. Voluntary commitment to such practices could reduce cumulative impacts and will continue to be encouraged in addition to the application of COAs.

2.3.2 Basis for Establishing a Federal Unit

BLM considered the use of a standard divided unit for the area on top of the plateau. However, based on public interest and the sensitive nature of the ecological and visual resources present, BLM would need to require BMPs and reclamation standards more stringent than historically required in the area. BLM would also need to regulate the rate of development by tying it to the success of mitigation and reclamation. The oil and gas industry expressed concerns regarding their ability to develop the natural gas resources in an economically viable manner while meeting the necessary mitigation unless leases were large enough to afford an economy of scale—perhaps as large as 10,000 acres. However, given its statutory and regulatory limit on oil and gas lease sizes to 2,560 acres, BLM concluded that the same objectives could be achieved through unitization. A non-contracting unit differs from a standard divided unit in that it does not have participating areas (PAs). Production is allocated to all leases committed to the agreement in proportion to their lease size. Subsequently, all leases share in any production from day one. Several issues were key in selection of a non-contracting unit:

- Agreement Term – Once the initial drilling obligation is met, the unit continues throughout the period of production. This contrasts with a divided unit, which has an initial drilling obligation until paying production or a PA is established and then continues for 5 years under a plan of development. After Year 5, a continuous drilling obligation must be met as outlined in the approved plan of development, with no more than 90 days between wells. The unit contracts to PAs in Year 10. One 2-year extension is possible—with a maximum of 12 years for the unit—prior to contracting to PAs.
- Rate of Development – In a non-contracting unit, all lessees share in production costs and revenues in a method approved by BLM and the agreement term continues throughout the period of production. This allows drilling plans to be developed logically without issues involving agreement termination dates for the lease where drilling is occurring. In a divided unit, drilling must continue until a PA is formed. However, given the 12-year maximum term of agreement until contraction, drilling plans must be developed that conform to the agreement terms.
- Clustered Drilling – In a non-contracting unit, all lessees share in production in a manner approved by BLM, regardless of where the production is occurring. This approach accommodates systematic development atop the plateau and avoids creating a leasing disincentive for areas with higher levels of environmental protection. Clustered development can be effectively planned in an orderly and systematic manner to minimize roads, well pads, pipelines, and other facilities. In contrast, a divided unit encourages scattered development as a way to expand the PA and include lessees not included within the initial PA.
- Mitigation Costs – In a non-contracting unit, the lessees share in all production costs as well as revenues (as approved by BLM). For the unit atop the plateau, costs of site-specific mitigation would also be shared by the lessees as a component of production costs. This is anticipated to make different portions of lands atop the plateau equally attractive for development, irrespective of differences in mitigation costs, and thereby facilitate the orderly progression of development sought by CDNR. This is because high costs in some areas would be tempered by lower costs in other areas.

In a divided unit, in contrast, lessees do not share in production costs unless in the PA. Site-specific mitigation may make an individual well non-paying, which means that it would never be in a PA and would not share in paying production. A divided unit would provide an incentive to develop on the highest producing areas with the lowest costs, contrary to the goals of orderly and efficient recovery of mineral resources for the top of the plateau as a whole.

- Limits on Unreclaimed Disturbance – Unreclaimed surface disturbance would be limited to 1 percent of the area of BLM lands atop the plateau (approximately 350 acres) at any one time. Disturbed areas would be removed from the running total as they meet interim and final reclamation standards (see Appendix J). Areas removed from the running total on the basis of attainment of interim standards would be placed back into the unreclaimed total if final success is not achieved in 5 years and would remain in that total until success is achieved.

  Unreclaimed surface disturbance associated with construction of the following would count toward the 1-percent limit:

  - Well pads above a threshold of 1 acre per pad (i.e., 1 acre of unreclaimed area per pad would not count toward the unreclaimed total to accommodate unavoidable long-term disturbance associated with operating wells).
  - Pipelines, whether for oil, gas, or water.
  - Compressors, dehydration units, storage tanks, maintenance buildings, and other surface facilities.
  - Borrow ditches, water diversion structures, and cut/fill slopes on any route used for oil and gas access.
  - Construction of new routes and realignment, widening, or other improving of existing routes used for oil and gas access.

  Items that would not contribute toward the 1-percent limit would include:

  - The existing driving surface (or improvements to the driving surface) on existing routes to be designated as open (86 miles).
  - The existing driving surface (or improvements to the driving surface) on existing routes to be designated as administrative use only (52 miles).

2.3.3 Other Components of the Proposed Plan

2.3.3.1 Special Management Designations

- Areas of Critical Environmental Concern – Another significant component of the Proposed Plan resulting from the Consultation and Coordination process is that the Proposed Plan would include the designation of four ACECs: East Fork Parachute Creek, Trapper/Northwater Creek, Magpie Gulch, and Anvil Points (Map 1). In this regard, the Proposed Plan is intermediate between Alternative II and the Preferred Alternative (Alternative III) of the Draft RMPA/EIS. Specifically, the Proposed Plan would include all four of the ACECs under Alternative II (compared to two under Alternative III), although with less total area (21,034 versus 36,184 acres). The smaller area reflects further analysis by BLM of where management for the relevance and importance criteria used to define the ACECs would be applied to protect the resource values. Resource management prescriptions for the ACECs are summarized in Tables 2-2a through 2-2d.
- Watershed Management Area – The entire area atop the plateau, excluding a minor portion draining northward into the Piceance Creek basin, would be designated as the Parachute Creek WMA. With a total area of 33,575 acres, the WMA under the Proposed Plan would be larger than the WMAs designated under Alternatives III and IV of the Draft RMPA/EIS. All portions of the Parachute Creek

WMA not protected by an NGD/NSO for one or more resource values would have an SSR/CSU to provide BLM with flexibility in project locations and timing. Table 2-3 details the management objectives and actions for the Parachute Creek WMA.

- Wild and Scenic Rivers – Stream segments found eligible for designation as WSRs would be protected by an SSR/CSU restriction stipulation until a suitability determination is made. These segments include 7,883 acres along approximately 24 miles of stream length.
- Wilderness Study Areas – No WSAs would be designated, nor would areas identified as having wilderness character be managed specifically to protect and maintain those values, under the Proposed Plan. However, NGD/NSO designations along drainages and the location of well pads on ridgetops would help preserve some or all of the existing wilderness characteristics.

2.3.3.2 Development of Fluid Minerals and Other Mineral Resources

- Fluid Minerals – The Proposed Plan would allow leasing for oil and gas development on 100 percent of the Federal mineral estate lands within the Planning Area. However, various constraints on long-term ground-disturbing activities (i.e., NGD/NSO restrictions) would limit the area available for these uses to 35,191 acres, or 48 percent of the Federal lands in the Planning Area. Management objectives to protect and enhance certain resources, and the natural processes on which they depend, would be achieved within the framework of the following land availability or restrictions on development or use restrictions (percentage of total BLM lands within the Planning Area shown in parentheses):
  - No Ground Disturbance/No Surface Occupancy (NGD/NSO) – 38,411 acres (52 percent)
  - Site-Specific Relocation/Controlled Surface Use (SSR/CSU) – 30,833 (42 percent)
  - Timing Limitations (TLs) – 39,947 acres (54 percent) – includes 15,135 acres of overlap with NGD/NSO areas and 22,597 acres of overlap with SSR/CSU areas.
  - Standard Restrictions and Limitations – 4,358 acres (6 percent) – includes 3,657 acres with one or more TL stipulations
- Other Minerals – Research-scale lease tracts for oil shale would be considered within the Planning Area and would be subject to the various NGD/NSO, SSR/CSU, TL, and standard restrictions and limitations contained within the Proposed Plan. Approval of research tracts would be based on the merits of the technologies proposed. [Note: a number of oil shale research tracts have recently been sought and approved on BLM lands in the Piceance Basin north and northwest of the Planning Area, but none was sought within the Planning Area.]

  Since the start of this RMP Amendment process, Congress enacted the Energy Policy Act of 2005. Section 369 of the Energy Policy Act requires the Secretary of Interior to "complete a programmatic environmental impact statement for a commercial leasing program for oil shale and tar sands resources on public lands, with an emphasis on the most geologically prospective lands within each of the States of Colorado, Utah, and Wyoming." On December 13, 2005, BLM published a Notice of Intent in the Federal Register initiating a Programmatic Environmental Impact Statement (PEIS) to support a commercial oil shale and tar sands leasing program on federal lands in these three states.

  In light of legislative requirements, all decisions related to oil shale leasing in this RMP Amendment effort are being deferred to the ongoing PEIS on Oil Shale and Tar Sands Leasing. The ROD on the final PEIS will also amend the Glenwood Springs RMP and decisions for the Roan Plateau planning area. The PEIS ROD will decide whether or not to allow leasing and future development of oil shale on Federal lands. Additional opportunities for public involvement and comment will occur when the PEIS becomes available in draft form. Site specific requirements will be addressed in future NEPA

analysis for specific project applications after the PEIS is completed. Activities associated with oil shale development would comply with applicable stipulations and conditions outlined in this Roan Plateau RMP Amendment, unless the stipulations and conditions are changed in future planning decisions.

Coal leases would also be allowed, subject to the various NGD/NSO, SSR/CSU, TL, and standard restrictions and limitations contained within the Proposed Plan. However, this use is not anticipated during the 20-year planning period.

All lands would be available to entry for locatable minerals and open for salable minerals, but again subject to the NGD/NSO, SSR/CSU, TL, and standard restrictions and limitations specified in the Proposed Plan. BLM would evaluate and, as appropriate, permit these uses on a case-by-case basis.

2.3.3.3 Physical Environment

- Geological Resources – As in the five other alternatives, the scientific and historic values of the Anvil Points Cave would be protected and preserved by prohibiting long-term ground-disturbing activities. This would be accomplished with an NGD/NSO. Activities that could cause direct or indirect impacts (such as roof collapse or dewatering) would be restricted.

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

- Paleontological Resources – Paleontological resources would also be managed as in Alternatives I through V. Paleontological clearances and mitigation would be required prior to ground-disturbing activities in areas with outcrops of formations that are known to contain, or have a high potential to contain, vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. Significant resources would be avoided or recovered through the authorization process. Paleontological resources in the Sharrard Park area would be protected from ground-disturbing activities through an SSR/CSU.

- Soils – Soils would be managed on a watershed level in the same manner specified in Alternatives I through V—i.e., to meet Land Health Standards, with an NGD/NSO restriction for slopes steeper than 50 percent and an SSR/CSU restriction for areas with highly erodible (erosive) soils on slopes steeper than 30 percent.

- Surface Water and Groundwater – Surface water and groundwater resources would be managed to meet all State and Federal water quality standards, as in Alternatives I through V. Based on NGD/NSO and SSR/CSU restrictions and BMPs to protect water quality, aquatic life, riparian/wetland habitats, and the Parachute Creek watershed, the Proposed Plan is not anticipated to result in violation of water quality standards. The potential for impacts from accidental spills or releases of pollutants associated with oil and gas operations exists, but BLM requirements are designed to minimize this potential and ensure an appropriate response. If standards are exceeded or if spills or releases occur, remedial measures and stringent protections and mitigation would be required. BLM's requirements for groundwater protection during oil and gas development, combined with the very limited existing or potential use of groundwater aquifers, are expected to result in no exceedances of water quality standards for groundwater.

- Air Quality – Air quality would also be managed, as for Alternatives I through V, to meet applicable Federal and State air quality regulations and standards and any local standards. This would be accomplished by monitoring and the application of BMPs or, if needed, additional mitigation

measures. Additional mitigation measures could include methods to further reduce fugitive dust from road construction and vehicular travel, emissions of pollutants from diesel engines, and gaseous emissions from wells and compressors below levels achieved using BMPs.

2.3.3.4 Biological Environment

- Vegetation – Upland vegetation would be managed to achieve a diverse native species composition and productivity, characterized by specific objectives for the ten most extensive plant communities in the Planning Area, and maintained at, or restored to, at least a 70 percent Ecological Condition Rating (ECR). Ecological Site Inventories (ESIs) or an equivalent monitoring system would be established to support assessments against these objectives and condition rating, based on Natural Resources Conservation Service (NRCS) procedures and standards. BLM decisions regarding the permitting and siting of ground-disturbing activities would consider these vegetation standards and objectives.

  Riparian/wetland communities would be managed to achieve Proper Functioning Condition (PFC) and late-seral stage community development, with a diverse structural and native species composition. Riparian/wetland vegetation would be protected with an NGD/NSO, while buffers of up to 500 feet would have an SSR/CSU. Within 500 feet of riparian/wetland vegetation, BLM may require special design or mitigation of projects, as well as requiring that a project be relocated by more than 200 meters to minimize impact to the resource.

  The Proposed Plan would also emphasize implementation of an integrated weed management program (which includes mechanical, biological, and chemical methods) to deter and control noxious weeds. This would include promoting healthy native plant communities as well as prevention, inventory, detection, monitoring, and specific project and control actions.

  Protections for special status plant species and significant plant communities would include an NGD/NSO for known occupied habitat of the two candidate species, the DeBeque phacelia and Parachute penstemon. This is in contrast to the Preferred Alternative of the Draft RMPA/EIS, which includes similar restrictions for all special status plants and significant plant communities. A large area of SSR/CSU restrictions for other special status plants and significant plant communities would apply in areas below the rim. A separate SSR/CSU would apply to protect the habitat for hanging garden special status species along the East Fork Parachute Creek and Trapper/Northwater Creek watersheds above the rim. Five populations of special status plants occur outside any areas with specific restrictions to protect them and thus would be vulnerable to ground-disturbing activities under the Proposed Plan.

- Fish and Wildlife – Another component incorporated into the Proposed Plan in response to the Consultation and Coordination process consists of NGD/NSO restrictions for areas mapped by CDOW as big game security areas along and below the cliffs. Protection of these areas of rugged, wooded terrain was included under Alternative II but not the Preferred Alternative of the Draft RMPA/EIS. Additionally, the Proposed Plan would provide SSR/CSU protection to 11,404 acres of big game security areas mapped by CDOW along some of the steep, wooded stream valleys atop the plateau.

  Another change under the Proposed Plan is that a seasonal TL on ground-disturbing activities (including oil and gas drilling and road construction) would be applied to all areas mapped by CDOW as big game winter range, and not only to crucial winter range (severe winter range and winter concentration areas). The TL would cover the 5-month period of December through April. This is consistent with Alternatives I through III of the Draft RMPA/EIS and exceeds the level of protection under Alternative IV (5 months, but as a COA) and Alternative V (3 months).

  While wildlife would benefit from the phased and clustered development approach atop the plateau, and from NGD/NSO restrictions for a host of other resources, specific protections would be applied

to special status wildlife and sensitive wildlife habitats or areas. Special status species include listed, proposed, or candidate Federal threatened or endangered species, BLM sensitive species, and State-listed threatened, endangered, or special concern species in Colorado.

Protections for genetically pure populations of the Colorado River cutthroat trout atop the plateau would include an NGD/NSO for occupied and other high-value habitat and an SSR/CSU for the entire Parachute Creek WMA, including areas identified as having a high value for watershed processes (i.e., upslope or upstream from areas of high-value trout habitat). Other, indirect protections would result from NGD/NSO and SSR/CSU restrictions for riparian/wetland areas and buffers, respectively.

Restrictions on long-term ground-disturbing activities for other habitats and areas of wildlife use include NGD/NSO restrictions for big game movement routes (consisting of passages through the Roan Cliffs), the Colorado River corridor, the Anvil Points Cave habitat for bats, bald eagle nesting and winter roosting areas, other raptor and waterbird nesting and brood-rearing areas, and occupied or other habitats needed to sustain threatened or endangered species. Additional protections include TLs for the bald eagle, other raptor nesting, and waterbird nesting areas, and an SSR/CSU (in addition to an NGD/NSO and a TL) for the peregrine falcon cliff-nesting complex. An SSR/CSU would also apply to habitats for any BLM sensitive species.

2.3.3.5 Human Environment

- Visual Resources – Visual resources would be managed to protect and preserve visual values and natural landscape values at a level consistent with the oil and gas development scenario incorporated into the Proposed Plan. Specifically, as described above, the restriction of oil and gas pads to ridgetops on the upper plateau as a way to reduce impacts on sensitive drainages would make these facilities more visible from roadways. Therefore, the top of the plateau would be managed as VRM Class III, which allows "moderate" changes to the landscape. The exception to this designation is that 1,612 acres (the East Fork Parachute Creek waterfall viewshed) would be managed as VRM Class I to preserve this visually sensitive area. The Class I area would have an NGD/NSO restriction, while an SSR/CSU restriction would be applied to the Class II and Class III areas.

  While focusing oil and gas facilities on ridgetops would increase visual resource impacts and along main roads, BLM has concluded (based on input during the Consultation and Coordination process) that the greater protection of drainages and the resources they support is an overall benefit. Areas below the rim would be managed as VRM Class II, which allows a lower degree of change than Class III, due to the visibility of much of this area from the I-70 and SH 13 corridors. An SSR/CSU restriction would be placed on the majority of VRM Class II areas below the rim, except for the 1-70 viewshed, which will be protected with an NGD/NSO. Exceptions to management for Class II below the rim include some areas of existing leases that would continue to be managed for their existing designations (Class III or IV).

- Cultural Resources – As under Alternatives I through V, cultural resource management would involve a moderate level of proactive fieldwork and would comply with the National Historic Preservation Act (NHPA), Archaeological Resources Protection Act (ARPA), National Programmatic Agreement/State Protocol, WO-IB-2002-101, and other applicable laws, regulations, and policies. Specific goals would be to:

  - Preserve and protect significant cultural resources and ensure that they are available for appropriate uses by present and future generations. This would include compliance with FLPMA Sections 103(c), 201(a), and 202(c); NHPA Section 110(a); and ARPA Section 14(a).
  - Reduce imminent threats from natural or human-caused deterioration or potential conflict with other uses by identifying priority geographic areas for field inventories. This would be based on

the probability of occurrence of unrecorded significant resources, as required by NHPA Sections 106 and 110 and ARPA Section 14(a).

- Recreation and Travel – As an outcome of the Consultation and Coordination process, the Proposed Plan would not identify Hubbard Mesa as a SRMA but would instead manage it as part of the Roan Plateau Extensive Recreation Management Area (ERMA) that encompasses all public lands in the Planning Area. This is due to the lack of an identified market for structured recreational opportunities and maintenance of a specific recreation setting character. Recognition of singularly dominant activity demand of and by itself, however great, is not a rationale for identification of an SRMA (BLM Handbook 1601-1).

  Recreation management within the Roan Plateau ERMA would be limited to custodial actions aimed at providing for visitor health and safety, addressing conflicts among uses and users, and protecting resources. Although not designated as an SRMA, Hubbard Mesa is identified in the Proposed Plan as an OHV Riding Area designated as "open" to cross-country motorized travel. Outside Hubbard Mesa, motorized travel within the Planning Area would be limited to designated routes, except for over-snow travel by snowmobiles when the depth of snow cover is at least 12 inches.

  The delineation of Travel Management Areas (TMAs) addresses other modes of travel not covered by OHV area designations (43 CFR 8342.1). The Roan Plateau Area TMA delineation allows muscle-powered (i.e., foot, ski, horse, and stock) travel cross-country year-round. Mechanized (wheeled conveyance) travel in the Roan Plateau Area TMA is limited to designated routes year-round as signed or identified on maps available onsite or at the GSFO. The Hubbard Mesa TMA delineation (same boundary as the Hubbard Mesa OHV Riding Area) allows muscle-powered travel and mechanized (wheeled conveyance) travel cross-country year-round consistent with the "open" OHV designation for motorized travel. All TMA delineations are subject to additional restrictions (i.e. seasonal, area, type, and number) set forth in the ROD or in subsequent travel planning.

  A total of 163 miles of the existing 259 miles of routes in the Planning Area would be designated for mechanized or motorized use. The remaining routes would include 28 miles to be closed and reclaimed and 68 miles to be limited to administrative use. Routes atop the plateau would be managed not to exceed approximately 138 miles of open and administrative use only. All new oil and gas access roads would be designated for administrative use, except in the Hubbard Mesa OHV Riding Area. Upon abandonment, all oil and gas roads would be reclaimed unless BLM deems it more appropriate to retain them for administrative or public use.

2.3.3.6 Additional Management Components

- Lands and Realty – Acquisitions of in-holdings and other areas with important resource values would be encouraged or allowed. Lands would be retained on top of the plateau except for the possibility of an exchange to acquire in-holdings. Below the rim, lands would be considered on a case-by-case basis for exchange. No exchanges or disposals would occur within ACECs. Use authorizations would have to meet the conditions or stipulations of the alternative. Approximately 120 acres of isolated parcels would be eligible for disposal.

  BLM will continue to allow use of the utility ROWs along I-70 and SH 13 as well as within 50 feet of BLM designated and administrative travel routes except where such placement would negatively impact other important resource values (e.g., wildlife seclusion areas, occupied habitat for special status plants, or significant plant communities). Where practicable in such areas, BLM will require that utilities be placed within the existing road ROW or realigned to avoid important resource values. On a case-by-case basis, BLM may require that proposed utility projects be relocated by more than 200 meters to avoid sensitive resources.

- Grazing and Rangeland Management – Management of these resources would conform to BLM grazing regulations (43 CFR 4180) and BLM Colorado's Standards for Public Land Health and Guidelines for Livestock Management (Appendix F) by development of allotment management plans, regular monitoring of rangeland health, and evaluation of existing grazing management practices. The BLM Glenwood Springs Monitoring Plan (BLM 2006)(Appendix K) would be the format for evaluation of grazing management outcomes in terms of Land Health Standards, vegetation community management objectives (Table 2-4), including riparian and wetland areas. In coordination with grazing permittees, Allotment Management Plans (AMPs) would be developed, implemented, monitored, and evaluated on a regular basis, with priority for allotments not meeting Land Health Standards.

  A combination of administrative solutions (e.g., mandatory terms and conditions of the permit, season of use revisions, pasture rotation, deferred or rest rotation, livestock exclusion, and stocking level adjustments), rangeland projects (fences, ponds, etc. to direct livestock use), and guidelines and BMPs for resting and deferring grazing of riparian areas (Appendix L) would be applied to meet resource objectives and Land Health Standards. Determination of drought conditions would be used to adjust livestock management within allotments to provide long-term protection of ecological values and forage values.

- Forest Products – Forest products would be managed to maintain and promote forest health, consistent with other resource objectives, as in Alternatives I through V.

- Fire Management – Public lands are managed within one of four fire management categories for the purposes of wildland fire suppression and prescribed vegetation management. The Fire Management Zone D-140-01–Roan Plateau would be changed from category "D" to category "C." This category is described as consisting of "areas where wildland fire is desired, but there are significant ecological, social or political constraints that must be considered for its use."

- Hazardous Materials – The Anvil Points spent oil shale facility, including support structures, mine portals, and spent oil shale pile, is being addressed through a removal action

2.4 FIVE ALTERNATIVES PREVIOUSLY ANALYZED IN DETAIL

This section summarizes the five alternatives analyzed in detail in the Draft RMPA/EIS. These alternatives were developed to present a reasonable range of management actions for analysis to assist decision-makers and the public in understanding the potential consequences and benefits of alternative scenarios. Substantial differences between the alternatives are listed below. However, a number of resources and actions are managed the same, or with slight variation between alternatives. These are noted below as common to all alternatives. Table 2-1 provides a detailed comparison of the resource and management components of the No Action and Preferred Alternatives with those of the Proposed Plan.

The following resource management components are the same under Alternatives I through V as described above for the Proposed Plan:

- Geological Resources (Anvil Points Cave)
- Paleontological Resources
- Soil Resources
- Water Quality
- Air Quality
- Lands and Realty

- Forest Products
- Fire Management
- Cultural Resources
- Hazardous Materials (Anvil Points spent oil shale facility)

Specific components of Alternatives I through V that are not common to all are described in the following subsections. For convenience, individual resource or management categories are lumped into broader groups to minimize repetition.

2.4.1 Alternative I (No Action Alternative)

This alternative (Maps 3 and 4) represents the No Action alternative required by the NEPA process. However, two considerations must be noted:

- The alternative is "no action" in the sense of "no change from current management," but not in the sense of "no change from current conditions." For example, a portion of the Planning Area is currently under oil and gas lease and is subject to further development regardless of the outcome of the current planning process. In general, current uses and trends would continue. An exception is that travel management of NOSRs 1 and 3 (viz., restricting motorized and mechanized travel to designated routes) would be vacated, and the entire Planning Area would be open to cross-country OHV use.
- Because of the specific language of the Transfer Act cited above, selecting an alternative that does not consider making a significant portion of NOSR 1 available for oil and gas leasing may require additional legislation.

Special Management Designations

No ACECs, WMAs, or WSAs would be created under Alternative I, nor would any areas be managed specifically to preserve WSR eligibility or maintain wilderness characteristics.

Fluid Mineral and Other Mineral Resources

The overall management objective for Alternative I—to maintain present uses by continuing present management direction and activities—would not allow oil and gas leasing on top of the plateau (NOSR 1) and would be accomplished using current stipulations for oil and gas within the rest of the Planning Area. Achieving this objective would be accomplished within the framework of the following land availability and development/use restrictions on oil and gas development (percentage of BLM lands within Planning Area in parentheses):

- Closed to Oil and Gas Leasing – 44,267 acres (60.1 percent)
- No Surface Occupancy (NSO) – 13,912 acres (18.9 percent)
- Controlled Surface Use (CSU) – 8,256 acres (11.2 percent)
- Timing Limitations (TLs) – 39,947 acres (54.0 percent) – includes 5-month restriction on big game winter range within areas available for oil and gas leasing
- Standard Lease Terms – 7,167 acres (9.7 percent)

Note that use of the terms "NSO" and "CSU" instead of the broader terms "NGD/NSO" and "SSR/CSU" indicates that these restrictions would not be extended to other types of land uses or management actions. This is consistent with current management (No Action) but differs from any of the other alternatives and the Proposed Plan.

Oil shale and coal leases, and entry for exploration and development of locatable minerals, would be prohibited under this alternative. Exploration and development of salable minerals would be considered on a case-by-case basis, subject to NSO and CSU stipulations.

Physical and Biological Resources

The goal for ecological resources under current management is to maintain or restore upland vegetation to at least a 40-percent ECR and manage riparian areas to meet PFC. See Appendix J for a discussion of ECR and PFC.

Occupied habitat for special status species would be protected from direct disturbances consistent with existing laws, regulations, and policies. No special management areas would be designated to provide additional protection for potential habitat, ecosystem processes, and significant plant communities.

Wildlife management would continue as at present, including maintaining existing populations and habitat quality for the Colorado River cutthroat trout, maintaining security areas and movement corridors for big game (mule deer, Rocky Mountain elk, mountain lion, and black bear), protecting raptor and waterfowl/shorebird nesting and brood-rearing areas, and protecting bald eagle nesting and winter roosting areas. The existing 5-month TL stipulation, which closes more than 20,000 acres of mapped big game winter range to oil and gas construction in the period December through April, would be retained.

Visual and Cultural Resources

Visual quality would be managed to maintain current Visual Resource Management (VRM) objectives for each designated class. This includes an emphasis on protecting visual quality of heavily viewed (high visual sensitivity) areas such as the East Fork Parachute Creek canyon and waterfall, the heavily traveled I-70 corridor, and portions of the northeastern cliffs visible from SH 13. A total of 24,039 acres in these areas would be managed as VRM Class II (see Appendix D for a discussion of VRM classes). All Class II areas would be protected with an SSR/CSU stipulation, and areas of the I-70 viewshed with slopes steeper than 30 percent would be protected with an NGD/NSO stipulation.

Cultural resources would have the least amount of proactive fieldwork under Alternative I

Recreation and Travel

A total area of 66,934 acres (comprising areas of BLM surface) would be open to cross-country travel, and the 259 miles of existing travel routes would remain open. This differs from the current situation, in which motorized and mechanized travel in NOSRs 1 and 3 is restricted to designated routes under interim management announced in the Federal Register on July 3, 2000. As with Alternatives I through V, all new oil and gas access roads would be designated for administrative use only. After abandonment, all oil and gas roads would be reclaimed unless BLM deems it more appropriate to retain them for administrative or public use. Cross-country over-snow travel by snowmobile would be allowed.

Realty, Grazing, Forest Resources, and Wildland Fire

Some small, isolated parcels (approximately 2,031 acres) would be eligible for disposal, and BLM would allow continued use of the utility rights-of-way along I-70 and SH 13.

Livestock grazing would continue to be permitted on existing allotments, managed to meet Colorado Public Land Health Standards and Guidelines for Livestock Grazing Management for upland vegetation, riparian areas, and aquatic habitats (Appendix F).

2.4.2 Alternative II

Alternative II (Maps 5 and 6) was designated as the environmentally most protective alternative in the Draft RMPA/EIS. As such, it placed a greater emphasis on protective restrictions and management actions aimed at preserving or improving sensitive resource values than Alternatives I through V, while accommodating some oil and gas development atop the plateau as well as in areas below the rim. Note

that some of the protective measures and management actions under this alternative have been incorporated into the Proposed Plan.

Special Management Designations

Four ACECs would be designated (36,184 acres total): Anvil Points, Magpie Gulch, East Fork Parachute Creek, and Trapper Creek. Tables 2-2a through 2-2d summarize the resource management objectives by for the four ACECs.

While no WSAs would be designated, three areas having wilderness character would be managed to protect and maintain wilderness characteristics. These areas are the Northeast Cliffs, Southeast Cliffs, and East Fork Parachute Creek units, encompassing a combined area of 21,382 acres. Adjustments to the East Fork Parachute Creek Unit were made based on topography, existing routes, and natural features to develop manageable boundaries. The other units have small differences in acreage due to mapping calculations.

Alternative II would also protect 7,883 acres of streams and stream corridors found to be eligible for WSR designation until a suitability decision is made.

Fluid Minerals and Other Mineral Resources

Alternative II would have the least amount of oil and gas development (and hence the lowest recovery of this resource) of any of the alternatives except for No Action (Alternative I), due in part of closure of 29 percent of the site to oil and gas leasing. Furthermore, Alternative II includes large areas with NGD/NSO restrictions and would implement a number of management actions and restrictions to protect and enhance certain resources and the natural processes on which they depend.

These management actions and restrictions reflect the emphasis of Alternative II on conservation of the visual, natural, wilderness, geological, and ecological qualities of the Planning Area while allowing oil and gas development in some areas where it is precluded at present. This would be achieved within the framework of the following land availability and restrictions on development or use (percentage of total BLM lands within the Planning Area shown in parentheses):

- Closed to Oil and Gas Leasing – 21,382 acres (29.0 percent)
- No Ground Disturbance/No Surface Occupancy (NGD/NSO) – 31,200 acres (42.4 percent)
- Site-Specific Relocation/Controlled Surface Use (SSR/CSU) – 7,015 acres (9.5 percent)
- Timing Limitations (TLs) – 39,947 acres (54.0 percent) – includes 5-month restriction on big game winter range
- Standard Restrictions and Limitations – 14,006 acres (19.0 percent)

Restrictions on oil shale and coal leases and entry for exploration and development of locatable minerals would be retained, as in Alternative I. Mineral sales (e.g., construction materials such as rock and sand/gravel) would be permitted on a case-by-case basis.

Physical and Biological Resources

Upland vegetation would be maintained or restored to at least a 70 percent ECR. Riparian areas would be managed to achieve PFC, and efforts would be focused toward achieving diverse native species composition. This alternative would also emphasize natural processes and promote healthy native plant communities to deter noxious weeds.

Occupied and potential habitat for special status species and the ecosystem processes that sustain them would be protected from ground-disturbing activities. This alternative would emphasize protection and enhancement of habitat for genetically pure populations of the Colorado River cutthroat trout, as well as

protection of watershed areas that contribute to water volume and quality in the trout habitat. Raptor and waterfowl nesting and brood-rearing areas would also be protected, as would bald eagle winter roosts.

Wildlife management would continue the protective measures in Alternative I and extend them to appropriate habitats throughout the Planning Area. These include security areas and movement corridors for big game (mule deer, Rocky Mountain elk, mountain lion, and black bear), raptor and waterfowl nesting and brood rearing, bald eagle winter roosts, and nearly 25,000 acres subject to the 5-month timing limitation to protect big game winter range.

Visual and Cultural Resources

Visual resources would be managed to protect and preserve the visual values and natural landscape within the ACECs, WSRs, areas having wilderness character, and areas of high visual sensitivity, while allowing some change to existing landscape character outside special designation areas. Areas of high visual sensitivity include the I-70, SH 13, and County Road (CR) 25 corridors and the East Fork Parachute Creek canyon and waterfall. A total of 37,024 acres would be managed as VRM Class I, with an additional 13,428 acres in VRM Class II (see Appendix D). An NGD/NSO stipulation would be applied to the East Fork canyon and waterfall and visible portions of the I-70 viewshed with slopes steeper than 30 percent. Other VRM Class I and Class II areas would have an SSR/CSU stipulation for visual resources.

Cultural resources under Alternative II would receive a moderate amount of proactive fieldwork.

Recreation and Travel

Alternative II would designate an SRMA for OHVs on Hubbard Mesa (2,460 acres) as a means to manage and enhance intensive mechanized and motorized use. This would include limiting mechanized and motorized travel within the SRMA to designated routes as a means to preserve and protect natural areas. Appendix E presents the management objectives for this SRMA.

Elsewhere in the Planning Area, travel would also be limited to designated routes, including over-snow travel by snowmobiles. A total of 173 miles of routes would be open to motorized and mechanized use. The remainder of the existing routes would include 43 miles open only to administrative use and 43 miles to be closed and reclaimed. All new oil and gas access roads would be designated for administrative use only. Upon abandonment, all oil and gas roads would be reclaimed unless BLM deems it more appropriate to retain them for administrative or public use.

Realty, Grazing, Forest Products, and Wildland Fire

Livestock management would emphasize administrative solutions to meet resource management objectives, and progress towards meeting Land Health Standards would be accelerated.

2.4.3 Alternative III – Preferred Alternative of Draft RMPA/EIS

BLM designated Alternative III (Maps 7 and 8) as the Preferred Alternative in the Draft RMPA/EIS. The goal of this Alternative III is to emphasize multiple resource use in the Planning Area. The most important ecological values would be protected through the development of management prescriptions intended to limit surface disturbance, implement active management, and mitigate effects of resource development. This alternative supports intensive management actions to meet Land Health Standards on a landscape basis.

Special Management Designations

Two ACECs would be designated—East Fork Parachute Creek and Trapper/Northwater Creek—with a combined area of 11,529 acres. Tables 2-2a and 2-2b summarize the resource management objectives for these ACECs. Including the two watershed-based areas atop the plateau but not the two ACECs along the

cliffs is intended to provide a level of protection intermediate between Alternatives II and V, and the same as Alternative IV.

A WMA encompassing 29,073 acres would also be designated for the entire portion of the Parachute Creek drainage atop the plateau to protect water quality, as well as aquatic biota and other adjacent resources. Among these are core conservation populations (i.e., greater than 99 percent pure) of the Colorado River cutthroat trout. The WMA prescriptions (Table 2-3) set a technically achievable standard designed to protect key values, minimize or preclude both site-specific and cumulative watershed impacts, and allow conditional human activity. The prescriptions are intended to apply throughout the Parachute Creek WMA and to result in conditions that meet or exceed the Land Health Standards described in Appendix F.

No WSAs would be designated. However, a combined 9,006 acres would be managed to protect naturalness and roadlessness. Associated NGD/NSO designations would not be subject to modification, waiver, or exceptions under this alternative.

A combined 7,883 acres of streams and stream corridors found to be eligible as WSRs would be managed to maintain that eligibility until a suitability decision is made. If the eligible WSR segments are found not to be suitable, the NGD/NSO restriction would remain in place to protect naturalness and roadlessness.

Fluid Minerals and Other Mineral Resources

Achieving the goal for Alternative III would be accomplished within the framework of the following land availability and restrictions on development or use (percentage of BLM lands in parentheses):

- Closed to Oil and Gas Leasing – 0 acres
- Deferred Leasing – 34,758 acres (47.2 percent)(see discussion below)
- No Ground Disturbance/No Surface Occupancy (NGD/NSO) – 30,928 acres (42.0 percent)
- Site-Specific Relocation/Controlled Surface Use (SSR/CSU) – 29,594 acres (40.2 percent)
- Timing Limitations (TLs) – 39,947 acres (54.0 percent) – includes 5-month restriction on big game winter range
- Standard Restrictions and Limitations – 13,080 acres (17.8 percent)

A unique feature of Alternative III is that although all BLM lands would be open to oil and gas leasing, lands above the rim would be leased only after a specified threshold of development below the rim has been reached. The threshold for leasing above the rim is defined as the point at which 80 percent of anticipated wells below the rim under during the 20-year life of the Plan have been effectively completed to total depth and a production test performed. This concept was developed in response to input by some local government representatives, who believed that deferring development atop the plateau would provide additional time for technology to develop in a way that would allow BLM to require directional drilling and clustered development. However, since the Proposed Plan (Section 2.3) would require directional drilling and clustered development on new leases, the concept of deferral atop the plateau is moot. Additionally, input during the Consultation and Coordination process did not indicate widespread support for deferred development.

Research-scale lease tracts for oil shale would be considered within the Planning Area but would be subject to the NGD/NSO and SSR/CSU constraints identified for this alternative. Approval of research tracts would be based on the merits of the technologies proposed.

Coal leases would also be allowed, but this use is not anticipated. All lands would be available to entry for locatable minerals and open for salable minerals, subject to the constraint of the NGD/NSO and

SSR/CSU restrictions for other uses. Development of these mineral resources would be considered by BLM on a case-by-case basis.

Physical and Biological Resources

The goal for ecological resources would be to achieve no less than a 50-percent ECR for upland vegetation and to manage riparian areas to the same specifications as in Alternative II. Known populations of special status plant species would be protected from ground-disturbing activities in potential habitat and disturbance to ecosystem processes would be minimized to the extent possible.

Wildlife management would retain the same protective restrictions as for Alternatives I and II, including the 5-month TL stipulation for deer and elk winter range, except that big game security areas would be protected by restrictions on travel rather than through NGD/NSO restrictions. Special status wildlife management would continue to focus on the Colorado River cutthroat trout and its habitat and on retention of surface-use limitations in raptor nesting, bald eagle winter roosting, and waterbird/shorebird nesting areas.

Visual and Cultural Resources

Visual Resource Management under Alternative III would include 925 acres of VRM Class I (the East Fork Parachute Creek canyon and waterfall), with the bulk of the area (48,752 acres) in VRM Class II. The combined area of Class I and Class II would be comparable to that of Alternative II and much larger than for Alternative I. An NGD/NSO stipulation would be applied to the East Fork Parachute Creek canyon and waterfall and portions the I-70 viewshed with slopes steeper than 30 percent. An SSR/CSU stipulation would be applied to the VRM Class II lands.

Cultural resources would receive a moderate level of proactive fieldwork.

Recreation and Travel

Alternative III would also designate an SRMA for OHV recreation on Hubbard Mesa, with the entire 2,460 acres designated as "open" for mechanized and motorized travel, meaning that this travel would not be limited to designated routes. Appendix E presents the management objectives for the Hubbard Mesa SRMA.

In the remainder of the Planning Area, mechanized and motorized travel would be limited to designated routes throughout the Planning Area, excluding over-snow travel by snowmobile. Approximately 209 miles of existing routes would be open to motorized and mechanized travel; the remainder would include 24 miles open only to administrative use and 26 miles to be closed and reclaimed. All new oil and gas access roads would be designated for administrative use only. After abandonment, all oil and gas roads would be reclaimed unless BLM deems it more appropriate to retain them for administrative or public use.

Realty, Grazing, Forest Product, and Wildland Fire

A combination of administrative solutions and rangeland projects would be used to manage livestock and make significant progress toward meeting Land Health Standards.

2.4.4 Alternative IV

Alternative IV (Maps 9 and 10) shares with Alternative III an emphasis on multiple resource use in the Planning Area. The most important ecological values would be protected with the development of management prescriptions that limit surface disturbance, implement active management, and mitigate effects of resource development. This alternative supports intensive management actions to meet Land Health Standards on a landscape basis.

Special Management Designations

Two ACECs would be designated—East Fork Parachute Creek and Trapper/Northwater Creek, with a combined area of 11,529 acres. Tables 2-2a and 2-2b summarize the resource management objectives for these ACECs. Including the two watershed-based areas atop the plateau but not the two ACECs along the cliffs is intended to provide a level of protection intermediate between Alternatives II and IV.

A WMA would be designated for Trapper/Northwater Creek to protect core conservation populations (i.e., greater than 99-percent purity) of the Colorado River cutthroat trout in portions of both streams. The higher levels of environmental protection in the WMA would also provide additional protection for associated wildlife and vegetation resources. The WMA prescriptions (Table 2-3) set a technically achievable standard designed to protect key values, minimize or preclude both site-specific and cumulative watershed impacts, and allow conditional human activity. The prescriptions are intended to apply throughout the Trapper/Northwater Creek WMA and to result in conditions that meet or exceed the Land Health Standards described in Appendix F.

No WSAs would be designated, and no areas would be managed specifically to protect and maintain wilderness characteristics.

Like Alternatives II and III, this alternative would protect 7,883 acres of streams and stream corridors found to be eligible as WSRs until a suitability decision is made.

Fluid Minerals and Other Mineral Resources

Achieving the goal for Alternative IV would be accomplished within the framework of the following land availability or development/use restrictions (percentage of BLM lands in parentheses):

- Closed to Oil and Gas Leasing – 0 acres
- No Ground Disturbance/No Surface Occupancy (NGD/NSO) – 30,928 acres (42.0 percent)
- Site-Specific Relocation/Controlled Surface Use (SSR/CSU) – 27,486 acres (37.3 percent)
- Timing Limitations (TLs) – 39,947 acres (54.0 percent) – includes 5-month restriction on big game winter range
- Standard Restrictions and Limitations – 15,188 acres (20.6 percent)

Research-scale lease tracts for oil shale would be considered within the Planning Area but would be subject to the NSO and CSU constraints identified for this alternative. Approval of research tracts would be based on the merits of the technologies proposed. Coal leases would also be allowed, but this use is not anticipated. All lands would be available to entry for locatable minerals and open for salable minerals, subject to the constraints of NGD/NSO and SSR/CSU restrictions for other uses. Development of these mineral resources would be considered by BLM on a case-by-case basis.

Physical and Biological Resources

The goal for ecological resources would be to achieve no less than a 50 percent ECR for upland vegetation and to manage riparian areas to the same specifications established in Alternative II. Known populations of special status plant species would be protected from ground-disturbing activities to potential habitat and disturbance to ecosystem processes would be minimized to the extent possible.

Wildlife management would retain the same protective restrictions as for the previous alternatives, except that the big game security areas would be protected by restrictions on travel rather than through NGD/NSO restrictions. Similarly, the 5-month TL stipulation for big game winter range in Alternatives I through III would be replaced with a 60-day TL (for the months of January and February), applied as a COA during the permit process. Management of special status wildlife would continue to focus on the

Colorado River cutthroat trout and its habitat and on retention of surface-use limitations in raptor nesting, bald eagle winter roosting, and waterbird/shorebird nesting areas.

Visual and Cultural Resources

Visual Resource Management under Alternative IV would be the same as for Alternative III. This includes 925 acres of VRM Class I (the East Fork Parachute Creek canyon and waterfall), with the bulk of the area (48,752 acres) in VRM Class II. The combined area in Class I and Class II would be the same as for Alternatives II and III and much larger than current management under Alternative I. The East Fork canyon area and visible portions of the I-70 viewshed with slopes steeper than 30 percent would be protected by an NGD/NSO stipulation, while remaining Class II areas would have an SSR/CSU stipulation.

Recreation and Travel

Like Alternative III, this alternative would designate an SRMA for OHV use on Hubbard Mesa, with the 2,460 acres designated as open for mechanized and motorized travel. The SRMA would be designated as "open" for motorized and mechanized travel, meaning that OHVs would not be limited to designated routes. Appendix E presents the management objectives for the Hubbard Mesa SRMA.

Travel would be limited to designated routes throughout the remainder of the Planning Area, excluding over-snow travel by snowmobile. Approximately 209 miles of existing routes would be designated for motorized and mechanized use; the remainder of the existing routes would include 24 miles open only to administrative use and 26 miles to be closed and reclaimed. All new oil and gas access roads would be designated for administrative use only. After abandonment, all oil and gas roads would be reclaimed unless BLM deems it more appropriate to retain them for administrative or public use.

Realty, Grazing, Forest Products, and Wildland Fire

A combination of administrative solutions and rangeland projects would be used to manage livestock and make significant progress toward meeting Land Health Standards.

2.4.5 Alternative V

Alternative V (Maps 11 and 12) would accommodate energy and other non-renewable resource development throughout the Planning Area. This alternative would permit ecological values and biological diversity to be modified by ground-disturbing activities related to resource development. Key resources would be protected on a site-specific basis through active management and mitigation to meet legal requirements and Land Health Standards.

Special Management Designations

Alternative V includes no designation of ACECs and no designation of a WMA. Additionally, no areas would be managed specifically to protect and maintain wilderness characteristics.

For the purpose of analysis, Alternative V also presumes that the WSR-eligible streams and stream corridors would not be designated as WSRs and that the associated protection would therefore not be applied. However, long-term ground-disturbing activities would be prohibited should the 7,883 acres be deemed suitable, with the corridors managed as NGD/NSO until a suitability decision is made.

Fluid Minerals and Other Mineral Resources

Achieving the goal of Alternative V would be accomplished within the framework of the following land availability and restrictions on development or use (percentage of BLM lands in parentheses):

- Closed to Oil and Gas Leasing – 0 acres
- No Ground Disturbance/No Surface Occupancy (NSG/NSO) – 21,609 acres (29.4 percent)

- Site-Specific Relocation/Controlled Surface Use (SSR/CSU) – 21,517 acres (29.2 percent)
- Standard Restrictions and Limitations – 30,746 acres (41.8 percent)
- Permit-Level Timing Limitations (TLs) – 5,279 acres (7 percent) – includes 2-month restriction on big game winter range

Research-scale lease tracts for oil shale would be considered within the Planning Area but would be subject to the NSO and CSU constraints identified for this alternative. Approval of research tracts would be based on the merits of the technologies proposed. Coal leases would also be allowed, but this use is not anticipated. All lands would be available to entry for locatable minerals and open for salable minerals, subject to the constraints of NGD/NSO and SSR/CSU restrictions for other uses. Development of these mineral resources would be considered by BLM on a case-by-case basis.

Physical and Biological Resources

The goal for ecological resources would consist of optimizing forage production and managing upland vegetation to no less than a 40-percent ECR while meeting Land Health Standards. Riparian areas would be managed to achieve PFC.

Known populations of threatened or endangered plant species would be protected from disturbance. Disturbance to BLM sensitive species and their habitats or to significant plant communities would be permitted but would require mitigation.

Raptor nesting, bald eagle winter roosting, and use by BLM sensitive species would continue to be protected by the restrictions described for Alternatives I through IV. No special management would be undertaken to protect or enhance big game winter range, including no lease-level or permit-level TLs. Fisheries management would concentrate on maintaining existing Colorado River cutthroat trout populations by protecting the occupied streams and adjacent slopes and mitigating impacts to watersheds.

Visual and Cultural Resources

VRM under this alternative would include 0 acres in either VRM Class I or II. More than 63,000 acres (86 percent of BLM lands) would be managed to VRM Class III, which allows for a moderate level of change to the existing character (acceptable visual changes can "attract attention" but not "dominate the landscape"). This would include no NGD/NSO stipulation related to visual quality in the East Fork Parachute Creek canyon and waterfall or visible portions of the I-70 viewshed with slopes steeper than 30 percent.

Cultural resource management under Alternative V would include low to moderate amounts of proactive fieldwork, intermediate between Alternative I (least amount) and Alternatives II, III, and IV.

Recreation and Travel

Alternative V would not include designation of an SRMA in the Hubbard Mesa area. Throughout the Planning Area, including Hubbard Mesa, mechanized and motorized travel would be limited to designated routes. All 259 miles of existing routes would remain open to motorized and mechanized travel, and all new oil and gas access roads would be designated for administrative use only. After abandonment, oil and gas roads would be reclaimed unless BLM decides to retain them for administrative or public use. Over-snow travel by snowmobiles would be allowed throughout the Planning Area and would not be limited to designated routes.

Realty, Grazing, Forest Products, and Wildland Fire

Rangeland projects and land treatments would be emphasized as the preferred method for achieving resource management objectives and Land Health Standards related to grazing.

2.5 ALTERNATIVES NOT ANALYZED IN DETAIL

As described in Section 2.2., a BLM interdisciplinary team formulated six preliminary alternatives during initial stages of this RMPA/EIS process. Other alternatives were considered but dropped prior to detailed analysis because they would not comply with the intent of the Transfer Act, fulfill the requirements of FLPMA, or adequately reflect existing resource values. The six preliminary alternatives formulated by BLM staff were described in a document dated October 14, 2002, which was mailed to interested parties and presented during public meetings in the towns of Rifle, Parachute, and Glenwood Springs. The document stated the alternatives were preliminary and that "…many management actions are interchangeable between alternatives, or could be presented in a different mix to alter an alternative to create a different alternative." The six preliminary alternatives were as follows:

- Alternative A (No Action) – Consisted of continuing current management of BLM lands within the Planning Area and is equivalent to Alternative I of this Proposed Plan/Final EIS (Section 2.4.1).
- Alternative B – Included designation of three WSAs (21,383 total acres) and four ACECs (36,145 total acres) and protection of streams eligible as WSRs.
- Alternative C – Designated two WSAs (10,993 total acres) and three ACECs (19,160 total acres) in addition to protecting the WSR-eligible streams.
- Alternative D – Designated two WSAs (10,993 total acres) and four ACECs (27,446 total acres) as well as protecting the WSR-eligible streams.
- Alternative E – Included no WSAs or ACECs but retained the protection of WSR-eligible streams.
- Alternative F – Designated three WSAs (21,383 total acres) and four ACECs (36,145 total acres), retained the protection of WSR-eligible streams, and precluded leasing for oil and gas development within 32,382 acres of a SRMA designated for primitive recreation atop the plateau.

In November 2002, following the 30-day comment period on the six preliminary alternatives, a meeting was held among BLM resource experts, land use planners, and legal advisors. BLM staff reviewed the comments on the preliminary alternatives, the resource data and planning criteria on which the alternatives were based, the goals and objectives of the RMP Amendment, and the applicable laws, regulations, and policies. Based on this review, BLM concluded that the alternatives included unnecessary overlap, were not always clearly differentiated, and might not satisfy the specific intent of the Transfer Act without additional legislation. Accordingly, the major components of Alternatives A through F were modified and recombined into Alternatives I through V of the Draft RMPA/EIS, described in Section 2.4. BLM concluded that Alternative F, in particular, did not comport with the Transfer Act because it would make none of the NOSR 1 area atop the plateau available for oil and gas leasing. However, the no-lease component was retained as part of the No Action alternative, which would continue current (pre-RMPA) management, and most other protective restrictions were incorporated into Alternative II, and some of these are currently included in the Proposed Plan.

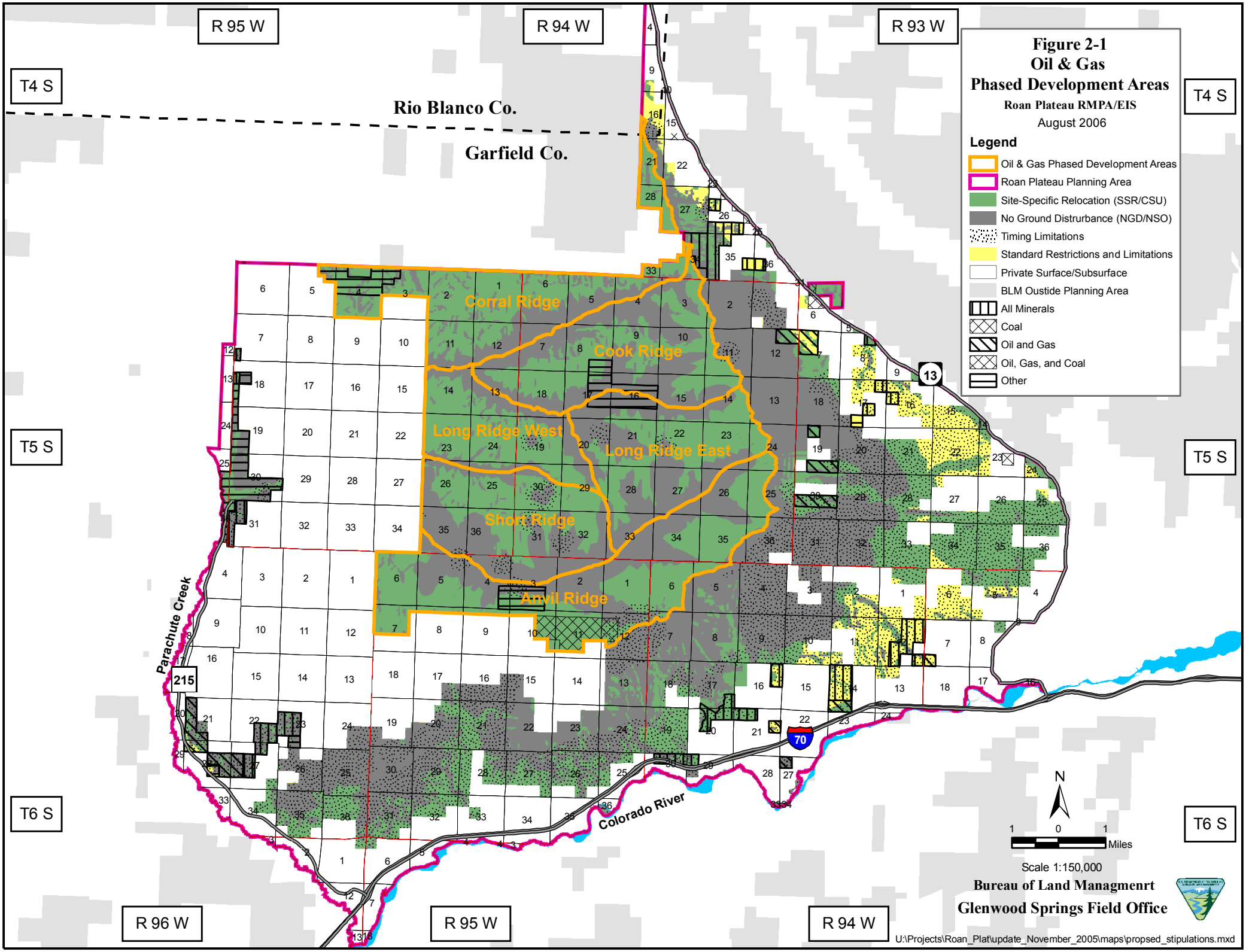

R 95 W
R 94 W
R 93 W
T4 S
T5 S
T6 S
R 96 W
Rio Blanco Co.
Garfield Co.
Corral Ridge
Cook Ridge
Long Ridge West
Long Ridge East
Short Ridge
Anvil Ridge
Parachute Creek
Colorado River
13
215
70
Figure 2-1
Oil & Gas
Phased Development Areas
Roan Plateau RMPA/EIS
August 2006
Legend
Oil & Gas Phased Development Areas
Roan Plateau Planning Area
Site-Specific Relocation (SSR/CSU)
No Ground Distrurbance (NGD/NSO)
Timing Limitations
Standard Restrictions and Limitations
Private Surface/Subsurface
BLM Oustide Planning Area
All Minerals
Coal
Oil and Gas
Oil, Gas, and Coal
Other
N
1 0 1
Miles
Scale 1:150,000
Bureau of Land Managmenrt
Glenwood Springs Field Office
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Table 2-1. Summary of Management Components for the No Action Alternative, Preferred Alternative, and Proposed Plan Goals, Objectives, and Constraints by Alternative and Resource

Management objectives, actions, and prescriptions are presented by alternative and resource. Management constraints designed to protect a variety of resources and/or mitigate impacts are included. Stipulations, conditions, and mitigating measures would be applied to all similar public land uses in a similar manner. All discretionary actions and activities must meet the objectives and management prescriptions described for each resource. Several types of constraints apply. They include NGD/NSO, SSR/CSU, TL, and BMPs and mitigation measures. NSO, CSU, and TL are terms that apply specifically to oil and gas leasing, while NGD and SSR would apply to other activities. BMPs, mitigation measures, and other protective measures within BLM's authority would apply to all activities when authorized, including the permitting process for oil and gas activities. Measures identified in this table are not inclusive of all possible site-specific mitigation for all possible conditions, but rather identify opportunities, constraints, and an overall framework and direction for future activities. Additional detailed site-specific mitigation for individual projects would be addressed in future site-specific NEPA analyses and any specific decisions to authorize specific actions.

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
GENERAL MANAGEMENT GOALS, OBJECTIVES, AND TECHNIQUES		
Maintain present uses by continuing present management direction and activities. Includes no oil and gas leasing on top of plateau.	Emphasize a variety of multiple resource uses, allowing for deferred oil and gas development atop the plateau. Protect resource values with management prescriptions while allowing mineral resource development with focused mitigation.	Emphasize balance in managing for a variety of multiple resource uses incorporating outcome-based adaptive management, to protect key biological and aesthetic resources while developing oil and gas resources in a systematic, clustered, and staged manner.
Protect natural values using current stipulations. Incorporate no special management based on administrative and legislative designations. • NSOs – 13,912 acres (18.9%) • CSUs – 8,256 acres (11.2%) • TLs – 39,947acres (54%) TLs include limitation on oil and gas drilling, major reworking, and road construction for 5 months (December – April) of every year. TL acres shown above include overlaps with other stipulations. Designate no ACECs. Designate no Watershed Management Areas.	Emphasize natural values through extension of current stipulations as well as administrative and legislative designations. • NGD/NSOs – 30,928 acres (42%) • SSR/CSUs – 29,594 acres (40.2%) • TLs – 39,947 acres (54%) TLs include limitation on oil and gas drilling, major reworking, and road construction for 5 months (December – April) of every year. TL acres shown above include overlaps with other stipulations. Designate two ACECs (East Fork Parachute Creek and Trapper/Northwater Creek). Protect important ecological values outside	Emphasize natural resource values through application of protective surface use restrictions and stipulations, directed management actions, and administrative designations. • NGD/NSOs – 38,411 acres (52%) • SSR/CSUs – 30,833 acres (42%) • TLs – 39,947 acres (54%) TLs include limitations on permitted activities, and road construction for 5 months (December – April) of every year in order to protect big game winter range. TL acres shown above include overlaps with other stipulations. Designate four ACECs (East Fork Parachute

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
WSRs eligibility findings not applied.	ACECs through site-specific mitigation. Designate Parachute Creek WMA to protect water quality and ecosystem integrity and function related to the Colorado River cutthroat trout and supporting factors through graduated stipulations. Manage streams eligible for a suitability study for possible designation as WSRs to protect values until suitability is decided. Manage 9,006 acres for roadlessness and naturalness by allowing no modification, waiver, or exceptions to NSO/NGD stipulations that overlap wilderness units.	Creek, Trapper/Northwater Creek, Magpie Gulch, and Anvil Points) to highlight important resources. Key fisheries, botanical, and visual resources that lie within the ACECs would be protected with an NGD/NSO stipulation independently of ACEC designation. Protect important ecological values outside ACECs through a variety of NGD/NSO, SSR/CSU, COAs, BMPS, and other site-specific mitigation. Protect water quality, ecosystem integrity and hydrologic function which support the Colorado River cutthroat trout and its habitat through an array of graduated mitigations, and designate the Parachute Creek WMA. Manage to protect outstandingly remarkable values on streams found to be eligible for a suitability study under the Wild and Scenic Rivers Act until a suitability study is completed.
COLORADO PUBLIC LAND HEALTH STANDARDS		
Ensure that all activities are authorized in a manner that would meet, or make progress towards meeting, Colorado Public Land Health Standards.	Implement appropriate management actions on a landscape basis that would result in meeting Colorado Public Land Health Standards, with emphasis on intensive management.	Implement appropriate management actions on a landscape basis that would result in meeting Colorado Public Land Health Standards and associated guidelines, with emphasis on outcome-based adaptive management.
GEOLOGICAL RESOURCES		
Protect and preserve the scientific and historic values of the Anvil Points Claystone Cave and karst system. Allow no physical disturbance to the cave or karst system surrounding the	Same as No Action Alternative	**Goal**: Protect and preserve Geological Heritage Resources. **Objective**: Protect and preserve the existing

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
cave. Restrict activities that could cause direct or indirect impacts such as collapse or dewatering.		scientific and historic geological values associated with the Anvil Points Claystone Cave and karst system. **Management Actions**: Restrict activities that could cause direct or indirect impacts, such as structural collapse or dewatering through the application of a NGD/NSO stipulation. Consider public education opportunities to help achieve goals.
PALEONTOLOGICAL RESOURCES		
Require paleontological clearances/mitigation prior to surface-disturbing activities in Condition 1 and some Condition 2 areas. Significant resources would be avoided or recovered through the authorization process.	Same as No Action Alternative	**Goal**: Protect and preserve paleontological resources. **Objective:** Protect Sharrard Park's scientifically significant Eocene fossil mammal localities from surface disturbing activities, and recover such resources and associated data through an authorization process. **Management Actions**: Apply a SSR/CSU stipulation to protect the paleontological resources in Sharrard Park. **Standards:** Require survey and mitigation prior to any surface disturbing activities in Condition 1 and Condition 2 areas.
Protect Sharrard Park paleontological resources from surface-disturbing activities through an SSR/CSU stipulation.	Same as No Action Alternative	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
SOIL RESOURCES		
Manage to meet or exceed Land Health Standards for soils on a watershed scale. Small portions would be allowed not to meet the standard. Below the rim, continue stipulations of the 1999 FSEIS, described below. NGD/NSO on slopes greater than 50 percent to maintain site stability and site productivity. SSR/CSU on erosive soils with slopes greater than 30 percent.	Same as No Action Alternative Stipulations developed in the 1999 Oil and Gas FSEIS would be applied to steep slopes and erosive soils throughout the Planning Area: NGD/NSO on slopes greater than 50 percent to maintain site stability and site productivity. SSR/CSU on erosive soils with slopes greater than 30 percent.	**Goal:** Maintain watershed soil stability and productivity. **Objective:** Manage to meet Land Health Standards for soils on a watershed scale, and support other resource needs. **Management Actions:** Maintain site stability and site productivity on steep slopes and erosive soils throughout the Planning Area by applying NGD/NSO and SSR/CSU stipulations, COAs, BMPs and other site-specific mitigation. **Standards:** Apply NGD/NSO on slopes greater than 50 percent to maintain site stability. Apply SSR/CSU on erosive soils with slopes greater than 30 percent. Apply COAs, BMPs, and other site-specific mitigation to minimize erosion, encourage rapid reclamation, retain soils using stormwater mitigation structures, maintain soil stability, and support other resources (including fisheries habitat).
WATER RESOURCES		
Meet all State and Federal water quality standards.	Same as No Action Alternative	**Goal**: Meet all State and Federal water quality standards, and support water quantity and quality needs of other resources. **Objective**: Ensure authorized activities comply with all applicable water quality standards and that objectives associated with management of the WMA are achieved (see

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
		Table2-3). **Management Actions**: Establish baseline water quality data and monitoring program for drainages prior to allowing surface disturbing activities. Assess disturbance related water quality changes identifying and implementing mitigation measures as needed to meet water quality standards; also implement those actions associated with the WMA (see Table 2-3).
CLIMATE AND AIR QUALITY		
Implement monitoring and mitigation measures required to meet or exceed all applicable Federal and State air quality regulations and standards and any other applicable local standards.	Same as No Action Alternative	**Goal:** Meet all Federal and State air quality standards and regulations. **Objective**: Document that permitted activities meet all applicable regulations and standards, and mitigation is implemented as needed to reduce emissions so as not to contribute to site-specific or regional air quality emission problems. **Management Actions**: Implement monitoring and mitigation measures to reduce emissions to meet Federal, State, and local air quality standards and regulations, both on a site-specific and cumulative basis.
ECOLOGICAL VALUES		
Maintain current ecological values and processes, and biological diversity, with existing management direction and activities.	Protect core ecological values and natural processes by designating two ACECs and the Parachute Creek WMA, managing areas for WSR eligibility, designing and implementing management prescriptions that would limit	**Goal**: Protect key ecological values and natural processes. **Objective**: Provide protection for candidate and sensitive species in addition to supporting

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
	surface disturbance, implementing site-specific mitigation, and limiting or mitigating effects of allowed disturbances.	important ecological processes throughout the Planning Area. **Management Actions**: Apply NGD/NSO, SSR/CSU, COAs and BMPs to provide protections to minimize impacts to an acceptable level and support sustainable ecosystem processes. Design and implement COAs, BMPs, other mitigation, and monitoring on a site-specific basis to mitigate the effects of surface disturbance. Designate four ACECs. While the ACECs carry no stipulations in and of themselves, they do serve to highlight the importance of natural values. Specific stipulations and mitigation measures are identified independently of ACEC designation for protection of various resources, but are synopsized in Table 2-2. Table 2-3 provides more information on the management of resources within the Parachute Creek WMA.
VEGETATION RESOURCES		
Rehabilitate areas affected by wildland fire and other surface-disturbing activities to protect soil, water, vegetation and other resources and ensure overall watershed protection.	Rehabilitate areas affected by wildland fire and other surface disturbing activities to protect soil, water, and vegetation resources and ensure overall watershed protection. Revegetate any allowed surface disturbance using locally adapted native species. Utilize seed mixtures containing forage-producing, native, and species preferred by wildlife.	**Goal**: Manage vegetation resources in a long-term sustainable manner, protecting the soil, hydrologic, and watershed conditions that support them. **Objectives**: Enhance the health, productivity, and ecological condition of native and other desirable plant communities; including the integrity of native stands of aspen, mountain shrubs, grasslands, and conifers.

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
Maintain or improve the ecological condition and integrity of native stands of aspen, mountain shrubs, grasslands, and conifers, where consistent with other resource objectives and uses.	Same as No Action Alternative	Optimize forage production, given other uses and objectives. **Management Actions**: Require reclamation practices, BMPs, and performance-based success criteria as COAs on all surface disturbing project proposals that reestablish and maintain native species. Require reclamation plans, reclamation monitoring plans, and weed management plans for all disturbances larger than one acre in size. Reclamation plans would contain specifics such as elevation, precipitation dependent seed mixes, topsoil management, site preparation, etc. Require annual monitoring/reporting of reclamation status and success for all disturbances larger than one acre in size until such time as reclamation meets 5-year reclamation standards, or until defined revegetation success criteria are achieved (see Appendix J). Develop and implement economically feasible grazing systems and range improvements. Defer grazing use for 2 growing seasons on disturbed areas larger than 0.5 acre (e.g., a fire event, reclamation of disturbed lands, or vegetation treatment), or until site-specific analysis and monitoring data indicate that vegetation cover, species composition, and litter accumulation are adequate to support and protect watershed values and meet vegetation objectives (Table 2-4). Establish vegetative site potential using Ecological Site Inventories (ESIs) based on
Defer grazing use for two years following wildfire and/or prescribed fire or until monitoring data or professional judgment indicate that desired vegetation cover, composition and root reserves, and litter accumulation have recovered to levels adequate to support and protect watershed values.	Defer grazing use for two years following wildfire and/or prescribed fire, or until monitoring data indicate that desired vegetation cover, species composition and root reserves, and litter accumulation have recovered to levels adequate to support and protect watershed values and vegetation objectives.	
Improve ecological condition and increase forage production through development and implementation of economically feasible grazing systems and range improvements.	Improve ecological condition and increase forage production through development and implementation of economically feasible grazing systems and range improvements. Optimize forage production, given other uses and objectives.	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
		NRCS procedures and standards (or a comparable methodology) incorporating soil and vegetation data, for at least the ten most extensive vegetation communities (Table 2-4) in the Planning Area to aid in the development of site-specific reclamation standards. Develop desired future condition objectives that support quantitative assessment of revegetation success, and adaptive management decisions for other resources. Incorporate vegetation management objectives (Table 2-4) for the most extensive vegetation communities into activity siting decisions, project proposals, mitigation requirements for permits, and COA decisions. Utilize range, fuels, and fire and vegetation management activities that protect and/or enhance the health and productivity of native and other desirable plant communities and wildlife habitat. **Standards:** Use only native plant species for revegetation (preferably locally adapted), unless in areas with a high risk of becoming dominated by cheat grass or other undesirable species under conditions where only non-native species have been proven effective (as consistent with BLM Manual 1745 or Handbook 1742-1). Activities should be designed to maintain or improve ecological condition.
RIPARIAN/WETLAND RESOURCES		
Manage riparian/wetlands to achieve a minimum condition rating of Proper	Manage riparian communities to achieve or exceed PFC.	**Goal**: Ensure healthy and vigorous riparian plant communities.

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
Functioning Condition (PFC).		**Objective**: Achieve a minimum condition rating of PFC and late-seral stage plant community development, and provide high quality fisheries habitat atop the plateau. **Management Actions**: Establish condition ratings based on Ecological Site Indices (or equivalent assessments of potential natural vegetation based on site and soil characteristics and conditions). Manage to improve riparian related fisheries habitat atop the plateau based on site potential findings. Apply NGD/NSO protections to riparian vegetation to avoid direct impacts to riparian vegetation. Apply SSR/CSU stipulations within 500 feet of riparian areas to avoid indirect impacts. Avoid or mitigate activities that could cause a downward trend in the condition of riparian resources or functioning condition. Initiate activity plans which identify habitat improvement projects to achieve desired conditions. Close, reclaim, or relocate routes that are negatively impacting the stream and/or riparian zones. Locate new routes outside riparian zones to reduce or eliminate negative impacts. Initiate riparian restoration projects within those systems that have been identified as not functioning, or functioning at risk, with a downward or static trend, and in those reaches of streams where fisheries habitat can be enhanced.
Avoid surface-disturbing activities that would disturb or destroy riparian vegetation. Mitigate or relocate activities within 500 feet of the outer edge of the riparian vegetation. Avoid surface-disturbing activities within a 0.5-mile buffer on either side of the Colorado River. Avoid or mitigate activities that could cause a downward trend in the condition of riparian resources or functioning condition. Initiate activity plans and improvement projects to achieve desired conditions.	Authorize only those uses or activities that would result in no negative impacts (direct or indirect) on riparian/wetland systems, and would not impair their ability to achieve or exceed PFC.	
	Maintain the significant riparian plant communities in mid- to late-seral stage to maintain current ecological values. Concentrate on achieving diverse native species composition and productivity.	
The stipulations developed in the 1999 Oil and Gas FSEIS would be carried forward for protection of riparian zones and their associated hydrologic and wildlife values. These stipulations would only apply to streams and associated riparian areas below the rim and not to any lands on top of the plateau.	The stipulations developed in the 1999 Oil and Gas FSEIS would be carried forward and extended to those streams and associated riparian areas above the rim.	
Initiate riparian restoration projects within those systems that have been identified as not functioning or functioning at risk with a downward or static trend.	Initiate riparian restoration projects within those systems that have been identified as functioning at a level below PFC or below late-seral stage plant community development.	
Determine grazing systems or exclusions on riparian/wetland areas on a case-by-case	Implement grazing systems and exclusions on riparian/wetland areas that would result in	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
basis to promote or maintain PFC.	achieving or exceeding PFC.	Implement grazing management (Appendix L) on riparian/wetland areas that would result in achieving PFC and late-seral stage plant community development and improve fisheries habitat. **Standards**: Mitigate or relocate activities that would fall within 500 feet of the outer edge of the riparian vegetation. Avoid surface-disturbing activities within a 0.5-mile buffer on either side of the Colorado River. Management actions in and near riparian areas atop the plateau should not only result in a PFC rating surpassing the minimum standards, but also provide for high quality fisheries habitat for the Colorado River cutthroat trout.
Relocate existing routes, wherever possible, and locate new routes outside riparian zones to reduce or eliminate negative impacts.	Close and reclaim routes that are negatively impacting the stream and/or riparian zones. New routes would be established outside of the riparian zone or must meet the objectives for maintaining riparian, fishery, and watershed conditions.	
NOXIOUS WEEDS		
Apply approved noxious weed control methods in an integrated weed management program (including preventive management, as well as mechanical, biological, and chemical control techniques).	Emphasize prevention, inventory, detection, and monitoring and project actions as part of an integrated weed management program (which includes mechanical, biological, and chemical control techniques).	**Goal:** Maintain healthy native vegetation free of noxious weeds and exotic (introduced) species on Federal lands within the Planning Area. **Objective**: Promote natural processes and healthy native plant communities to deter noxious weeds, while minimizing and to the extent practicable eradicating noxious weed and undesirable exotic species on Federal lands within the Planning Area. **Management Actions**: Implement an integrated weed management program (which includes a weed management plan; pre-disturbance weed mapping; and mechanical, biological, and chemical control techniques).
	Promote natural processes and healthy native plant communities to deter noxious weeds.	
Continue and expand public education efforts concerning the importance of weed detection, prevention, and management.	Same as No Action Alternative	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
		For activities creating a surface disturbance larger than one acre, require a weed management plan which would emphasize and detail prevention, inventory, detection, eradication, and monitoring efforts, corrective measures, and other weed control actions. Require weed free seed for reclamation activities. Require the use of weed free hay and feed for livestock. Require weed control actions for all disturbances, including those less than one acre in size. Require prompt reclamation of all disturbed areas with native species. **Standards**: To the extent practicable eradicate all noxious weeds and minimize the occurrence of exotic species within the Planning Area.
TERRESTRIAL WILDLIFE (INCLUDING BIG GAME)		
Maintain or enhance habitats capable of sustaining current populations of wildlife.	Within the constraints of other resource management objectives and activities, maintain or enhance habitats capable of sustaining existing or increasing populations of wildlife.	**Goal:** Protect important wildlife habitats atop the plateau and below the rim. **Objective**: Protect wildlife security areas, habitat connectivity, habitat carrying capacity, and winter range.
Protect wildlife seclusion areas as identified in the 1999 Oil and Gas FSEIS from human disturbance. An NSO stipulation would apply.	Minimize loss of habitat connectivity and displacement of wildlife through management actions such as the following: (1) Apply travel restrictions on new routes within wildlife seclusion areas, and (2) Cluster disturbances so they do not create fragmentation or loss of more than a 10	**Management Actions**: Apply a NGD/NSO stipulation to wildlife security areas below the rim, and a SSR/CSU stipulation to security areas atop the plateau. Within the constraints of other resource management objectives and activities, maintain or enhance habitats capable of

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
	percent contiguous block of unroaded wildlife habitat below the rim.	sustaining existing or increasing populations of wildlife. Minimize loss of habitat connectivity and displacement of wildlife through design and siting of allowed activities. Maintain or enhance big game habitat through vegetation management, to improve habitat quantity and quality. Apply travel restrictions on new and existing routes atop the plateau and within or near wildlife security areas. Cluster disturbances to limit fragmentation, or loss of roadless wildlife habitat, below the rim. Atop the plateau require clustered and sequenced development of oil and gas resources; location of drilling pads not closer than 2,640 feet, and on slopes of 20 percent or less along ridge tops; limit direct surface disturbance not yet meeting reclamation standards to less than one percent of the land area (350 acres); require successful reclamation (five-year standard) prior to development of other ridge top areas. (See Tables 2-3 and C-1 for more details). Implement wildlife TLs, including one to protect 34,668 acres of big game winter range from December 1 through April 30 below the rim. Encourage offsite mitigation across the landscape, in consultation with CDOW, to offset impacts to wildlife habitat. A detailed presentation of the stipulations, particularly the winter range TL is presented in Appendix C.
Apply five wildlife TLs, including one to protect 24,978 acres of crucial big game winter range from December 1 through April 30 below the rim.	Same as No Action Alternative	
No planned management actions to enhance big game habitat, but site-specific actions to enhance wildlife habitat would be allowed.	Initiate mitigation and vegetation management to maintain or enhance big game habitat where practical.	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
RAPTORS		
In accordance with the Migratory Bird Treaty Act and the Bald and Golden Eagle Act, protect raptor nests and nesting raptors from human disturbances to avoid destruction or abandonment of the nest or reduction in nesting productivity.	Same as No Action Alternative	**Goal**: Protect raptor nests and nesting raptors from human disturbances. Avoid the construction of facilities hazardous to raptors. **Objective**: Comply with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Avoid destruction or abandonment of the nest, or reduction in nesting productivity. **Management Actions**: Apply NSO and TL stipulations to nest sites. The nest cliff nesting complex for peregrine falcon on the cliffs and wildlife seclusion areas above the rim would be protected with SSR/CSU rather than NGD/NSO restrictions, because the peregrine falcon is now a sensitive species rather than threatened or endangered.) **Standards:** No surface disturbances would be allowed within a 0.125-mile radius of a nest site for owls, ospreys, golden eagles, buteos, accipiters, and falcons except kestrels. The buffer for the peregrine falcon cliff nesting complex and bald eagle roost or nest sites would be a 0.25-mile radius. TL stipulations would apply during the roosting and nesting season of each species.
The NSO and TL stipulations identified in the 1999 Oil and Gas FSEIS would apply below the rim only. No surface disturbances would be allowed within a 0.125-mile radius of a nest site for owls, ospreys, golden eagles, buteos, accipiters, and falcons except kestrels. The buffer for the peregrine falcon cliff nesting complex and bald eagle roost or nest sites would be a 0.25-mile radius. TL stipulations would apply during the roosting and nesting season of each species.	The NSO and TL stipulations identified in the 1999 Oil and Gas FSEIS would apply throughout the Planning Area and the NSO expanded to NGD/NSO. No surface disturbances would be allowed within a 0.125-mile radius of a nest site for owls, ospreys, golden eagles, buteos, accipiters, and falcons except kestrels. The buffer for the peregrine falcon cliff nesting complex and bald eagle roost or nest sites would be a 0.25-mile radius. TL stipulations would apply during the roosting and nesting season of each species.	
AQUATIC WILDLIFE		
Maintain existing populations and habitat quality for Colorado River cutthroat trout and other native fish species.	Maintain and enhance aquatic habitats on a site-specific basis. Restore habitats important to Colorado River cutthroat trout and other	**Goal:** Maintain and enhance habitats important to Colorado River cutthroat trout and other native fish.

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
	native fish, consistent with other resource uses and objectives.	**Objective:** Maintain or improve water quality, natural stream flow, and stream ecological function throughout the WMA by preventing or minimizing direct, indirect, or cumulative adverse impacts to Colorado River cutthroat trout or their habitat. **Management Actions:** Prior to conducting surface disturbance in the WMA, collect baseline data to assess current local hydrological and ecological conditions. Continue water quality monitoring throughout development of surface disturbing activities until reclamation is complete. Require project-specific design and mitigation such that proposed actions and site locations would prevent or minimize: reductions in natural stream flow; additional sedimentation or other degradation of water quality; or adverse impacts to stream ecological function, for reaches containing cutthroat trout habitat, and reaches upstream from occupied habitat. **Standards:** Required design components may include construction design, implementation of BMPs, mitigation, reclamation, revegetation, monitoring (to guide adaptive management), and erosion control. Project design would incorporate baseline studies, other results as available, and require monitoring of mitigation components sufficient to demonstrate effectiveness. Re-locate activities as necessary to minimize negative impacts to water quality and stream ecological function. Recognize valid existing water rights. Design culvert and bridge installations such
	Designate Parachute Creek WMA to protect water quality and ecosystem integrity and function related to the Colorado River cutthroat trout and supporting factors through graduated stipulations.	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
		that erosion and sedimentation is minimized, structures would function properly with anticipated water flows, and would allow for fish passage. Consider activities designed to provide long-term habitat improvement or protection, such as culvert or bridge installation or bank stabilization actions. Assess terms of indicator values for Public Land Health Standard #2 – Riparian Systems, #3 – Plant and Animal Communities, #4 – Special Status Species, and #5 – Water Quality. (See Appendix F) Implement WMA management prescriptions as detailed in Table 2-3.
SPECIAL STATUS PLANTS AND SIGNIFICANT PLANT COMMUNITIES		
Manage listed, proposed, or candidate threatened or endangered species to comply with the provisions of the Endangered Species Act (ESA). Manage special status plants and BLM recognized significant plant communities consistent with the Colorado Standards for Public Land Health and with BLM policy on Special Status Species Management (BLM Manual 6840) which directs BLM to prevent the need for listing of proposed, candidate and sensitive species under the ESA and improve the condition of special status species and their habitats to a point where their special status recognition is no longer warranted.	Same as No Action Alternative	**Goal:** Prevent the need for listing of proposed, candidate and sensitive species under the ESA and improve the condition of special status species and their habitats to a point where their special status recognition is no longer warranted. Promote recovery of special status species plants that may become listed. **Objective**: Manage listed, proposed, or candidate threatened or endangered species to comply with the provisions of the ESA and promote their recovery. Manage BLM sensitive and significant plant communities consistent with the Colorado Standards for Public Land Health and with BLM policy on Special Status Species Management (BLM Manual 6840).
Protect and maintain occupied habitat for special status plants and significant plant	Designate two ACECs and the Parachute Creek WMA to provide special management	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
communities.	attention to preserve, restore, and enhance known/potential special status plant and significant plant community habitat and ecological processes.	**Management Actions**: Any species which may be listed and candidate species, would be protected through application of a NGD/NSO. Sensitive species and significant plant communities would be protected through the application of a SSR/CSU. Designate four ACECs. While the ACECs carry no stipulations in and of themselves, they do serve to highlight the importance of natural values. Specific stipulations and mitigation measures are identified independently of ACEC designation for protection of various resources, but are synopsized in Table 2-2. Within the WMA prevent disruption, alteration, or interruption of surface and subsurface water flows that support rare and/or significant natural plant communities. Implement WMA management prescriptions as detailed in Table 2-3. Take action to protect against invasion and establishment of noxious weeds or other aggressive exotic plants. Close selected routes to protect special status species and significant plant communities. Prohibit collection of rare plants or plant parts, except for scientific research.
Avoid activities that could have a direct or indirect negative effect on special status plants and plant communities. NGD/NSO and SSR/CSU stipulations in the 1999 Oil and Gas FSEIS (which apply only below the rim) would be carried forward for the protection of special status plants.	Avoid ground-disturbing activities in occupied and high-risk habitat for special status plants, significant plant communities, and high-risk plant habitat. Some disturbances may be allowed to potential habitat and ecological processes but relocation or mitigation would be required to minimize impacts.	
	Close selected routes to protect special status species and significant plant communities.	
	Protect and maintain the immediately adjacent hydrologic and ecological processes that support rare plants and significant plant communities. Allow only activities that would not disturb, alter, or interrupt the hydrologic or ecological processes within habitat identified as moderate risk plant habitat. Mitigation or relocation of activities beyond 200 meters may be required.	
	Within the high value watershed, special design and construction methods may be used to prevent disruption, alteration, or interruption of the hydrologic and ecological processes that support rare plants or significant plant communities.	
	Prohibit collection of rare plants or plant parts, except for scientific research.	
SPECIAL STATUS FISH AND WILDLIFE SPECIES		
Manage the Big River Fishes (Colorado pikeminnow, razorback sucker, bonytail chub, humpback chub), and bald eagle in accordance with		

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
existing recovery plans and consultations completed with the USFWS. Manage special status fish and wildlife consistent with the Colorado Standards for Public Land Health and BLM direction for the management of special status species in BLM Manual 6840 (BLM 2001b). Implement the strategy outlined in the *Conservation Agreement and Strategy for Colorado River Cutthroat Trout (Oncorhynchus clarki pleuriticus) in the States of Colorado, Utah, and Wyoming* (CRCT 2001).		
Protect and maintain special status fish and wildlife and their immediate habitats. Avoid activities that could have a direct or indirect negative effect on special status fish and wildlife.	Designate two ACECs to protect, maintain, and enhance habitat immediately adjacent to occupied Colorado River cutthroat trout streams. ACEC management prescriptions are presented in Table 2-2.	**Goal**: Protect, preserve, restore, recover, and enhance special status fish and wildlife species and their habitats. **Objective**: Protect supporting habitat, ecosystem integrity and function, maintain or improve water quality and stream flow, and manage in accordance with recovery plans and Conservation Agreement for the Colorado River cutthroat trout and, Big River Fishes (Colorado pike minnow, razorback sucker, bonytail chub, humpback chub), and the bald eagle. Protect the habitat for the Townsends big eared bat that inhabits the Anvil Points Claystone Cave. This includes preventing or minimizing direct, indirect, or cumulative adverse impacts to these species habitats. **Management Actions:** Manage special status fish and wildlife consistent with the Colorado Standards for Public Land Health and BLM direction for the management of special status species in BLM Manual 6840 (BLM 2001b). Designate four ACECs, two of which would encompass Colorado River cutthroat trout habitat. While the ACECs carry no stipulations in and of themselves, they do serve to highlight the importance of natural values. Specific stipulations and mitigation measures are identified independently of ACEC designation for protection of various resources, but are synopsized in Table 2-2.
	Designate Parachute Creek WMA to protect ecosystem integrity and function related to the Colorado River cutthroat trout and supporting factors through graduated stipulations. WMA goals, objectives, and actions are presented in Table 2-3.	
	Allow no loss or degradation of high risk fish habitat. Require special measures including relocation of surface-disturbing activities more than 200 meters to minimize indirect impacts to Colorado River cutthroat trout within areas delineated as moderate risk habitat. Mitigate impacts in the remainder of watersheds supporting Colorado River cutthroat trout.	
	Manage livestock grazing so that streambank damage along occupied cutthroat trout streams does not exceed 10 percent of the stream length.	
Disturbance to sensitive bat habitat would be mitigated or relocated more than 200 meters. Enhancement and restoration efforts where necessary on a site-specific basis.	Protect and maintain habitat for sensitive bat species at the Anvil Points Claystone Cave. Disturbance to habitat would be mitigated or relocated more than 200 meters.	
Manage habitat conditions specific to the	Manage habitat conditions specific to the	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
requirements of individual species versus ecosystem approaches.	requirements of individual species and focus on needed mitigation.	Apply a NGD/NSO to areas adjacent to streams containing Colorado River cutthroat trout. Apply a SSR/CSU to the watershed within the WMA. A detailed description of management actions within the WMA is contained in Table 2-3. Actions would include collection of baseline data to assess current local hydrological and ecological conditions, requiring project-specific design and mitigation to prevent or minimize: reductions in natural stream flow; additional sedimentation or other degradation of water quality; or adverse impacts to stream ecological function, for reaches containing cutthroat trout habitat, and reaches upstream from occupied habitat. Culverts and other stream crossings must be designed to permit the passage of fish. If livestock grazing management practices or utilization levels are found to be substantial factors in stream bank damage along any occupied cutthroat trout streams, implement appropriate actions not later than the start of the next grazing year, or as soon as practicable. **Standards:** Consider activities designed to provide long-term habitat improvement or protection, such as culvert or bridge installation or bank stabilization actions. Assess terms of indicator values for Public Land Health Standard #2 – Riparian Systems, #3 – Plant and Animal Communities, #4 – Special Status Species, and #5 – Water Quality. (See Appendix F.)

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VISUAL RESOURCES		
Restrictions based on visual resource management (VRM) would not apply to the existing utility corridor. (Map 23.)	Same as No Action Alternative	**Goal:** Protect and maintain visual and aesthetic qualities in sensitive areas while allowing for changes to visual quality in less sensitive areas **Objectives:** Manage changes in the landscape to maintain and protect visual qualities as identified by VRM Class designations throughout the Planning Area. (Map 23). **Management Actions:** Apply NGD/NSO to preserve the landscape character within the East Fork Falls viewshed and to maintain VRM Class I. Apply NGD/NSO on slopes steeper than 30 percent, visible from and within 5 miles of I-70 to retain the existing character of the landscape and to maintain VRM Class II. Apply SSR/CSU to retain the existing character of the landscape on all lands designated as Class II. Apply SSR/CSU to retain the existing character of the landscape on all lands designated as Class III above the rim. Manage lands below the rim adjacent to Highway 13 and urban areas as VRM Class IV, which allow for major modifications to the existing landscape character. Restrictions based on VRM would not apply to the existing utility corridor. (Map 23) Areas previously managed as VRM Class V would be managed under the VRM Class directly adjacent to the area. Within BLM's VRM system Class V is no longer considered
Allow changes in the landscape associated with maintaining current VRM Classes throughout the Planning Area. The stipulations developed in the 1999 Oil and Gas FSEIS would be carried forward for the protection of visual resources only on some of the lands below the rim and would not apply to any lands on top of the plateau.	Allow only limited changes and retain the visual values in areas with high visual sensitivity, high scenic quality, or relevant and important resource values to maintain a natural appearing landscape. Emphasize protection and/or mitigation for those lands that receive the greatest amount of public viewing within the I-70 viewshed. Design all developments, land alterations, and vegetative manipulations within the I-70 viewshed to limit visual impacts.	
Disturbed areas (Class V) areas would be restored to meet VRM Class objectives for adjacent lands.	No areas allocated to VRM Class V as this is no longer considered a valid classification.	
VRM Classes (acres): • Urban: 12 • Class I: 0 • Class II: 24,039 • Class III: 37,115 • Class IV: 10,340 • Class V: 2,096	VRM Classes (acres): • Urban: 12 • Class I: 925 • Class II: 48,752 • Class III: 15,563 • Class IV: 8,350	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
		valid. VRM Classes (acres) as shown on Map 23: • Urban: 12 • Class I: 1,612 • Class II: 30,168 • Class III: 33,536 • Class IV: 8,274
TRANSPORTATION AND TRAVEL MANAGEMENT		
Delineation of Travel Management Areas (TMAs)		
N/A	N/A at publication of the DEIS	**Goal:** Travel Management Area (TMA) delineation addresses other modes of travel not covered by OHV area designations (43 CFR 8342.1). **Objective:** Identify appropriate TMA conveyances to supplement and complement goals and objectives for other resources atop the plateau, and to accommodate recreational demand in Hubbard Mesa. **Management Actions:** The Roan Plateau Area TMA delineation allows *muscle-powered* (i.e. foot, ski, horse, stock) travel cross-country year-round. Mechanized (wheeled conveyance) travel in the Roan Plateau Area TMA is limited to designated routes year-round as signed or identified on maps available onsite or at the GSFO. Generate and maintain a travel management plan to minimize disturbance and redundant routes. The Hubbard Mesa TMA delineation (same boundary as the Hubbard Mesa OHV Riding

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		Area) allows *muscle-powered* (i.e. foot, ski, horse, stock) travel and mechanized (wheeled conveyance) travel cross-country year-round consistent with the "open" OHV designation for motorized travel. **Standards:** All TMA delineations are subject to additional restrictions (i.e. seasonal, area, type, and number) set forth in the Record of Decision or in subsequent travel planning.
Designation of Off-Highway Vehicle (OHV) Management Areas		
No designated routes on transferred lands. Open to cross-country travel. (Present travel restrictions are temporary, subject to land use planning.)	Travel on all public lands is classified as *Limited* to designated routes except snowmobiles which are allowed to travel cross-country if there is at least 12 inches of snow (43 CFR 8342.1). The designation excludes vehicles in official and authorized use. OHV travel and access may also be limited at certain times/seasons, in certain areas, and/or to certain vehicular types and numbers of vehicles.	**Goal:** Provide for both protection of sometimes fragile resources and at the same time provide for motorized recreational opportunities. **Objective:** Provide for motorized recreational opportunities in the Hubbard Mesa Area, while managing for other activities and values in other portions of the Planning Area. **Management Actions:** Hubbard Mesa is classified as *Open* to OHV travel. Travel on all other public lands is classified as limited to designated routes except snowmobiles which are allowed to travel cross-country on top of the Roan Plateau if there is at least 12 inches of snow (43 CFR 8342.1). The designation excludes vehicles in emergency, official, and authorized use. OHV travel and access may also be limited at certain times/seasons, in certain areas, and/or to certain vehicular types and numbers of vehicles. A SSR/CSU would be applied to surface disturbing activities in Hubbard Mesa to preclude and manage conflicts between
As oil and gas or other development occurs, travel in areas affected by oil and gas development may be limited, restricted, or closed to resolve conflicts, provide for public safety, and provide for orderly oil and gas operations. New routes associated with oil and gas would be designated administrative access only, unless specific objectives for other resources (e.g., recreational travel routes or access to recreational sites) are present that warrant other designations on a case-by-case basis.	Same as No Action Alternative	

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		surface-disturbing activities such as oil and gas development and recreational OHV use in the Hubbard Mesa OHV Riding Area. As oil and gas or other development occurs, travel in areas affected by oil and gas development (outside the Hubbard Mesa OHV Riding Area) may be limited, restricted, or closed to resolve conflicts, provide for public safety, and provide for orderly oil and gas operations. New routes associated with oil and gas would be designated administrative access only, unless specific objectives for other resources (e.g., recreational travel routes or access to recreational sites) are present that warrant other designations on a case-by-case basis.
Open to cross-country travel: 66,934 acres (over-snow conveyances may travel cross-country).	Open to cross-country travel: 0 acres (over-snow travel open on 66,934 acres).	Open to cross-country travel: 2,460 acres (over-snow travel open on 34,758 acres atop the plateau).
Limited to designated routes: 0 acres	Limited to designated routes: 66,934 acres (excludes over-snow travel).	Limited to designated routes: 64,474 acres (excludes 2,640 acres in Hubbard Mesa OHV Riding Area and over-snow travel by snowmobile with minimum 12 inches of snow cover).
Closed to motorized and mechanized travel: 0 acres	Same as No Action Alternative	Closed to motorized and mechanized travel: 0 acres
Routes		
Route discussion applies only to currently existing routes unless otherwise noted. Additional routes which may be authorized as part of permitted activities would generally be for administrative access only in order to reduce impacts to wildlife and habitat fragmentation, but may be open to limited use by recreationists, or for other resource management purposes. Such future identification would not require an RMP amendment, but would be addressed in site-specific NEPA analyses.		
Open to motorized (public and administrative) and mechanized use: 259 miles	Open to motorized and mechanized use: 209 miles.	**Goal:** Provide a network of roads and trails open to administrative, recreational, and

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
	Open only for administrative motorized use: 24 miles	permitted uses that accommodates environmental and resource concerns. **Objective**: Manage routes as open if they provide recreational opportunities, needed administrative access (including permitted uses), are not redundant with other routes, and do not pose a potential risk to other resources. Restrict use to administrative purposes to avoid or minimize conflicts. Close routes that are redundant, conflict with management objectives or pose threats to the various resources present, and are not needed for administrative purposes. The primary purpose in implementing closures and administrative use limitations was to minimize impacts to wildlife and to reduce habitat fragmentation. **Management Actions:** Open to motorized and mechanized use: 163 miles (86.5 miles atop the plateau, 86.5 miles below the rim). Open only for administrative motorized use: 68 miles. (52 miles atop the plateau, 16 miles below the rim) Administrative roads in the Hubbard Mesa OHV Riding Area would be open to the public. Closed to motorized and mechanized use: 28 miles (26 miles atop the plateau, 2 miles below the rim). **Standard**s: Routes atop the Plateau would be managed to not exceed approximately 138 miles of open and administrative routes, although some exceptions may apply (Appendix C). Routes subject to closure or restrictions for public safety, or environmental protection.
Closed to motorized and mechanized use: 0 miles	Closed to motorized and mechanized use: 26 miles	
	Routes subject to closure or restrictions for public safety.	
	Closed routes would be rehabilitated and may be designated/managed for foot and horse travel.	
The JQS Road is not suitable as a main access for oil and gas drilling equipment and other long/heavy equipment due to grades and switchbacks. It is assumed that oil and gas lessees would access the top of the plateau across private lands from the west or via public access on Cow Creek Road from the north. In Rio Blanco County, Cow Creek Road provides public access either across BLM land or through easements across private lands and is not a BLM road.	The JQS Road is not suitable as a main access for oil and gas drilling equipment and other long/heavy equipment due to grades and switchbacks. It is assumed that oil and gas lessees would access the top of the plateau across private lands from the west or via public access on Cow Creek Road from the north. In Rio Blanco County, Cow Creek Road provides public access either across BLM land or through easements across private lands.	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
		Closed routes would be rehabilitated and may be designated/managed for foot and horse travel, and/or other non-motorized uses including mountain bikes. The JQS Road would be managed to allow only for historical and recreational use and would be maintained in approximately its current condition. It is not suitable as a main access for industrial or other long/heavy equipment due to steep grades and switchbacks. Improvements to accommodate such use would not be permitted.
LANDS AND REALTY		
Acquisitions of in-holdings and other areas with important resource values would be encouraged or allowed.	Same as No Action Alternative	**Goal**: Provide for compatible land use authorizations within the framework of law and regulation. Provide for land tenure adjustments and sales to benefit the public interest and facilitate effective land management. **Objective:** Meet agency and public rights-of-way, utility, land exchange, land tenure adjustments, and consolidation of ownership needs, when in the public interest, and within the constraints for other resources. **Management Actions**: Acquisition of in-holdings, and other lands with important resource values, would be encouraged or allowed. Allow development in the existing rights-of-way corridor along SH 13 and I-70. Retain lands on top of the plateau, and acquire in-holdings atop the plateau. Below the rim,
Maintain the current Oil Shale Withdrawal affecting the transferred lands.	The current Oil Shale Withdrawal affecting the transferred lands is proposed for revocation through this RMPA.	
BLM would continue to allow development in existing rights-of-way along SH 13 and I-70.	Major utility corridors are identified for the public lands along SH 13 and north of I-70. This is an existing corridor and would continue to be made available for new pipelines and utilities rights-of-way.	
No direction identified for transferred lands. Acquisition of in-holdings and areas of important resource values allowed.	Retain lands on top of the plateau except for the possibility of an exchange to acquire in-holdings. Below the rim, lands would be considered on a case-by-case basis for exchange. No exchanges or disposals would occur within ACECs or the SRMA. Use authorizations would have to meet the conditions or stipulations of the alternative.	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
Disposal of 2,031 acres in previously isolated parcels. (With the transfer of the NOSR parcels, lands identified in the 1988 GSRA RMP may not be suitable for disposal as they are no longer isolated.)	Potential disposal or exchange of approximately 40 acres adjacent to gun range, along with about 80 acres in other isolated parcels.	lands would be considered for exchange on a case-by-case basis. Lands would be available for communication and other facilities (such as wind power generation) subject to other management constraints. No exchanges or disposals would be allowed within ACECs, or the WMA. Use authorizations would conform to the various protective measures contained in this alternative. Allow for potential disposal or exchange of approximately 40 acres adjacent to gun range, along with about 80 acres in other isolated parcels. Allow utility corridors within 50 feet of BLM designated and administrative travel routes except where such placement would negatively impact other important resource values (e.g., wildlife seclusion areas, occupied habitat for special status plants or significant plant communities). In such areas (typically with SSR/CSU restrictions), utilities would be placed within the existing roadway or realigned to avoid important resource values. Retain lands atop of the plateau. Below the rim, lands would be considered on a case-by-case basis for exchange. Propose revocation of the current Oil Shale Withdrawal affecting the transferred lands.
All lands are suitable for consideration for the location of utility and communication facilities. Sensitive zones are identified for some lands where existing resource values must be mitigated prior to location of a proposed facility.	Utility corridors would be allowed within 50 feet of centerline of BLM designated and administrative travel routes. BLM would continue to allow development in existing utility rights-of-way along SH 13 and I-70.	
	Lands would be available for communication and other facilities (such as wind power generation) subject to the closures and conditions associated with protective stipulations, and other management constraints identified by alternative.	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
RECREATION		
Manage entire area as part of Glenwood Springs Extensive Recreation Management Area (ERMA).	Identify Hubbard Mesa as a Special Recreation Management Area (SRMA) managed under a community recreation market strategy. Remaining lands would be identified as the Roan Plateau ERMA.	**Goal:** Manage the entire Planning Area as the Roan Plateau ERMA. **Objectives:** ERMA objectives describe custodial outcomes for the purpose of *"taking care"* of identified stewardship needs associated with recreation-tourism activity participation. Through the life of the land use plan in the Roan Plateau ERMA: 1) Visitor Health and Safety – Ensure that participants in dispersed recreational activities have a low potential for serious accidents (< two accidents/year that require hospitalization) due to human-created conditions and no (zero) exposure to hazardous health conditions. 2) Use and User Conflicts – Limit incidents of conflict that impede gas production (as determined by BLM Natural Resource Specialists) to three or less per year by increasing the understanding of participants in traditional dispersed recreational activities about gas production and the phasing of development. 3) Resource Protection – Create an increased awareness, understanding, and sense of stewardship in recreational activity participants so their conduct safeguards natural resource values within ACECs and overall land health (as defined by ACEC objectives or Land Health Standards). **Management Actions:** Management activities would include custodial recreation management actions only.
Ensure the continued availability of outdoor recreation opportunities which the public seeks and which are not readily available from other sources to reduce the impacts of recreational use on fragile and unique resource values, and to provide for visitor safety.	Management objectives for the Hubbard Mesa SRMA are presented in Appendix E.	
Implementation Actions: Existing type and degree of management, marketing, monitoring and administration would occur.	Implementation Actions: Adaptively managed under the framework identified in the Hubbard Mesa SRMA (Appendix E).	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
		Marketing/Interpretation - Mitigate conflicts through visitor outreach efforts. Monitoring - BLM staff would monitor conflicts with other uses (i.e., oil and gas production, grazing, ACEC management and land health), and private lands. Administration - Mitigate conflicts directly by way of recreation use restrictions, realignments, signage, and closures. Permitted special events would be allowed consistent with other management objectives for other resources and uses.
GRAZING AND RANGELAND MANAGEMENT		
Continue the authorization of livestock grazing in a manner consistent with Public Land Health Standards and Guidelines for Livestock Grazing Management in Colorado.	Same as No Action Alternative	**Goal:** Provide livestock forage while maintaining or enhancing healthy landscapes. **Objectives:** Grazing management would conform to BLM grazing regulations (43 CFR 4180) and BLM Colorado's Standards for Public Land Health and Guidelines for Livestock Management. **Management Actions:** Regularly monitor rangeland health, and evaluate of existing grazing management practices. Continue to implement the BLM Glenwood Springs Monitoring Plan (Appendix K) and current AMPs in conjunction with Standards for Public Land Health and Guidelines for Livestock Management to assess overall rangeland health. Develop, implement, and review AMPs on a regularly scheduled basis with grazing permittees with priority for allotments
Conduct high-intensity monitoring on allotments with identified issues to ensure compliance with permit terms and conditions and progress toward Land Health Standards. Conduct low-intensity monitoring on other allotments to ensure compliance with authorization and maintenance of current conditions.	Conduct high-intensity monitoring on allotments covered by allotment management plans and on allotments with management actions to make progress toward meeting Land Health Standards. Conduct low-intensity monitoring on remaining allotments to ensure compliance with authorization and maintain current conditions.	
Develop Allotment Management Plans (AMPs) within administrative units that do not meet, or have identified concerns in meeting, Land Health Standards.	Develop AMPs for units that do not meet standards or have identified conflicts with wildlife, watershed, wetland/riparian, botanical, or wilderness values.	
Implement rangeland projects (fences, ponds, etc. to direct livestock use) and administrative solutions (season of use revisions, stocking	Use a combination of administrative solutions (season of use revisions, livestock exclusion, and stocking level adjustments) and	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
level adjustments, pasture exclusions and utilization stipulations) to meet resource management objectives based on monitoring studies and land health assessment findings.	rangeland projects (fences, ponds, etc., to direct livestock use) to meet resource objectives while making significant progress towards meeting Land Health Standards.	determined not to be meeting Land Health Standards. Apply guidelines and BMPs to rest and defer grazing of riparian areas (Appendix L). Ensure that Land Health Standards are being met through Land Health surveys, and application of the GSFO Monitoring Plan (Appendix K). Use a combination of administrative solutions (season of use revisions, livestock exclusion, and stocking level adjustments) and rangeland projects (fences, ponds, etc.) to direct livestock use to meet resource objectives and Land Health Standards, following the latest version of BLM Technical Reference 1734-6 or equivalent documents. Abandon and rehabilitate rangeland projects that do not function to maintain resource values and meet management objectives. Identify criteria for determining the beginning and end of droughts (or droughty periods whether officially declared or not) on the basis of scientifically credible methods, data, and BLM policy (e.g., Palmer Drought Severity Index, Crop Moisture Index, and soil moisture). Upon a determination by the Field Office Manager that a drought has begun, initiate proactive management (i.e., season of use adjustments, reduced stocking levels, or complete rest) to mitigate the drought effects. Upon a determination by the Field Office Manager that a drought has ended, initiate gradual restocking and season adjustments.
Abandon and rehabilitate rangeland projects that do not function to maintain resource values and meet management objectives.	Same as No Action Alternative	

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
OIL AND GAS LEASING AND DEVELOPMENT		
Protection of Threatened, Endangered, or Special Status Species		
In addition to standard stipulations, all lands made available for lease under any alternative would have a special stipulation as follows: The lease area may now or subsequently contain threatened, endangered, or other special status species of plants or animals or their habitats. BLM may recommend modifications to exploration and development proposals to further its conservation and management objective to avoid BLM-approved activity that will contribute to a need to list such species or their habitat under the Endangered Species Act (ESA), as amended (16 U.S.C. 1531 et seq.). BLM will require modifications to or disapprove proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of a designated or proposed critical habitat. BLM will not approve any ground-disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the ESA, including any required procedure for conference or consultation.		
Access for Exploration and Development		
The JQS Road is not suitable as a main access for oil and gas drilling equipment and other long or heavy equipment due to steep grades and switchbacks. It is assumed that holders of oil and gas leases would access the top of the plateau across private lands from the west or via public access on Cow Creek Road (Rio Blanco CR 5 and Garfield CR 249) from the north. In Rio Blanco County, CR 5 provides public access across BLM land or via easements on private lands and is not a BLM road.	The JQS Road is not suitable as a main access for oil and gas drilling equipment and other long or heavy equipment due to steep grades and switchbacks. It is assumed that holders of oil and gas leases would access the top of the plateau across private lands from the west or via public access on Cow Creek Road from the north. In Rio Blanco County, CR 5 provides public access across BLM land or via easements on private lands.	**Goal:** Maintain the present visual quality and character associated with the JQS Road. **Objective:** Maintain the JQS Road in its present condition and allow for present uses. **Management Action:** The JQS Road would be managed to allow only for historical and recreational use and would be maintained in approximately its current condition. It is not suitable as a main access for industrial or other long/heavy equipment due to steep grades and switchbacks. Improvements to accommodate such use would not be permitted.
Leasing and Permitting		
Oil and gas leasing would be conducted on leasable lands in accordance with the Mineral Leasing Act and the Federal Onshore Oil and Gas Reform Act of 1987 (Reform Act) and applicable regulations under 43 CFR 3100	Same as No Action Alternative	**Goal:** Make lands available as appropriate for oil and gas leasing in an environmentally sound manner, under multiple use mandates. **Objective:** Oil and gas leasing would be

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and in accordance with the decisions made through application of FLPMA and other laws applicable to public lands. Regulations governing onshore oil and gas operations can be found at 43 CFR 3160.		conducted on leasable lands in accordance with the Mineral Leasing Act and the Federal Onshore Oil and Gas Reform Act of 1987 (Reform Act) and applicable regulations under 43 CFR 3100 and in accordance with the decisions made through application of FLPMA and other laws applicable to public lands. Regulations governing onshore oil and gas operations can be found at 43 CFR 3160. **Management Actions:** Lands would be available for oil and gas leasing and development, including associated actions and facilities such as upgrading existing roads and constructing well sites, new roads, pipelines, and compressor stations. The standard lease form along with standard terms and conditions is shown in Appendix B. Lease stipulations are described in Appendix C. Prior to exploration and/or lease development within the Planning Area, the operator must submit a Geographic Area Proposal (GAP) identifying projected activity (including well locations, pipelines, and facilities) during the next two to five years and appropriate mitigation. All oil and gas operations and activities on top of the plateau would be under the control of a single operator; BLM would directly control and manage the timing, location, and type of all operations by that single operator. Activities atop the plateau would be conducted in accordance with the following decisions:
BLM would issue oil and gas leases and provide for environmentally sound development such as upgrading existing roads and constructing well sites, new roads, and associated facilities for development of new or existing oil and gas leases.	Same as No Action Alternative	
Although well pad densities may vary across the Planning Area, the objective would be to manage lease development to limit surface density consistent with lease rights granted. This would be achieved through clustering of wells and collocation of facilities based on site-specific considerations in response to ecological, visual, recreational, and other resource sensitivities. Prior to exploration and/or lease development, the operator must submit a Geographic Area Proposal identifying projected activity (including well locations, pipelines, and facilities) during the next 2 to 5 years and appropriate mitigation. The standard lease form along with standard terms and conditions is shown in Appendix B. Lease stipulations are described in Appendix C.	Although well pad densities may vary across the Planning Area, the objective would be average surface spacing density to one well pad per 160 acres This may be achieved by, but is not necessarily limited to, relocation of drilling locations, inventories, special studies, onsite and offsite mitigation, and timing restrictions and clustering of wells and collocation of facilities based on site-specific considerations in response to ecological, visual, recreational, and other resource sensitivities. Prior to exploration and/or lease development, the operator must submit a Geographic Area Proposal identifying projected activity (including well locations, pipelines, and facilities) during the next 2 to 5 years and appropriate mitigation. The standard lease form along with standard terms and conditions is shown in Appendix B. Lease stipulations are described in Appendix C.	

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		▪ oil and gas development activities would be restricted to six specific development areas (Figure 2-1) along the ridge tops on slopes less than 20 percent; ▪ operations would be staged and sequenced over time; ▪ development activities would be allowed on only one of six development areas at a time. Exploratory wells may be drilled in other areas sufficient to plan future drilling operations; ▪ total unreclaimed surface disturbance would be limited to 350 acres atop the plateau at any given time; ▪ five year interim reclamation standards must be met throughout 90 percent of any development area, as determined by BLM, prior to development operations moving to another development area; ▪ drilling pads would be a minimum of 2,640 feet apart; and development and production facilities would be clustered and designed to minimize surface impacts; ▪ limit open and administrative motorized routes to approximately 138 miles. Allow exceptions only where necessary to reduce impacts, such as using a longer route to avoid a sensitive resource or reduce visual impacts and direct habitat loss; ▪ implement innovative reclamation and performance-based monitoring

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		standards; ▪ consolidate natural gas production facilities, roads, pipelines, and staging areas along roadways to minimize disturbance; ▪ apply the resources protections detailed in this table, and in Tables 2-2, 2-3, and C-1. This includes NSO, CSU, and TL lease stipulations, and COAs current at the time of permitting; Before any on-the-ground lease operations are considered for approval by BLM on top of the plateau, the lessees would be required to reach formal agreement on one operator to conduct all operations on behalf of all the lessees. All lessees/leases would be required, by lease stipulation, to join a Federal Unitization Agreement, approved by BLM. This agreement would be non-contracting. The Unitization Agreement would allow BLM to directly control and manage the timing, location, and type of all operations occurring on all Federal lands atop the plateau. In effect, all of the leases would act administratively as a single lease and BLM would work with just one operator for the life of all oil and gas operations occurring on the top of the plateau. This legal agreement would (among other things) identify the agreed-upon single operator, and provide for allocation of costs and revenues of gas and/or oil production to all of the leases.

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STIPULATIONS AND RESTRICTIONS The following terms and conditions would be applied to oil and gas development in the Planning Area to accommodate needs of other resources, and ensure that development is performed in an environmentally responsible manner.		
Closed to Oil and Gas Leasing: 44,267 acres (60.1%) (not leased within former NOSR 1 and three parcels)	Closed to Oil and Gas Leasing: 0 acres	Closed to Oil and Gas Leasing: 0 acres
Deferred to Oil and Gas Leasing: 0 acres	Deferred to Oil and Gas Leasing: 34,758 acres (47.2%) The threshold criterion for leasing and development atop the plateau would be drilling and completion of 80% of the anticipated total number of wells below the rim during the 20-year period of analysis. This point could be reached in 10 to 20+ years.	Deferred to Oil and Gas Leasing: 0 acres
No Surface Occupancy (NSO): 13,912 acres (18.9%). NSO stipulations for the following resources: • slopes greater than 50% • threatened, endangered and federal proposed or candidate species • wildlife seclusion areas • raptors • bald eagle nest areas • peregrine falcon cliff nesting complex • I-70 viewshed • Anvil Points Claystone Cave • riparian and wetland habitat • Colorado River corridor	No Surface Occupancy (NSO): 30,928 acres (42%). May overlap with less restrictive stipulations. NSO stipulations for the following resources: • slopes greater than 50% • special status species (threatened, endangered and federal proposed or candidate species and sensitive species) • high risk plant habitat • significant or remnant plant communities • raptors nest sites • bald eagle nest or winter roost sites • peregrine falcon cliff nesting complex • I-70 viewshed • Class 1 VRM/high visual sensitivity • high risk special status fish species	No Surface Occupancy (NSO): 38,411 acres (52%). May overlap with less restrictive stipulations. NSO stipulations for the following resources: • slopes greater than 50% • DeBeque phacelia (ESA Candidate species) • Parachute penstemon (ESA Candidate species) • raptor nest sites • bald eagle nest or winter roost sites • wildlife seclusion areas below the rim • high value special status fish species habitat • riparian and wetland habitat • I-70 viewshed (VRM Class II)

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
	habitat • Anvil Points Claystone Cave • riparian and wetland habitat, • WSR eligibility • Colorado River corridor NSOs with no modification, waiver, or exceptions for the 9,006 acres with roadlessness and naturalness values.	• East Fork Falls Viewshed (VRM Class I) • Anvil Points Claystone Cave • Colorado River corridor
Controlled Surface Use (CSU): 8,256 acres (11.2%). CSU is the most restrictive stipulation, where no NSO stipulations apply. CSU stipulations for the following resources: • sensitive species populations and significant plant communities • erosive soils and slopes • VRM Class II areas • Sharrard Park paleontological resources • riparian and wetland habitat below the rim	Controlled Surface Use (CSU): 29,594 acres (40.2%). CSU is the most restrictive stipulation, where no NSO stipulations apply. CSU stipulations for the following resources: • sensitive species populations and significant plant communities • erosive soils and slopes • VRM Class II areas • Sharrard Park paleontological resources • riparian and wetland habitat below the rim	Controlled Surface Use (CSU): 30,833 acres (42%). CSU is the most restrictive stipulation where no NSO stipulations apply. CSU stipulations for the following resources: • special status plant species population and significant plant community habitat • hanging garden special status plant species habitat • riparian and wetland habitat • peregrine falcon cliff nesting complex • wildlife seclusion area above the rim • big game migration corridors • sensitive bat species habitat • WSR eligibility • erosive soils and steep slopes (>30%) • VRM Class II areas below the rim • VRM Class III areas above the rim • Sharrard Park paleontological resources • Parachute Creek High Value Watershed and Watershed Management Area (WMA) • Hubbard Mesa OHV Riding Area

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
Timing Limitation (TL): 39,947 acres (54%). Lands available for lease with TLs on periods when construction and drilling activities are prohibited to protect important wildlife habitats. These limitations do not apply to the operation and maintenance of producing wells. TL stipulations for the following resources: • big game winter range • raptor nesting • bald eagle nest or winter roost sites • peregrine falcon cliff nesting complex • waterfowl and shorebird nesting areas	Timing Limitation (TL): 39,947 acres (54%). Lands available for lease with TLs on periods when construction and drilling activities are prohibited to protect important wildlife habitats. These limitations do not apply to the operation and maintenance of producing wells. TL stipulations for the following resources: • big game winter range • active raptor nest sites • bald eagle nest or winter roost sites • peregrine falcon cliff nesting complex • waterfowl and shorebird nesting areas	Timing Limitation (TL): 39,947 acres (54%). Lands available for lease with TLs on periods when construction and drilling activities are prohibited to protect important wildlife habitats. These limitations do not apply to the operation and maintenance of producing wells. TL stipulations for the following resources: • big game winter range • active raptor nest sites • bald eagle nest or winter roost sites • peregrine falcon cliff nesting complex • waterfowl and shorebird nesting areas
Areas with Protective Designations or Management Actions: 0 acres. Lands where exploration and development activities are subject to BMPs and mitigation measures. These would be in the form of COAs, and would be developed through the permitting process. BMPs and mitigation measures to protect wildlife, vegetation, geological, watershed, fisheries, visual, and Hubbard Mesa SRMA values.	Areas with Protective Designations or Management Actions: 69,867 acres (94.9%). Lands where exploration and development activities are subject to BMPs and mitigation measures. These would be in the form of COAs, and would be developed through the permitting process. BMPs and mitigation measures to protect wildlife, vegetation, geological, watershed, fisheries, visual, and Hubbard Mesa SRMA values.	Areas with Protective Designations or Management Actions: 62,762 acres (85%). Lands where exploration and development activities are subject to BMPs and mitigation measures. These would be in the form of COAs, and would be developed through the permitting process. BMPs and mitigation measures to protect wildlife, vegetation, geological, watershed, fisheries, and visual values.
Standard Terms and Conditions with or without TLs: 7,167 acres (10%). Lands where exploration and development activities are subject to standard lease terms and conditions plus a stipulation for the protection of species under the ESA. Mitigation measures, which may be in the form of COAs, would be developed through the impact analysis process.	Standard Terms and Conditions with or without TLs: 13,080 acres (17.8%). Lands where exploration and development activities are subject to standard lease terms and conditions plus a stipulation for the protection of species under the ESA. Mitigation measures, which may be in the form of COAs, would be developed through the impact analysis process.	Standard Terms and Conditions with or without TLs: 4,358 acres (6%). Lands where exploration and development activities are subject to standard lease terms and conditions plus a stipulation for the protection of species under the ESA. Mitigation measures, which may be in the form of COAs, would be developed through the impact analysis process.

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
OTHER MINERALS		
Oil Shale Leasing and Development		
No leasing	At the discretion of the Secretary of the Interior, research and development (R&D) lease tracts would be considered in the Planning Area. Approval of research tracts would be based on the merits of the technology proposed. All leases and development (including R&D) would be subject to the NSO, CSU, and other constraints identified for this alternative, unless addressed in a future RMP amendment. At this time no R&D lease tracts have been proposed within the Planning Area. The Secretary could also propose research tract development to further the goals of Federal energy policy. If the research technology demonstrates adequate reserve recovery, the Secretary has the discretion to expand the research tract into a commercial mineral lease. Additional NEPA analysis would likely be required prior to any lease offering, and appropriate stipulations and mitigation (within the constraints of this alternative) would be developed. Future leasing other than described above would be based on promulgation of oil shale regulations, and analyzed separately from this document.	The Glenwood Springs Field Office and in particular the Roan Plateau Planning Area contains areas of oil shale resources. There are at present no regulations in place for leasing oil shale, nor any existing oil shale leases. Lands containing oil shale resources were originally identified through an inventory of the Green River Formation in Utah, Wyoming, and Colorado. Once identified, lands containing oil shale resources were withdrawn from mineral entry through a 1930 Executive Order, which was later modified to allow for oil, gas, and sodium leasing. Since that time, the economic potential for the oil shale resource has been further defined, and now comprises a smaller area in the three states. When the Roan Plateau RMP Amendment effort was initiated in 2001, there was no reasonable foreseeable development expectation for oil shale over the life of the plan. The mineral report identified this resource, but did not foresee any future leasing or development due to lack of regulations as well as prevailing and anticipated economic factors. Since the start of this RMP Amendment, Congress enacted the Energy Policy Act of 2005. Section 369 of the Energy Policy Act requires the Secretary of Interior to “complete a programmatic environmental impact

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
		statement for a commercial leasing program for oil shale and tar sands resources on public lands, with an emphasis on the most geologically prospective lands within each of the States of Colorado, Utah, and Wyoming." On December 13, 2005, the BLM published a Notice of Intent in the Federal Register initiating a Programmatic Environmental Impact Statement (PEIS) to support a commercial oil shale and tar sands leasing program on Federal lands in these three states. In light of legislative requirements, all decisions related to oil shale leasing in this RMP Amendment effort are being deferred to the ongoing PEIS on Oil Shale and Tar Sands Leasing. The Record of Decision (ROD) on the final PEIS will also amend the Glenwood Springs RMP and decisions for the Roan Plateau Planning Area. The PEIS ROD will decide whether or not to allow leasing and future development of oil shale on Federal lands. Additional opportunities for public involvement and comment will occur when the PEIS becomes available in draft form. Site-specific requirements will be addressed in future NEPA analysis for specific project applications after the PEIS is completed. Activities associated with oil shale development would comply with applicable stipulations and conditions outlined in this Roan Plateau RMP Amendment, unless the stipulations and conditions are changed in future planning documents.

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
Coal Leasing and Development		
No leasing	Leasing would be allowed in limited areas. Although the potential for the occurrence of coal at depth (6,000 to 9,000 feet) is high, development within the foreseeable future is considered low as the current economic mining limit is around 3,000 feet.	**Goal**: Provide opportunities for coal leasing and development. **Objective**: Allow environmentally responsible development of coal resources as future economic conditions allow. **Management Actions**: Make the area available for coal leasing. **Standards**: All environmental protection requirements of the various resources described in the plan and contained in the various stipulations would apply. The occurrence of coal at 6,000-9,000 feet is high, but the current economic mining limit is around 3,000 feet. Development potential in the near future is considered to be low.
Locatable Minerals		
Under current management, the Oil Shale Withdrawal has closed the transferred lands to mineral entry under the mining law.	The Naval Oil Shale Withdrawal affecting the transferred lands would be proposed for revocation. All lands would be available for mining claim location. Exploration/development activities would be subject to 43 CFR 3809 but not the NGD/NSO or SSR/CSU stipulations identified by alternative. Rights granted under the mining law cannot be modified by NGD/NSO or SSR/CSU stipulations.	**Goal:** Make lands available for mining claim location. **Objective:** Allow mineral exploration and development activities. **Management Action:** The Naval Oil Shale Withdrawal affecting the transferred lands would be proposed for revocation. All lands would be available for mining claim location. Exploration/development activities would be subject to 43 CFR 3809 but not the NGD/NSO or SSR/CSU stipulations identified in the Proposed Plan. Rights granted under the mining law cannot be modified by NGD/NSO

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
		or SSR/CSU stipulations.
Salable Minerals		
Allow for mineral material sales on a case-by-case basis subject to the closures associated with areas managed to protect and maintain wilderness characteristics and NGD/NSO and SSR/CSU constraints identified by alternative.	Same as No Action Alternative	**Goal**: Allow for limited sales of mineral materials. **Objective**: Permit mineral material sales on a case-by-case basis in an environmentally responsible manner. **Management Actions**: Allow for mineral material sales on a case-by-case basis. **Standards:** Maintain NGD/NSO and SSR/CSU constraints, and apply appropriate site-specific mitigation.
AREAS OF CRITICAL ENVIRONMENTAL CONCERN (ACECS)		
No ACECs would be designated. Management direction would be consistent with that provided by the overall objective for the alternative, and for specific resources.	Designate two ACECs where special management is applied to protect and prevent irreparable damage to relevant and important core vales: scenic, fisheries, wildlife, and botanical/ecological values. Risk of impacts to these significant values would be minimized through management prescriptions on 11,529 acres: East Fork Parachute Creek: 6,719 acres (visual, fisheries, botanical/ecological) Trapper/Northwater Creek: 4,810 acres (fisheries, botanical/ecological) Values outside the ACECs would be protected or mitigated through the use of stipulations or conditions on development. ACEC management prescriptions detailed in Table 2-2.	**Goal:** Highlight management of relevant and important resource values. **Objective**: Although protective stipulations would be applied independently of ACEC designation, and ACEC designation carries no protective stipulations in and of itself, ACEC designation would serve to highlight relevant and important values. **Management Action:** Designate four ACECs where special management is applied to protect and prevent irreparable damage to relevant and important scenic, fisheries, wildlife, and botanical/ecological values. Risk of impacts to these significant values would be minimized through management prescriptions on these 21,034 acres: East Fork Parachute Creek: 6,571 acres

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
		(visual, fish/wildlife, botanical/ecological) Trapper/Northwater Creek: 4,810 acres (fish/wildlife, botanical/ecological) Magpie Gulch: 4,698 acres (visual, wildlife, botanical/ecological) Anvil Points: 4,955 acres (visual, geological, wildlife, botanical/ecological) Management prescriptions for resources within the ACECs are detailed in Table 2-2.
WATERSHED MANAGEMENT AREA (WMA)		
No WMAs would be identified. Management direction would be consistent with that provided by the overall objective for the alternative, and for specific resources.	The Parachute Creek WMA would be identified. BMPs and mitigation measures to protect watershed values associated with fisheries, botanical resources, and municipal water quality could be applied to 29,073 acres during permitting. Management Goals, Objectives, and Actions for the Parachute Creek Watershed Management Area are detailed in Table 2-3.	**Goal:** The goals of the WMA are threefold: **1.)** Maintain or improve Colorado River cutthroat trout habitat. This may be accomplished by habitat improvement and by preventing or minimizing ecological function throughout the WMA. **2.)** Maintain or improve special status plant populations, significant plant communities, and their habitat. **3.)** Maintain the hydrologic regime and ecological integrity/function that provide existing habitat for special status plant populations and significant plant communities in the WMA (defined in Section 3.3.3). **Objective:** The objectives are also threefold: **1.)** Maintain or improve water quality, natural stream flow, and stream ecological function throughout the WMA by preventing or minimizing direct, indirect, or cumulative adverse impacts to Colorado River cutthroat trout or their habitat. **2.)** Maintain or improve surface and subsurface water flows, and the ecological integrity and function that supports rare and/or significant natural plant

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
		communities. **3.)** Prevent disruption, alteration, or interruption of surface and subsurface water flows that support rare and/or significant natural plant communities, and protect against invasion of noxious weeds or other aggressive exotic plants. **Management Actions:** Protections would be applied to the watershed in the form of a SSR/CSU. For more information on these management actions see Table 2-3.
AREAS HAVING WILDERNESS CHARACTER		
Management direction would be consistent with that provided by the overall objective for the alternative, and other resources. No special protections would be provided for wilderness characteristics in those areas that have been found to contain them.	Manage 9,006 acres to maintain roadlessness and naturalness characteristics within 3 units: • Northeast Cliffs: 2,291 acres • Southeast Cliffs: 3,014 acres • East Fork Parachute Creek: 4,241 acres	**Goal:** No areas would be managed specifically to maintain wilderness character. However, protections for various resources may have the effect of maintaining some wilderness characteristics (e.g., roadlessness and naturalness) within NGD/NSO allocations.
STREAMS ELIGIBLE FOR SUITABILITY STUDY UNDER WILD AND SCENIC RIVERS ACT		
Eligibility findings not applied.	Protect rivers and corridors totaling 7,883 acres within the Planning Area that are found to be eligible under the WSRA, by not allowing any surface-disturbing activities that might impair values, until a suitability analysis has been completed.	**Goal:** Protect rivers and corridors within the Planning Area until such time a suitability study is conducted under the Wild and Scenic Rivers Act. **Objective:** Protect rivers and corridors totaling 7,883 acres within the Planning Area that are found to be eligible under the WSRA, by not allowing any surface-disturbing activities that might impair values, until a suitability analysis has been completed. **Management Action:** Apply a SSR/CSU to the 7,833 acres until such time a suitability study is completed. At that time if the waterways are found to be suitable the SSR/CSU would remain in place. If the

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
		waterways are found to be not-suitable, the SSR/CSU for this action would be removed.
HAZARDOUS MATERIALS AND THE ANVIL POINTS FACILITY		
	BLM is developing plans to remediate the Anvil Points spent oil shale pile and DOE facilities.	**Goal:** Remove environmental hazards at the former Anvil Points Facility. **Objective**: Remove hazards while complying to the extent feasible with the environmental mitigation outlined in this plan. **Management Action:** Conduct a CERCLA Removal Action at the former Anvil Points Facility. BLM is developing plans to remove hazards, reclaim, and rehabilitate spent oil shale and DOE facilities at the Anvil Points Facility. All removal, restoration and reclamation activities associated with the Anvil Points facility would be exempt from the requirements of this plan. An NGD/NSO stipulation would be applied to the spent shale repository, and a perpetual rights-of-way issued to the United States. Removal activities would incorporate the various design features to the extent practicable in order to minimize impacts to a variety of resources.
FOREST PRODUCTS		
No special management actions identified. Manage to maintain and promote forest health consistent with other resource objectives.	Same as No Action Alternative	**Goal:** Maintain and promote forest health consistent with other resource objectives.
FIRE		
Provide appropriate management response	Same as No Action Alternative	Same as No Action Alternative

NO ACTION ALTERNATIVE	*PREFERRED ALTERNATIVE*	*PROPOSED PLAN*
based on Fire Management Plan and fire management zone (FMZ) classification considering firefighter and public safety and social, economic, and environmental values.		
FMZs for the Planning Area are as follows: • B-140-02 (south side of plateau) • C-140-02 (NE and SE cliffs) • D-140-01 (top of plateau)	FMZs for the Planning Area are as follows: • B-140-02 (south side of plateau) • C-140-02 (NE and SE Cliffs and top of plateau)	FMZs for the Planning Area are as follows: ▪ B-140-02 (south side of plateau) ▪ C-140-02 (NE and SE Cliffs and top of plateau)
CULTURAL RESOURCES		
Proactive Cultural Resources Fieldwork		
Least Amount	Moderate Amount	Same as Preferred Alternative
Cultural Resources Management		
Goal: Preserve and protect significant cultural resources and ensure that they are available for appropriate uses by present and future generations. (FLPMA Sec. 103(c), 201(a), 202(c); NHPA Sec. 110(a); ARPA Sec. 14(a).) **Objectives:** Comply with the National Historic Preservation Act, National Programmatic Agreement/State Protocol, WO-IB-2002-101, and other applicable laws, regulations, and policies. Reduce imminent threats from natural or human-caused deterioration or potential conflict with other uses by identifying priority geographic areas for new field inventory based on a probability for unrecorded significant resources (ARPA Sec. 14(a); NHPA Sec. 106, 110).		

Cultural Resources Fieldwork Actions by Sensitivity Area and Location

Sensitivity Zone	*Survey Management*			*Management of Cultural Resource Locations*		
	Project Location	*Areas Not Inventoried*	*Inventoried Areas (No Resources)*	*Sites Needing Data*	*NRHP Eligible Sites*	*NRHP Not Eligible Sites*
High	Atop the Plateau	Class III – 100% Inventory	Monitor [1]	Avoid or test [2]	Avoid or implement data recovery plan [3]	Monitor
	Below the Rim	Class III –100% Inventory	Monitor	Avoid or test [2]	Avoid or implement data recovery plan [3]	No further work
Moderate	Atop the Plateau	Class III – 100% Inventory	Monitor	Avoid or test [2]	Avoid or implement data recovery plan [3]	Monitor

NO ACTION ALTERNATIVE			*PREFERRED ALTERNATIVE*		*PROPOSED PLAN*	
	Below the Rim	Class II – Reconnaissance	No further work	Avoid or test [2]	Avoid or implement data recovery plan [3]	No further work
Low	Atop the Plateau	Class I – Records Search	No further work	Avoid or test [2]	Avoid or implement data recovery plan [3]	No further work
	Below the Rim	Class I – Records Search	No further work	Avoid or test [2]	Avoid or implement data recovery plan [3]	No further work

[1] *Monitor refers to having a qualified archaeologist on site during construction/maintenance activities as determined by the Cultural Resource Specialist.*

[2] *Test refers to evaluative testing and excavation of a site to determine NRHP eligibility.*

[3] *Data recovery refers to large-scale excavation of the site for mitigation purposes.*

All authorizations for land and resource use would comply with Section 106 of the NHPA, consistent with and subject to the objectives established in the RMPA for the proactive use of cultural properties in the public interest (NHPA Sec. 106, 101(d)(6), 110(a)(2)(E); BLM-ACHP-NCSHPO Programmatic Agreement of March 1997).

Proposed activities would not be authorized until compliance with Section 106 of NHPA has been completed and documented, including, where applicable, consultation with the State Historic Preservation Officer and Indian Tribes.

Native American consultation for identification and protection of culturally sensitive properties and use areas would occur under all alternatives.

Level of proactive work and/or need for National Register District or ACEC based on Class I overview data and potential impacts of proposed action.

Table 2.2 Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

ACECs have been identified for designation based on the presence of various relevant and important values discussed in the following table. Various protective measures and management actions are identified in the Proposed Plan to guide management of these values. These measures and actions are specific to identified resources; they are being applied independently of ACEC designation. ACEC designation highlights the resource values present. Designation does not carry or require any particular measures or actions. Wilderness characteristics are separate and distinct from the relevant and important resource values for ACECs. ACEC designation is separate and distinct from any management action to maintain and protect wilderness characteristics that may have been discussed in the Draft RMPA/EIS.

ANVIL POINTS ACEC	
RELEVANT AND IMPORTANT RESOURCES	
Visual	**Objective:** Protect visual resources on lands that are most visible from I-70 and where changes to the visual character would be the most noticeable. **Management Action**: Apply NGD/NSO restrictions to lands over 30 percent slopes which are within 5 miles of, and visible from, I-70 to retain the existing natural character of the landscape. The level of allowed change to the characteristic landscape would be low. Management activities may be visible but not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. **Objective:** Preserve the existing natural character of the landscape on lands below the cliffs to the casual observer. **Management Action**: Apply SSR/CSU to VRM Class II lands to retain the existing natural character of the landscape. The level of allowed change to the characteristic landscape would be low. Management activities may be visible but not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Wildlife	**Objective:** Protect identified raptor nest sites. **Management Actions**: Apply NGD/NSO within wildlife security areas below the rim. For the protection of raptors, apply NGD/NSO restrictions within a 0.125-mile radius of nest sites. Raptors include owls, osprey, golden eagles, buteos, accipiters, and falcons except American kestrel. (For the protection of peregrine falcon, apply NGD/NSO restrictions within 0.25-mile radius of cliff-nesting complexes). **Objective:** Prevent raptor nest abandonment and reductions in nesting productivity. **Management Actions**: Apply NGD/NSO within wildlife security areas below the rim. Avoid drilling or other high-disturbance activities within a 0.25-mile buffer around nest sites from February 1 through August 15. For protection of peregrine falcons, apply a 0.5-mile buffer around the cliff-nesting complex from March 16 through July 31 to prevent abandonment and desertion of established territories.

Table 2.2 Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

	Objective: Maintain habitat connectivity and avoid displacement of wildlife. **Management Action**: Apply NGD/NSO within wildlife security areas below the rim. Allow no new long-term (longer than two growing seasons) human use related ground disturbing activities within the unroaded wildlife habitat located below the cliffs. **Objective:** Protect and minimize disturbance to wintering big game, and allow for their use of limited winter range habitats during the critical winter months. **Management Action**: Apply a TL to protect wintering big game. Avoid high-disturbance activities (such as oil and gas drilling) from December 1 through April 30 within winter habitat as mapped by the CDOW, unless impacts have been mitigated.
Botanical/ Ecological	**Objective:** Protect occupied habitat and the immediately adjacent ecosystem processes that support candidate plants. **Management Action**: Apply NGD/NSO restrictions within occupied habitat or within the immediately adjacent ecosystem processes that support candidate plants. **Objective:** Allow for the long-term viability and recovery of candidate plant species, and protect and maintain potential habitat and the ecosystem processes that support them. **Management Actions**: Apply SSR/CSU restrictions within potential habitat/ecosystem processes for candidate plants. **Objective:** Maintain the current ecological integrity and function of the rare plants and significant plant communities. **Management Action**: Revegetate using locally adapted native species, unless the risk of cheatgrass dominance following disturbance is high and non-natives have been proven to be more effective in competition with cheatgrass. (SM P-9) **Objective**: Allow natural ecosystem processes such as rockslides to continue. Control wildfire only when human safety or property is at risk. **Management Action**: Manage significant grassland and shrubland communities to retain mid- to late-seral stage condition. **Objective:** Minimize fragmentation of habitat and the risk of invasion by noxious weeds and other aggressive non-native species, which may compromise ecosystem function and the long-term viability of the rare plants and significant plant communities. **Management Action**: Minimize disturbance to habitat and ecosystem processes that support habitat for candidate and rare plants, and significant plant communities. Where practicable, restore to a naturally functioning state any existing human-caused disturbance that is impairing natural ecosystem processes affecting habitat for rare plant species or significant plant communities. Actions may include burying pipelines and utilities in roads or relocation of facilities to minimize impacts. **Objective:** Ensure the long-term survival and reproductive capability of rare plants and significant plant communities. **Management Actions**: Prohibit collection of plants, plant materials, and seeds, except for scientific or research purposes. Such collection must have no detrimental impact on long-term survival and reproduction of rare species or significant communities.

Table 2.2 Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

	Objective: Maintain healthy native plant communities, minimizing competition from non-native invasive species. **Management Action:** Control noxious weeds using integrated control techniques. Utilize focused control techniques in areas with rare species or significant plant communities to avoid damage to non-target species. **Objective:** Maintain populations of rare plants and significant plant communities that are healthy, productive, and able to reproduce and sustain natural fluctuations and ecological processes. Provide adequate opportunities for recovery, regrowth, and seed dissemination and establishment. **Management Action**: Manage livestock grazing within occupied or potential habitat for rare plants or significant plant communities to promote plant health, maintain sufficient residual vegetation, and sustain overall watershed functions, as defined in the Colorado Livestock Grazing Management Guidelines (BLM 1997a).
OTHER IMPORTANT RESOURCES	
Steep Slopes	**Objective:** Maintain site stability and productivity. **Management Action**: Apply NGD/NSO on slopes greater than 50 percent to minimize impacts on site productivity, to adequately control surface runoff, to reduce accelerated erosion and increase likelihood of successful reclamation.
Soils	**Objective:** Maintain site stability and minimize potential for erosion. **Management Action**: On slopes greater than 30 percent, require special design, construction, operation, and reclamation measures.
Riparian Areas	**Objective:** Maintain proper hydrologic function and protect adjacent areas that provide habitat for special status fish and wildlife species, important riparian values, water quality, waterfowl and shorebird production, amphibian habitat, and high scenic and recreation values. Allow continued access to and use of these habitats by fish and wildlife species. **Management Actions**: Roads, transmission lines, storage facilities and similar human-induced surface disturbances will be restricted to an area beyond the outer edge of the riparian vegetation. A SSR/CSU would apply within 500 feet of the outer edge of the wetland or riparian area.

MAGPIE GULCH	
RELEVANT AND IMPORTANT RESOURCES	
Visual	**Objective:** Protect visual resources on lands that are most visible from I-70, and where changes to the visual character would be most noticeable. **Management Action**: Apply NGD/NSO restrictions to lands over 30 percent slopes which are within 5 miles of, and visible from I-70 to retain the existing natural character of the landscape. The level of allowed change to the characteristic landscape would be low. Management activities may be visible but not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. **Objective:** Preserve the existing natural character of the landscape on lands below the cliffs to the casual observer. **Management Action**: Apply SSR/CSU to VRM Class II lands to retain the existing natural character of the landscape. The level of allowed change to the characteristic landscape would be low. Management activities may be visible but not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Wildlife	**Objective:** Protect identified raptor nest sites. **Management Actions**: Apply NGD/NSO within wildlife security areas below the rim. For the protection of raptors, apply NGD/NSO restrictions within a 0.125-mile radius of nest sites. Raptors include owls, osprey, golden eagles, buteos, accipiters, and falcons except American kestrel. (For the protection of peregrine falcon, apply NGD/NSO restrictions within 0.25-mile radius of cliff nesting complexes. **Objective:** Prevent raptor nest abandonment and reductions in nesting productivity. **Management Actions**: Apply NGD/NSO within wildlife security areas below the rim. Avoid drilling or other high-disturbance activities within a 0.25-mile buffer around nest sites from February 1 through August 15. For protection of peregrine falcons, apply a 0.5-mile buffer around the cliff-nesting complex from March 16 through July 31 to prevent abandonment and desertion of established territories. **Objective:** Maintain habitat connectivity and avoid displacement of wildlife. **Management Action**: Apply NGD/NSO within wildlife security areas below the rim. Allow no new long-term (longer than two growing seasons) human use related ground disturbing activities within the unroaded wildlife habitat located below the cliffs. **Objective:** Protect and minimize disturbance to wintering big game, and allow for their use of limited winter range habitats during the critical winter months. **Management Action**: Apply a TL to protect wintering big game. Avoid high-disturbance activities (such as oil and gas drilling)

MAGPIE GULCH	
	from December 1 through April 30 within winter habitat as mapped by CDOW, unless impacts have been mitigated.
Botanical/ Ecological	**Objective:** Protect the current extent, ecological integrity, and function of the old-growth Douglas-fir community. **Management Action**: Apply a SSR/CSU within old-growth Douglas-fir remnant communities, including removal of any size-class trees.
	Objective: Protect occupied habitat and the immediately adjacent ecosystem processes that support candidate plants. **Management Action**: Apply NGD/NSO restrictions within occupied habitat or within the immediately adjacent ecosystem processes that support candidate plants. **Objective:** Allow for the long-term viability and recovery of candidate plant species, and protect and maintain potential habitat and the ecosystem processes that support them. **Management Actions**: Apply SSR/CSU restrictions within potential habitat/ecosystem processes for candidate plants. **Objective:** Maintain the current ecological integrity and function of the rare plants and significant plant communities. **Management Action**: Revegetate using locally adapted native species, unless the risk of cheatgrass dominance following disturbance is high and non-natives have been proven to be more effective in competition with cheatgrass. (SM P-9) **Objective**: Allow natural ecosystem processes such as rockslides to continue. Control wildfire only when human safety or property is at risk. **Management Action**: Manage significant grassland and shrubland communities to retain mid- to late-seral stage condition. **Objective:** Minimize fragmentation of habitat and the risk of invasion by noxious weeds and other aggressive non-native species, which may compromise ecosystem function and the long-term viability of the rare plants and significant plant communities. **Management Action**: Minimize disturbance to habitat and ecosystem processes that support habitat for candidate and rare plants, and significant plant communities. Where practicable, restore to a naturally functioning state any existing human-caused disturbance that is impairing natural ecosystem processes affecting habitat for rare plant species or significant plant communities. Actions may include burying pipelines and utilities in roads or relocation of facilities to minimize impacts. **Objective:** Ensure the long-term survival and reproductive capability of rare plants and significant plant communities. **Management Actions**: Prohibit collection of plants, plant materials, and seeds, except for scientific or research purposes. Such collection must have no detrimental impact on long-term survival and reproduction of rare species or significant communities. **Objective:** Maintain healthy native plant communities, minimizing competition from non-native invasive species. **Management Action:** Control noxious weeds using integrated control techniques. Utilize focused control techniques in areas with rare species or significant plant communities to avoid damage to non-target species.

MAGPIE GULCH	
	Objective: Maintain populations of rare plants and significant plant communities that are healthy, productive, and able to reproduce and sustain natural fluctuations and ecological processes. Provide adequate opportunities for recovery, regrowth, and seed dissemination and establishment. **Management Action**: Manage livestock grazing within occupied or potential habitat for rare plants or significant plant communities to promote plant health, maintain sufficient residual vegetation, and sustain overall watershed functions, as defined in the Colorado Livestock Grazing Management Guidelines (BLM 1997a).
OTHER IMPORTANT RESOURCES	
Steep Slopes	**Objective:** Maintain site stability and productivity. **Management Action**: Apply NGD/NSO on slopes greater than 50 percent to minimize impacts on site productivity, to adequately control surface runoff, to reduce accelerated erosion and increase likelihood of successful reclamation.
Soils	**Objective:** Maintain site stability and minimize potential for erosion. **Management Action**: On slopes greater than 30 percent, require special design, construction, operation, and reclamation measures.
Riparian Areas	**Objective:** Maintain proper hydrologic function and protect adjacent areas that provide habitat for special status fish and wildlife species, important riparian values, water quality, waterfowl and shorebird production, amphibian habitat, and high scenic and recreation values. Allow continued access to and use of these habitats by fish and wildlife species. **Management Actions**: Roads, transmission lines, storage facilities and similar human-induced surface disturbances will be restricted to an area beyond the outer edge of the riparian vegetation. A SSR/CSU would apply within 500 feet of the outer edge of the wetland or riparian area.

EAST FORK PARACHUTE CREEK	
RELEVANT AND IMPORTANT RESOURCES	
Visual	**Objective**: Preserve the existing character of landscape for East Fork Falls viewshed to meet VRM Class I objectives. **Management Action**: Apply NGD/NSO to maintain the natural character and scenic quality of the landscape to provide for ecological changes and restrict landscape modifications. Limited activities may be allowed if the basic landscape elements (line, form, color, and texture) are repeated and changes are not evident, and appear natural. **Objective:** Partially retain the character of the remainder of the landscape within the ACEC. **Management Action:** Apply SSR/CSU to partially retain the existing character of the landscape on all lands designated as Class III. Activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the elements found in the natural features of the characteristic landscape.
Fish and Wildlife	**Objective:** Protect identified raptor nest sites. **Management Actions**: Apply NGD/NSO within wildlife security areas below the rim. For the protection of raptors, apply NGD/NSO restrictions within a 0.125-mile radius of nest sites. Raptors include owls, osprey, golden eagles, buteos, accipiters, and falcons except American kestrel. For the protection of peregrine falcon, apply NGD/NSO restrictions within 0.25-mile radius of cliff nesting complexes. **Objective:** Prevent raptor nest abandonment and reductions in nesting productivity. **Management Actions**: Apply NGD/NSO within wildlife security areas below the rim. Avoid drilling or other high-disturbance activities within a 0.25-mile buffer around nest sites from February 1 through August 15. For protection of peregrine falcons, apply a 0.5-mile buffer around the cliff-nesting complex from March 16 through July 31 to prevent abandonment and desertion of established territories. **Objective:** Protect Colorado River cutthroat trout from direct impacts. **Management Action**: Apply NGD/NSO to high and moderate risk habitat areas. Allow no loss or degradation of fish habitat that supports Colorado River cutthroat trout high risk habitat. **Objective:** Protect Colorado River cutthroat trout from indirect impacts. **Management Action**: Apply NGD/NSO to high and moderate risk habitat areas. Allow no loss or degradation of fish habitat that supports Colorado River cutthroat trout moderate risk habitat. **Objective:** Minimize direct impacts to streambanks resulting from livestock grazing. **Management Action**: Manage livestock grazing within the ACEC so that streambank damage does not exceed 10 percent of the stream length.

EAST FORK PARACHUTE CREEK	
Botanical/ Ecological	**Objective:** Maintain the current ecological integrity and function of the rare plants and significant plant communities. **Management Action**: Revegetate using locally adapted native species, unless the risk of cheatgrass dominance following disturbance is high and non-natives have been proven to be more effective in competition with cheatgrass. (SM P-9) **Objective**: Allow natural ecosystem processes such as rockslides to continue. Control wildfire only when human safety or property is at risk. **Management Action**: Manage significant grassland and shrubland communities to retain mid- to late-seral stage condition. **Objective:** Minimize fragmentation of habitat and the risk of invasion by noxious weeds and other aggressive non-native species, which may compromise ecosystem function and the long-term viability of the rare plants and significant plant communities. **Management Action**: Minimize disturbance to habitat and ecosystem processes that support habitat for candidate and rare plants, and significant plant communities. Where practicable, restore to a naturally functioning state any existing human-caused disturbance that is impairing natural ecosystem processes affecting habitat for rare plant species or significant plant communities. Actions may include burying pipelines and utilities in roads or relocation of facilities to minimize impacts. **Objective:** Ensure the long-term survival and reproductive capability of rare plants and significant plant communities. **Management Actions**: Prohibit collection of plants, plant materials, and seeds, except for scientific or research purposes. Such collection must have no detrimental impact on long-term survival and reproduction of rare species or significant communities. **Objective:** Maintain healthy native plant communities, minimizing competition from non-native invasive species. **Management Action:** Control noxious weeds using integrated control techniques. Utilize focused control techniques in areas with rare species or significant plant communities to avoid damage to non-target species. **Objective:** Maintain populations of rare plants and significant plant communities that are healthy, productive, and able to reproduce and sustain natural fluctuations and ecological processes. Provide adequate opportunities for recovery, regrowth, and seed dissemination and establishment. **Management Action**: Manage livestock grazing within occupied or potential habitat for rare plants or significant plant communities to promote plant health, maintain sufficient residual vegetation, and sustain overall watershed functions, as defined in the Colorado Livestock Grazing Management Guidelines (BLM 1997a).
OTHER IMPORTANT RESOURCES	
Steep Slopes	**Objective:** Maintain site stability and productivity. **Management Action**: Apply NGD/NSO on slopes greater than 50 percent to minimize impacts on site productivity, to adequately control surface runoff, to reduce accelerated erosion and increase likelihood of successful reclamation.

EAST FORK PARACHUTE CREEK	
Soils	**Objective:** Maintain site stability and minimize potential for erosion. **Management Action**: On slopes greater than 30 percent, require special design, construction, operation, and reclamation measures.
Riparian Areas	**Objective:** Maintain proper hydrologic function and protect adjacent areas that provide habitat for special status fish and wildlife species, important riparian values, water quality, waterfowl shorebird production, amphibian habitat, and high scenic and recreation values. Allow continued access to and use of these habitats by fish and wildlife species. **Management Actions**: Roads, transmission lines, storage facilities and similar human-induced surface disturbances will be restricted to an area beyond the outer edge of the riparian vegetation. A SSR/CSU would apply within 500 feet of the outer edge of the wetland or riparian area.

TRAPPER / NORTHWATER CREEK	
RELEVANT AND IMPORTANT RESOURCES	
Fish and Wildlife	**Objective:** Protect identified raptor nest sites. **Management Actions**: Apply NGD/NSO within wildlife security areas below the rim. For the protection of raptors, apply NGD/NSO restrictions within a 0.125-mile radius of nest sites. Raptors include owls, osprey, golden eagles, buteos, accipiters, and falcons except American kestrel. (For the protection of peregrine falcon, apply NGD/NSO restrictions within 0.25-mile radius of cliff nesting complexes. **Objective:** Prevent raptor nest abandonment and reductions in nesting productivity. **Management Actions**: Apply NGD/NSO within wildlife security areas below the rim. Avoid drilling or other high-disturbance activities within a 0.25-mile buffer around nest sites from February 1 through August 15. For protection of peregrine falcons, apply a 0.5-mile buffer around the cliff-nesting complex from March 16 through July 31 to prevent abandonment and desertion of established territories. **Objective:** Protect Colorado River cutthroat trout from direct impacts. **Management Action**: Apply NGD/NSO to high and moderate risk habitat areas. Allow no loss or degradation of fish habitat that supports Colorado River cutthroat trout high risk habitat. **Objective:** Protect Colorado River cutthroat trout from indirect impacts. **Management Action**: Apply NGD/NSO to high and moderate risk habitat areas. Allow no loss or degradation of fish habitat that supports Colorado River cutthroat trout moderate risk habitat. **Objective:** Minimize direct impacts to streambanks resulting from livestock grazing. **Management Action**: Manage livestock grazing within the ACEC so that streambank damage does not exceed 10 percent of the stream length.

Botanical/ Ecological	**Objective:** Maintain the current ecological integrity and function of the rare plants and significant plant communities. **Management Action**: Revegetate using locally adapted native species, unless the risk of cheatgrass dominance following disturbance is high and non-natives have been proven to be more effective in competition with cheatgrass. (SM P-9) **Objective**: Allow natural ecosystem processes such as rockslides to continue. Control wildfire only when human safety or property is at risk. **Management Action**: Manage significant grassland and shrubland communities to retain mid- to late-seral stage condition. **Objective:** Minimize fragmentation of habitat and the risk of invasion by noxious weeds and other aggressive non-native species, which may compromise ecosystem function and the long-term viability of the rare plants and significant plant communities. **Management Action**: Minimize disturbance to habitat and ecosystem processes that support habitat for candidate and rare plants, and significant plant communities. Where practicable, restore to a naturally functioning state any existing human-caused disturbance that is impairing natural ecosystem processes affecting habitat for rare plant species or significant plant communities. Actions may include burying pipelines and utilities in roads or relocation of facilities to minimize impacts. **Objective:** Ensure the long-term survival and reproductive capability of rare plants and significant plant communities. **Management Actions**: Prohibit collection of plants, plant materials, and seeds, except for scientific or research purposes. Such collection must have no detrimental impact on long-term survival and reproduction of rare species or significant communities. **Objective:** Maintain healthy native plant communities, minimizing competition from non-native invasive species. **Management Action:** Control noxious weeds using integrated control techniques. Utilize focused control techniques in areas with rare species or significant plant communities to avoid damage to non-target species. **Objective:** Maintain populations of rare plants and significant plant communities that are healthy, productive, and able to reproduce and sustain natural fluctuations and ecological processes. Provide adequate opportunities for recovery, regrowth, and seed dissemination and establishment. **Management Action**: Manage livestock grazing within occupied or potential habitat for rare plants or significant plant communities to promote plant health, maintain sufficient residual vegetation, and sustain overall watershed functions, as defined in the Colorado Livestock Grazing Management Guidelines (BLM 1997a).
OTHER IMPORTANT RESOURCES	
Steep Slopes	**Objective:** Maintain site stability and productivity. **Management Action**: Apply NGD/NSO on slopes greater than 50 percent to minimize impacts on site productivity, to adequately control surface runoff, to reduce accelerated erosion and increase likelihood of successful reclamation.

Soils	**Objective:** Maintain site stability and minimize potential for erosion. **Management Action**: On slopes greater than 30 percent, require special design, construction, operation, and reclamation measures.
Riparian Areas	**Objective:** Maintain proper hydrologic function and protect adjacent areas that provide habitat for special status fish and wildlife species, important riparian values, water quality, waterfowl and shorebird production, amphibian habitat, and high scenic and recreation values. Allow continued access to and use of these habitats by fish and wildlife species. **Management Actions**: Roads, transmission lines, storage facilities and similar human-induced surface disturbances will be restricted to an area beyond the outer edge of the riparian vegetation. A SSR/CSU would apply within 500 feet of the outer edge of the wetland or riparian area.

Table 2-3. Management Goals, Objectives, and Actions for the Parachute Creek Watershed Management Area

Resource	Proposed Management Goal, Objective, and Action
Fisheries	**Goal:** Maintain or improve Colorado River cutthroat trout habitat. This may be accomplished by habitat improvement and by preventing or minimizing impacts to ecological function throughout the WMA. **Objective:** Maintain or improve water quality, natural stream flow, and stream ecological function throughout the WMA by preventing or minimizing direct, indirect, or cumulative adverse impacts to Colorado River cutthroat trout or their habitat. **Management Actions:** • Prior to conducting surface disturbance in the WMA, collect baseline data to assess current local hydrological and ecological conditions. • Require project-specific design and mitigation such that proposed actions and site locations will prevent or minimize: reductions in natural stream flow; additional sedimentation or other degradation of water quality; or adverse impacts to stream ecological function, for reaches containing cutthroat trout habitat, and reaches upstream from occupied habitat. Required design components may include construction design, implementation of BMPs, mitigation, reclamation, revegetation, monitoring (to guide adaptive management), and erosion control. Project design will establish baseline environmental conditions and monitor post development conditions, other results as available, and require monitoring of mitigation components sufficient to demonstrate effectiveness. • Relocate activities as necessary to minimize negative impacts to water quality and stream ecological function. • Recognize valid existing water rights. Standards: • Consider activities designed to provide long-term habitat improvement or protection, such as culvert or bridge installation or bank stabilization actions. • Assess terms of indicator values for Public Land Health Standard #2 – Riparian Systems, #3 – Plant and Animal Communities, #4 – Special Status Species, and #5 – Water Quality. (See Appendix F)
Botanical/ Resources	**Goal:** Maintain or improve special status plant populations, significant plant communities, and their habitat. **Objective:** Maintain or improve surface and subsurface water flows, and the ecological integrity and function that supports rare and/or significant natural plant communities.

Table 2-3. Management Goals, Objectives, and Actions for the Parachute Creek Watershed Management Area

Resource	Proposed Management Goal, Objective, and Action
	Management Actions: • Prior to conducting surface disturbance, collect baseline data of current local hydrological conditions as well as current ecological condition in terms of indicator values for Public Land Health Standard #3 – Plant and Animal Communities and #4 – Special Status Species. • Require project-specific design and mitigation such that proposed actions and site locations will prevent or minimize: reduction of natural stream flows, degradation of water quality, or loss stream ecological function. Required design components may include construction design, implementation of BMPs, mitigation, reclamation, revegetation, monitoring (to guide adaptive management), and erosion control. • Consider exceptions for short duration, one-time events designed to enhance ecological function to provide long-term habitat protection, such as culvert or bridge installation or bank stabilization actions. • Relocate activities as necessary to minimize negative impacts to the hydrologic regime and ecological integrity/function that provide existing habitat for special status plant populations and significant plant communities, and the habitat which supports them. Standards: • Project design will incorporate baseline and other relevant study results, as available, and require monitoring of mitigation components sufficient to demonstrate effectiveness. • Review project-specific design plans submitted by the proponent before approving an exception.
	Goal: Maintain the hydrologic regime and ecological integrity/function that provide existing habitat for special status plant populations and significant plant communities in the WMA (defined in Section 3.3.3). **Objective:** Prevent disruption, alteration, or interruption of surface and subsurface water flows that support rare and/or significant natural plant communities, and protect against invasion of noxious weeds or other aggressive exotic plants. **Management Actions:** • Prior to approval of proposed surface disturbance, conduct baseline studies of current local hydrological conditions as well as current ecological condition in terms of indicator values for Public Land Health Standard #3 – Plant and Animal Communities and #4 – Special Status Species. • Assess all activities for potential impacts that may change or reduce local surface or subsurface flow volumes directly, indirectly, or cumulative to existing conditions and other human impacts or otherwise cause degradation of indicators for

Table 2-3. Management Goals, Objectives, and Actions for the Parachute Creek Watershed Management Area

Resource	Proposed Management Goal, Objective, and Action
	Public Land Health Standards #3 – Plant and Animal Communities and #4 – Special Status Species. • Require project-specific design and mitigation plans prior to approval of proposed actions that may affect habitat for existing rare plant populations and significant plant communities. • Consider exceptions for short duration, one-time events designed to provide long-term habitat protection, such as culvert or bridge installation or bank stabilization actions. Move proposed locations of ground-disturbing activities, as required, to minimize negative impacts to the hydrologic regime and ecological integrity/function that provide existing habitat for special status plant populations and significant plant communities. Standards: • Design projects such that proposed actions and site locations will not contribute to reduction of natural stream flows or other degradation of water quality or stream ecological function. • Required design components may include construction design, implementation of BMPs, mitigation, reclamation, revegetation, monitoring (to guide adaptive management), and erosion control. Incorporate baseline study results into project design. Require that designs and mitigation components be demonstrated effective under similar ecological conditions. • Review project-specific design plans submitted by the proponent before approving an exception.

Table 2-3. Management Goals, Objectives, and Actions for the Parachute Creek Watershed Management Area

Resource	Proposed Management Goal, Objective, and Action
Municipal Water Quality	**Goal:** Protect and maintain or enhance resource values, especially water quantity and quality, in the Parachute Creek WMA. **Objective:** Ensure sufficient water supply and water quality is available for use by the Town of Parachute and natural hydrologic systems now and in the future. To minimize cumulative impact to the Parachute Creek WMA resource values. **Management Actions:** • Prior to conducting surface disturbance, or new surface disturbing activities, collect baseline data of local hydrological conditions. Data parameters will include physical, chemical, and biological characteristics. • Require project-specific design and mitigation such that actions do not measurably decrease water quality (including physical, chemical, or biological characteristics) at any collection or diversion point utilized by the Town of Parachute for municipal purposes. • Monitor and evaluate mitigation efforts on a regular basis for ground-disturbing activities that disturb, either separately or in combination with other activities, within a disturbance area greater than 5 acres. • Operations must be designed, constructed and located to minimize the footprint of surface disturbance, erosion, and other negative impacts on the water supply. • Minimize the footprint from oil and gas activities and preclude location of activities on slopes greater than 20 percent. Apply a CSU stipulation with standards that would require a minimum distance of 2,640 feet between well pads unless: topographic constraints require a closer location, which would result in fewer cumulative impacts to important wildlife, aquatic, visual and soil resources. • A transportation plan will be required after forming the unit, during formulation of development plans. Standards: • Design any activities, facilities (including wells, pads, and roads) or site locations to prevent or minimize adverse impacts to natural stream flow volume or other degradation of water quality or stream ecological function. • Required design components may include construction design, implementation of BMPs, mitigation, reclamation, revegetation, monitoring (to guide adaptive management), and erosion control. • Project design will incorporate baseline and other relevant study results and require monitoring mitigation components sufficient to demonstrate effectiveness. Apply stringent requirements where recommended by State of Colorado

Table 2-3. Management Goals, Objectives, and Actions for the Parachute Creek Watershed Management Area

Resource	Proposed Management Goal, Objective, and Action
	practices. • Relocate activities as necessary to minimize negative impacts to quality and quantity of the current and future water supply of the Town of Parachute.

Table 2-3. Management Goals, Objectives, and Actions for the Parachute Creek Watershed Management Area

Resource	Proposed Management Goal, Objective, and Action
Hydrologic Function and Ecosystem Stability	**Goal:** Ensure protection of overall hydrologic function, ecosystem stability, functionality of wildlife habitat and botanical habitats, and enhancement of fisheries habitat; while making lands available for oil and gas leasing in an environmentally sound manner, under multiple use management. **Objective:** Provide resource protections through actions that minimize disturbance, habitat fragmentation, and protect key habitats from disturbance; while providing for oil and gas leasing accordance with the Mineral Leasing Act and the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (Reform Act) and applicable regulations under 43 CFR 3100 and in accordance with the decisions made through application of FLPMA and other laws applicable to public lands. **Management Actions:** Condition the development of oil and gas through sequencing and clustering of development; consolidation of disturbance and facilities; limiting the amount of un-reclaimed disturbance, and limiting development and associated disturbance to the less environmentally sensitive ridge tops. Prior to exploration and/or lease development within the planning area, the operator must submit a Geographic Area Proposal (GAP) identifying projected activity (including well locations, pipelines, and facilities) during the next 2 to 5 years and appropriate mitigation. All oil and gas operations and activities on top of the plateau will be under the control of a single operator; BLM will directly control and manage the timing, location, and type of all operations by that single operator. Activities atop the plateau will be conducted in accordance with the following decisions: ▪ Oil and gas development activities will be restricted to six specific development areas (Figure 2-1) which are primarily the ridge tops on slopes less than 20 percent; ▪ Operations will be staged and sequenced over time; ▪ Allowing development on only one of six development areas at a time; ▪ Total unreclaimed surface disturbance will be limited to 350 acres at any given time; ▪ Five year interim reclamation standards must be met throughout 90 percent of any development area prior to moving to the next development area; ▪ Drilling pads will be a minimum of 2,640 feet apart; and development and production facilities will be clustered and

Table 2-3. Management Goals, Objectives, and Actions for the Parachute Creek Watershed Management Area

Resource	Proposed Management Goal, Objective, and Action
	designed to minimize surface impacts; ▪ Limit open and administrative motorized routes to approximately 138 miles. Allow exceptions only where necessary to reduce impacts, such as using a longer route to avoid a sensitive resource or reduce visual impacts and direct habitat loss. ▪ Implement innovative reclamation and performance-based monitoring standards; ▪ Consolidate natural gas production facilities, roads, pipelines, and staging areas along roadways to minimize disturbance; ▪ Apply the resources protections detailed in this table, and in Tables 2-1, 2-2, and C-1. This includes NSO, CSU, and TL lease stipulations, and COAs current at the time of permitting Before any on-the-ground lease operations are considered for approval by BLM on top of the plateau, the lessees will be required to reach formal agreement on one operator to conduct all operations on behalf of all the lessees. All lessees/leases will be required, by lease stipulation, to join a Federal Unitization Agreement, approved by BLM. The Unitization Agreement will be non-contracting. The agreement will allow BLM to directly control and manage the timing, location, and type of all operations occurring on the entire top of the plateau. In effect, all of the leases will act administratively as a single lease and BLM will work with just one operator for the life of all oil and gas operations occurring on the top of the plateau. The Federal Unitization Agreement will (among other things) identify the agreed upon single operator, and provisions on how to allocate the benefits of gas and/or production to all of the leases.

Table 2-4. Management Objectives for Major Plant Communities [1]

Community Type	Management Objectives
Aspen Woodland	• Prevent new noxious weed infestations and manage existing populations according to prioritized management plan • Maintain existing spatial extent • Maintain a full range of size/age classes, with a minimum of 10 percent of any one class • Encourage or maintain a diverse herbaceous and woody understory component
Old-growth Douglas-fir Forest	• Prevent new noxious weed infestations and manage existing populations according to prioritized management plan • Maintain existing spatial extent • Protect and maintain the ecological integrity and function of the old-growth Douglas-fir community
Spruce/Fir Coniferous Forest	• Prevent new noxious weed infestations and manage existing populations according to prioritized management plan • Maintain existing spatial extent, allowing for natural succession processes (e.g. wildland fire, native insect infestation) • Manage for wildlife habitat values (i.e. hiding cover, raptor nest sites, and general community cohesiveness)
Semi-desert Shrublands	• Prevent new noxious weed infestations and manage existing populations according to prioritized management plan • Maintain existing spatial extent • Minimize surface disturbance impacts to limit expansion of annual weed populations
Mountain Grassland	• Prevent new noxious weed infestations and manage existing populations according to prioritized management plan • Maintain existing spatial extent • Reduce community fragmentation
Mixed Mountain Shrubland	• Prevent new noxious weed infestations and manage existing populations according to prioritized management plan • Maintain existing spatial extent • Maintain a diversity of seral stages, age classes, and species composition
Pinyon/Juniper Woodland	• Prevent new noxious weed infestations and manage existing populations according to prioritized management plan • Maintain current extent of oldest age classes • Maintain or enhance current diversity and extent of biological soil

	crust communities
Riparian/Wetland	• Prevent new noxious weed infestations and manage existing populations according to prioritized management plan • Maintain, or increase, existing spatial extent • Manage riparian communities to achieve PFC while attaining potential natural condition or a late-seral plant community stage. Concentrate on achieving diverse native species composition and productivity. • Atop the plateau manage to provide or contribute to high quality habitat for the Colorado River cutthroat trout
Sagebrush Shrubland	• Prevent new noxious weed infestations and manage existing populations according to prioritized management plan • Limit encroachment by other woody species • Maintain a full range of age/size class shrubs • Encourage diversity and cover of native perennial herbaceous understory
Shale Barrens/Naturally Unvegetated	• Prevent new noxious weed infestations and manage existing populations according to prioritized management plan • Allow natural succession processes while limiting human-caused surface disturbance

[1] *Objectives are defined in terms of potential natural vegetation parameters, based on conditions in the corresponding ESI site.*

CHAPTER 3

AFFECTED ENVIRONMENT

3 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

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

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

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

3.2 PHYSICAL ENVIRONMENT

3.2.1 Geology

3.2.1.1 Regional Setting

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

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

3.2.1.2 Bedrock and Surficial Geology

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

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

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

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

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

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

3.2.1.3 Anvil Points Claystone Cave

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

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

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

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

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

3.2.1.4 Geologic Hazards

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

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

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

3.2.2 Paleontological Resources

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

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

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

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

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

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

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

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

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

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

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

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

3.2.3 Soils

3.2.3.1 General Soil Characteristics

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

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

3.2.3.2 Soils atop the Plateau

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

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

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

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

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

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

3.2.3.3 Soils below the Rim, Southern and Western Areas

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

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

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

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

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

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

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

3.2.3.4 Soils below the Rim, Eastern Area

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

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

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

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

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

3.2.3.5 Soils along Major Drainages

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

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

The principal soils along the major drainages are:

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

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

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

3.2.3.6 Erodibility

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

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

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

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

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

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

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

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

3.2.3.7 Compaction

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

3.2.4 Water Resources

3.2.4.1 Surface Water

Planning Objective

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

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

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

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

Physical Characteristics and Setting

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Surface Water Quality

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Source: TRW (1982)

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

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

Source: BLM (2001d)

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

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

Source: BLM (2001d)

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

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

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

3.2.4.2 Groundwater

Planning Objectives

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

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

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

Characteristics and Setting

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

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

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

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

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

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

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

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

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

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

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

3.2.4.3 Water Yield

Planning Objectives

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

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

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

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

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

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

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

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

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

Characteristics and Setting

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

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

Factors Affecting Water Yield

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

3.2.4.4 Water Rights

Planning Objectives

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

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

Characteristics and Setting

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

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

Factors Affecting Water Rights

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

3.2.5 Climate and Air Quality

3.2.5.1 Climate

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

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

3.2.5.2 Air Quality

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3.3 BIOLOGICAL ENVIRONMENT

3.3.1 Vegetation and Riparian/Wetland Communities

3.3.1.1 Introduction

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

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

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

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

3.3.1.2 Major Plant Community Types

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

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

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

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

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

Lands atop the Plateau

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

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

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

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

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

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

Lands below the Rim

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

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

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

3.3.1.3 Current Condition and Trends

Upland Vegetation

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

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

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

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

Riparian/Wetland Vegetation

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

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

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

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

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

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

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

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

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

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

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

Noxious Weeds and Other Invasive Non-Native Species

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

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

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

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

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

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

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

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

3.3.1.4 Current Management and Desired Future Conditions

Upland Vegetation

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

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

Riparian/Wetland Vegetation

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

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

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

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

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

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

Noxious Weeds

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

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

3.3.2 Terrestrial and Aquatic Wildlife

3.3.2.1 Introduction

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

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

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

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

3.3.2.2 Major Habitat Types

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

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

Semi-desert Scrub

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

Sagebrush Shrubland

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

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

Pinyon/Juniper Woodland

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

Mixed Mountain Shrubland

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

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

Aspen Forest

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

Conifer Forest

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

Low Elevation Riparian/Wetland Communities

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

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

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

High Elevation Riparian/Wetland Communities

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

Aquatic Habitats

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

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

Cliffs and Caves

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

3.3.2.3 Current Use by Wildlife

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

Big Game Ungulates (Hoofed Mammals)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Large Carnivores

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

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

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

Other Mammals

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

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

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

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

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

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

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

Bird

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

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

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

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

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

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

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

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

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

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

Reptiles and Amphibians

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

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

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

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

Fish

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

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

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

3.3.2.4 Current Condition and Trends

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

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

Land Health Assessments

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

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

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

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

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

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

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

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

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

Resource Capabilities

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3.3.2.5 Current Management and Desired Future Conditions

Management Plans and Documents

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

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

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

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

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

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

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

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

Management Direction

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

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

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

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

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

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

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

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

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

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

Future Management

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

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

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

3.3.3 Special Status Plants and Significant Plant Communities

3.3.3.1 Introduction

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

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

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

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

3.3.3.2 Current Condition and Trends

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

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

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

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

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

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

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

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

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

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

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

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

Federally Listed, Proposed, or Candidate Threatened or Endangered Species

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

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

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

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

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

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

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

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

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

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

BLM Sensitive Species

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

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

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

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

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

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

Other Potential Special Status Plant Species

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

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

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

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

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

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

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

Significant Plant Communities

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

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

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

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

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

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

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

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

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

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

3.3.3.3 Current Management and Desired Future Conditions

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

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

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

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

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

3.3.4 Special Status Fish and Wildlife

3.3.4.1 Introduction

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

3.3.4.2 Current Conditions and Trends

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Federally Listed, Proposed, or Candidate Threatened or Endangered Species

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3.3.4.3 Current Management and Desired Future Conditions

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

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

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

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

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

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

3.3.5 Wild Horses and Burros

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

3.4 HUMAN ENVIRONMENT

3.4.1 Visual Resources

3.4.1.1 Landscape Character and Scenic Quality

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

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

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

Lands on top of the Plateau

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

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

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

Lands below the Rim

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

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

3.4.1.2 Viewing Distance Zones and Visual Sensitivity

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

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

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

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

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

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

3.4.1.3 Key Viewsheds

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

Interstate 70 Viewshed

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

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

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

State Highway 13 Viewshed

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

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

Rim Road Viewshed

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

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

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

Other Viewsheds Considered but Not Analyzed

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

3.4.1.4 Current VRM Classes and Visual Resource Management

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

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

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

Visual Resource Management

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

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

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

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

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

Current Protective Visual Stipulations

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

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

3.4.2 Cultural Resources

3.4.2.1 Introduction

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

3.4.2.2 Prehistoric and Historic Context

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

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

Table 3-17. Northern Colorado River Basin Prehistory Chronology

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

Source: Reed and Metcalf (1999)

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

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

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

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

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

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

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

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

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

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

3.4.2.3 Results of Previous Investigations

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

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

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

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

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

3.4.2.4 Traditional Cultural Properties

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

3.4.2.5 Sensitivity Zones

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

Table 3-19. Cultural Resource Type by Location

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

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

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

3.4.2.6 Use Allocations

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

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

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

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

No Allocation

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

Scientific Use

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

Conservation for Future Use

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

Traditional Use

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

Public Use

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

Experimental Use

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

Discharged from Management

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

3.4.2.7 Data Gaps

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

3.4.3 Socioeconomics

3.4.3.1 Area of Analysis

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

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

3.4.3.2 Population

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

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

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

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

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

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

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

3.4.3.3 Environmental Justice

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

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

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

3.4.3.4 Employment and Income

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

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

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

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

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

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

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

Ranching

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

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

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

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

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

Hunting and Recreation

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

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

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

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

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

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

Oil and Gas

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

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

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

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

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

3.4.3.5 Public Revenue

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

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

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

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

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

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

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

Source: Colorado Department of Local Affairs (2002)

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

3.4.3.6 Quality of Life Considerations

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

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

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

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

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

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

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

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

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

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

3.4.3.7 Growth Scenarios for the Planning Area

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

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

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

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

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

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

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

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

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

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

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

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

3.4.4 Transportation

3.4.4.1 Major Highways and Access Roads

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

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

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

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

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

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

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

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

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

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

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

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

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

3.4.4.2 BLM Roads and Trails

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

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

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

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

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

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

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

3.5 MANAGEMENT ENVIRONMENT

3.5.1 Lands and Realty

3.5.1.1 Introduction

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

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

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

Table 3-29. Land Ownership in the Planning Area

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

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

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

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

3.5.1.2 Withdrawals

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

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

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

3.5.1.3 Land Tenure Categories

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

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

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

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

3.5.1.4 Land Use Authorizations

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

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

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

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

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

3.5.2 Onsite Travel Management

3.5.2.1 Plans and Documents

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

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

3.5.2.2 Current Management

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

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

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

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

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

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

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

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

3.5.2.3 Current Use

Lands atop the Plateau

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

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

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

Lands below the Rim

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

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

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

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

3.5.3 Recreation

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

3.5.3.1 Factors Creating Recreation Management Challenges

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

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

3.5.3.2 Administrative Framework

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

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

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

3.5.3.3 Current Management

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

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

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

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

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

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

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

3.5.3.4 Resource Condition and Characteristics atop the Plateau

Activities

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

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

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

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

Recreational Settings

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

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

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

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

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

Experiences and Outcomes

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

3.5.3.5 Resource Condition and Characteristics below the Rim

Activities

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

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

Recreational Setting

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

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

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

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

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

Experiences and Outcomes

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

3.5.3.6 Current and Projected Recreational Use

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

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

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

3.5.3.7 Tourism

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

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

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

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

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

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

3.5.4 Grazing and Rangeland Management

3.5.4.1 Management Plans and Documents

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

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

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

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

3.5.4.2 Current Management

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

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

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

3.5.4.3 Characteristics and Setting

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

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

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

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

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

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

[3] *Sharrard Park is not allotted.*

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

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

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

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

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

3.5.4.4 Resource Condition and Capabilities Evaluation

Allotments atop the Plateau

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Allotments below the Rim

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

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

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

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

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

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

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

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

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

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

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

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

3.5.5 Oil and Gas

3.5.5.1 Oil and Gas Resource

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

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

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

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

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

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

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

3.5.5.2 Drilling and Production

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

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

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

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

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

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

3.5.5.3 Recoverable Resources

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

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

3.5.5.4 Leasing

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

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

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

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

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

3.5.5.5 Coalbed Natural Gas

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

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

3.5.6 Other Minerals

3.5.6.1 Oil Shale

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

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

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

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

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

3.5.6.2 Coal

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

Coalbed natural gas is discussed in Section 3.5.5.6.

3.5.6.3 Other Leasable Minerals

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

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

3.5.6.4 Locatable Minerals

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

3.5.6.5 Mineral Materials

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

3.5.7 Areas of Critical Environmental Concern (ACECs)

3.5.7.1 Introduction

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

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

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

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

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

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

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

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

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

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

3.5.7.2 Anvil Points ACEC

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

Scenic Values

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

Geologic Values

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

Wildlife Values

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

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

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

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

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

Botanical/Ecological Values

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

Plant Species

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

Plant Communities

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

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

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

3.5.7.3 Magpie Gulch ACEC

The proposed ACEC is situated on the east- and northeast-facing slopes below the Roan Plateau (Map 1). Elevations drop from 9,200 feet at the cliff edge to 6,500 feet in the canyons below. The boundaries of the 5,846-acre unit are virtually the same as those in the area having wilderness character along the Northeast Cliffs portion of the Planning Area: the western boundary follows the eastern cliff edge of the Roan Plateau, and to the north and east is defined by private property and an electric transmission (powerline) ROW. The southern boundary is delineated by the JQS Road and private property. One 40-acre private in-holding is located in the northern portion of the proposed ACEC. Vegetation on north-facing slopes is dominated by mature to old-growth Douglas-fir; south-facing slopes consist of mixed mountain shrub communities at the higher elevations and pinyon/juniper at lower elevations. Benches and terraces along the lower slopes support sagebrush communities.

Scenic Values

Magpie Gulch includes steep, dramatic shale cliffs which give way to deep gulches and rugged ridges at lower elevations on the eastern-most edge of the Roan Plateau. The stark contrast of the vertical barren white cliffs to the heavily vegetated slopes accentuates this unit's rugged character and exceptional scenic qualities. This unique landscape is regionally significant as it provides a scenic backdrop to the communities of Rifle, Silt, and New Castle, and to travelers along I-70 and SH 13. This area warrants special management attention because the eastern-most portion of the Roan Cliffs is not only locally important but also represents a significant visual feature on a regional scale. The qualities and character of this scenic viewshed make it sensitive or vulnerable to adverse change.

Wildlife Values

Magpie Gulch has a wide diversity of vegetation types including stringers of Douglas-fir, aspen, oakbrush, mixed mountain shrub, pinyon/juniper, sagebrush benches, and limited riparian. These various habitat types provide essential food, cover, water, and seclusion for many wildlife species. For this reason, it is one of the few areas where migration routes exist from the top of the Roan Cliffs to the lower slopes. The southern aspects, supporting shrub and pinyon/juniper communities, are critical to mule deer during severe winters as they provide areas free from snow in which mule deer can forage. The proximity of these open, southern slopes to higher density brush and tree habitats is also critical as a cover component. This mosaic of habitat types and their proximity to each other also provide important nesting areas for a variety of bird species including wild turkey, blue grouse, and numerous migratory species, as well as critical production habitats for many other wildlife species.

Because of the diversity in vegetation and elevation, Magpie Gulch is important in maintaining a rich and diverse mix of wildlife habitats. Its unroaded nature provides seclusion among an array of habitat types important to a diverse grouping of species and is irreplaceable and exemplary in nature. This area is vulnerable to adverse changes, including habitat fragmentation and a resultant loss of species diversity.

Botanical/Ecological Values

This proposed ACEC supports several excellent examples of small, unfragmented old-growth Douglas-fir communities, which in turn support small populations of three-toed woodpeckers. The old-growth Douglas-fir communities occur as numerous stringers and large patches (Maps 21 and 22), which together encompass approximately 1,600 acres along the north-facing slopes of the unit. CNHP has ranked it as a B-3 "highly significant" area for its biological diversity. Historic wildfires have helped create a healthy mosaic of dense and open areas important to the diverse wildlife of this area. Three-toed woodpeckers

now thrive in small areas of the conifer forest inflicted with beetle infestations (Crockett and Hansley 1978).

The proposed Magpie Gulch ACEC meets the relevance criterion for natural processes as it contains several small but excellent examples of intact old-growth Douglas-fir communities. The area meets the importance criterion because this resource represents a remnant community type within the region; thus it is an important site for protecting an example of this community type.

3.5.7.4 East Fork Parachute Creek ACEC

This proposed ACEC includes 9,776 acres in the headwaters of East Fork Parachute Creek, a small but biologically significant tributary to the Colorado River drainage. The headwaters for this creek begin at approximately 9,000 feet in elevation with gently rolling hills covered with aspen forests, sagebrush and snowberry shrublands, and native grasslands. East Fork Parachute Creek originates near the eastern rim of the Roan Plateau and flows westward, cutting through the Green River shale to form a deep canyon before plunging 200 feet into a narrow, scenic box canyon. The resource values within the proposed ACEC include this scenic waterfall and box canyon, Colorado River cutthroat trout habitat, a BLM sensitive plant species, a Green River shale endemic plant species, and three significant plant communities (Maps 21 and 22). Most of the proposed ACEC boundary is coterminous with the boundary of the area having wilderness character in the East Fork Parachute Creek basin.

Scenic Values

The scenic area within the proposed East Fork Parachute Creek ACEC starts about midway down East Fork Parachute Creek where a 200-foot waterfall drops into a dramatic box canyon running to the west. The viewshed consists of steep canyon walls with vertical relief of over 2,000 feet from the top of the canyon to the lowest reaches of the creek. Dramatic visual contrast is created by the narrow, incised canyon and the changes in form, line, and color. The diversity and stark contrasts resulting from the steep, barren cliffs falling off to spruce fir forests create a national park-quality scenic attraction. While this scenic portion of the study area is not one-of-a-kind, the region includes few other canyons of this scale and with similar setting. East Fork Canyon was determined to be one of five high-quality (Class A) scenic areas in the 1984 GSRA RMP.

East Fork Parachute Creek meets the ACEC relevance criterion because it contains significant scenic values. It meets the ACEC importance criterion because the scenic values are irreplaceable and deserving of special management.

Fish and Wildlife Values

This area contains year-round habitat for Colorado River cutthroat trout (Section 3.3.4). This subspecies is the only native trout in the Colorado River Basin and is designated as a special status species by the States of Colorado, Utah, and Wyoming. In addition, the Colorado River cutthroat trout is classified as a sensitive species by Regions 2 and 4 of the USFS, and by the BLM in Colorado and Utah. Colorado River cutthroat trout were petitioned for Federal listing as threatened or endangered under ESA on December 9, 1999.

East Fork Parachute Creek and JQS Gulch are two of five conservation populations located within the Planning Area (along with Trapper, Northwater, and East Middle Fork Parachute Creeks). A conservation population is defined as a reproducing and recruiting population of native cutthroat trout that is managed to preserve the historical genome and/or unique genetic, ecological, and/or behavioral characteristics within specific population and within geographic units (CRCT Task Force 2001).

This area meets the relevance criterion for wildlife resources as it contains a genetically pure population of native, wild, naturally reproducing Colorado River cutthroat trout that has been identified as a conservation population. The area satisfies the importance criterion since these streams are regionally

and nationally important producers of native, genetically pure, and naturally reproducing Colorado River cutthroat trout.

Botanical/Ecological Values

This proposed ACEC supports the following rare plants and significant plant communities and provides the habitat that sustains the ecosystem processes upon which these plants depend:

Plants

- Hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*)
- Utah fescue (*Argillochloa dasyclada*)
- Southwest stickleaf (*Nuttallia argillosa* or *Mentzelia argillosa*)

Plant Communities

- Montane riparian forest (Colorado blue spruce/red osier dogwood)
- Boxelder riparian forest (boxelder, narrowleaf cottonwood, and red osier dogwood)
- Western slope grassland (Indian ricegrass shale barrens)

A unique wetland feature found along East Fork Parachute Creek and its tributaries is the "hanging gardens." Hanging gardens occur along seeps limited to the walls of waterfalls or cliffs. These seeps are most abundant on north-facing slopes along East Fork Parachute and Northwater Creeks where the Green River shale beds are exposed within the canyon walls. The hydrologic flows, combined with the Green River shale substrate, create the unique environment which supports the hanging garden sullivantia, a Colorado endemic plant. The plant is narrowly restricted to calcareous seeps and is found in abundance in these hanging gardens. Although it occurs in several locations other than the Roan Plateau, it occurs more often and more extensively in the Roan Plateau than anywhere else (CNHP 1997a). Combined with occurrences in the proposed Trapper/Northwater Creek ACEC, this represents nearly 62 percent of the total known occurrences.

Utah fescue is a perennial grass and an oil shale endemic species found within this proposed ACEC. It is restricted to barren scree slopes or sparsely vegetated Douglas-fir communities in soils derived from oil shales, especially the Green River Formation or Uinta Formation sandstone. It often occurs with other oil shale endemics.

Southwest stickleaf, a BLM sensitive species, is an oil shale endemic that frequently occurs with other such species. Populations of Southwest stickleaf occur on steep talus slopes below the falls on East Fork Parachute Creek.

As East Fork Parachute Creek begins to cut through the Green River shale approximately a mile above the waterfall, the canyon narrows and the riparian vegetation changes from willow-dominated communities to spruce/fir and narrowleaf cottonwoods. The montane riparian forest or Colorado blue spruce/red osier dogwood plant community is found in only a handful of riparian areas in Colorado. Below the waterfall, the riparian vegetation changes to a more low-elevation type of boxelder riparian forest or boxelder, narrowleaf cottonwood, and red osier dogwood community, which is considered rare on a global and State-wide scale.

The western slope grassland or Indian ricegrass shale barrens community occurs on south-facing slopes composed of shale or mudstone soils, often capped with a thin layer of gravel. This grassland community is sparsely vegetated, with often less than 25 percent vegetation cover. Indian ricegrass is the dominant species, with smaller amounts of other grasses, scattered shrubs, and forbs, including several special status plant species. This plant community is extremely limited in distribution. It occurs only in three counties in western Colorado. It is restricted to south-facing slopes with soils derived from shales or

mudstones. Within the Planning Area, this community is found on south-facing slopes of East Fork Parachute Creek, Northwater Creek, Trapper Creek, and Ben Good Creek.

Maps 21 and 22 illustrate the occupied habitat for rare plants and plant communities within the East Fork Parachute Creek watershed.

The proposed East Fork Parachute Creek ACEC meets the relevance criterion for natural processes as it contains a diversity of rare or uncommon riparian plant communities and BLM sensitive plant species. The area also meets the importance criterion since the rare plants and plant communities found in this drainage are of excellent condition and abundance and are vulnerable to adverse change.

3.5.7.5 Trapper/Northwater Creek ACEC

The proposed Trapper/Northwater Creek ACEC comprises 10,296 acres. In this area, Trapper Creek, Northwater Creek, and East Middle Fork Parachute Creek flow roughly parallel to East Fork Parachute Creek. Northwater Creek and Trapper Creek are smaller tributaries with their headwaters at the eastern edge of the Roan Plateau and flow 4 to 5 miles across the plateau before merging to form East Middle Fork Parachute Creek (Figure 1-2). The upper reaches of both Trapper and Northwater Creek have more gentle side slopes than East Fork Parachute Creek, although all three cut the Green River Shale. The canyon walls become steeper and more abrupt just above their confluence. East Middle Fork Parachute Creek continues to cut deeper into the Green River shale before plunging over a waterfall approximately one mile west of the public land boundary. The riparian vegetation in these three drainages is not as diverse as that in the East Fork, although East Middle Fork Parachute Creek and the lower segment of Northwater Creek do support hanging gardens.

Fish and Wildlife Values

Like East Fork Parachute Creek, this area contains year-round habitat for Colorado River cutthroat trout, the only native trout of the Colorado River Basin and designated as a special status species by the States of Colorado, Utah, and Wyoming. In addition, the Colorado River cutthroat trout is classified as a sensitive species by Regions 2 and 4 of the USFS, and by BLM in Colorado and Utah. A petition was filed for listing Colorado River cutthroat trout under ESA on December 9, 1999.

Trapper, Northwater, and East Middle Fork Parachute Creeks are three of five conservation populations located within the Planning Area (along with East Fork Parachute Creek and JQS Gulch). Those in Northwater and Trapper Creeks are classified as core conservation populations. A core conservation population is based on a genetic purity of 99 percent or higher. These populations are "managed to preserve the historical genome and/or unique genetic, ecological, and/or behavioral characteristics within specific populations and within geographic units (CRCT Task Force 2001).

This area meets the relevance criterion for wildlife resources as it contains a genetically pure population of native, wild, naturally reproducing Colorado River cutthroat trout that have been identified as a core conservation population. The area satisfies the importance criterion since these streams are regionally and nationally important producers of native, genetically pure, and naturally reproducing Colorado River cutthroat trout.

Botanical/Ecological Values

This proposed ACEC supports the following rare plants and significant plant communities and provides the habitat that sustains the ecosystem processes upon which these plants depend:

Plants

- Hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*)
- Utah fescue (*Argillochloa dasyclada*)

Plant Communities

- Sagebrush bottomland shrubland (western slope sagebrush shrubland community)
- Western slope grassland (Indian ricegrass shale barrens)

East Middle Fork Parachute Creek and the lower portion of Northwater Creek contain a unique hanging gardens wetland feature. Hanging gardens occur along seeps limited to the walls of waterfalls or cliffs. Seeps are most abundant on north-facing slopes where the Green River Shale beds are exposed within the canyon walls. The hydrologic flows, combined with the Green River Shale substrate, create the unique environment which supports the hanging garden sullivantia, a Colorado endemic plant that is narrowly restricted to calcareous seeps and is found in abundance in these hanging gardens. Although it occurs in several locations other than the Roan Plateau, it occurs more frequently and extensively in the Planning Area than anywhere else (CNHP 1997a), comprising nearly 62 percent of the total known occurrences when combined with those in the proposed East Fork Parachute Creek ACEC.

Utah fescue is a perennial grass and an oil shale endemic species found within this proposed ACEC. It is restricted to barren scree slopes or sparsely vegetated Douglas-fir communities in soils derived from oil shales, especially the Green River Formation or Uinta Formation sandstone. It often occurs with other oil shale endemics.

The sagebrush bottomland shrubland or Western slope sagebrush shrubland community has only been described as occurring on the western slope of Colorado (Johnston 1987), although there is no apparent reason why this type could not be found in Utah and Wyoming as well. On the Roan Plateau, this plant association was located on private land along a Northwater Creek tributary. Thurber fescue, a component of this community, is uncommon on the Roan Cliffs. It is possible that Thurber fescue was once a more common grass on the plateau and that a century of grazing has favored sagebrush and smaller grasses over Thurber fescue.

The Western slope grassland or Indian ricegrass shale barrens community occurs only on south-facing slopes composed of shale or mudstone soils, often capped with a thin layer of gravel. This grassland community is sparsely vegetated, with often less than 25 percent vegetation cover. Indian ricegrass is the dominant species, with smaller amounts of other grasses, scattered shrubs, and forbs, including several special status plant species. This community is extremely limited in distribution, occurring in only three Counties in western Colorado. Within the Planning Area, it is restricted to south-facing slopes of East Fork Parachute, Northwater, Trapper, and Ben Good Creeks.

The Trapper/Northwater Creek ACEC meets the relevance criterion for natural processes or systems because it contains the Colorado endemic hanging garden sullivantia, rare Utah fescue, and two uncommon plant communities: the sagebrush bottomland shrubland association and the rare Western slope grassland community. The area also meets the importance criterion since the Roan Plateau hanging gardens comprise nearly 62 percent of the total known occurrences and are therefore of special consequence and vulnerable to adverse change. The sagebrush/fescue site is also important because it is the only site documented within the Planning Area.

3.5.8 Areas Having Wilderness Character

3.5.8.1 Plan Conformance

The Planning Area includes the NOSR lands, which were not under BLM jurisdiction when FLPMA was enacted and not part of the original wilderness inventory of public lands performed pursuant to Sections 201 and 603 of FLPMA. Instead, as newly acquired lands, they fell under the general inventory and planning authority of Section 201 and 202. These lands were inventoried for wilderness character using

procedures identified in the BLM Wilderness Inventory Handbook, September 27, 1978 and Colorado Wilderness Review Procedures, June 18, 1997.

This process entailed identification of wilderness inventory units, an inventory of roads and wilderness character, and a determination of whether the units possess wilderness characteristics as defined by the Wilderness Act of 1964 (BLM Handbook H-6310-1)(BLM2001e). Units found to possess such characteristics are evaluated during the land-use planning process to address future management. The inventory consisted of a review of roads, wilderness characteristics, and supplemental values in each unit. The following factors were documented:

1. Size – Generally, roadless units must be larger than 5,000 acres.
2. Naturalness – An area is judged to be natural if it "… generally appears to have been affected primarily by the forces of nature, with the imprint of [human activity] substantially unnoticeable." Naturalness is a required component for designation.
3. Solitude or Primitive and Unconfined Recreation – An area must have outstanding opportunities for solitude or primitive and unconfined recreation. At least one of these qualities is required for designation.
4. Supplemental Values – The inventory notes whether the units contain "ecological, geological, or other features of scientific, educational, scenic, or historical value." This is not necessarily required for designation.

3.5.8.2 Roan Plateau Wilderness Inventory

Portions of the transferred lands were inventoried in 1998 and found not to have wilderness character, as documented in the 1999 FSEIS. The remaining transferred lands were inventoried by BLM in 1999 and 2000, including four inventory units: East Fork Parachute Creek, Trapper Creek, Northeast Cliffs, and Southeast Cliffs (Table 3-32). The following subsections describe the wilderness qualities of each of the four inventory units.

Table 3-32. Results of Wilderness Character and Roadless Inventory (acres)

Unit	*Area Inventoried*	*Roadless Area*	*Wilderness Character*	*No Wilderness Character*
East Fork Parachute Creek	14,342	12,403	8,330	4,073
Trapper Creek	11,373	9,073	0	9,073
Northeast Cliffs	5,847	5,845	5,799	46
Southeast Cliffs	5,338	5,336	5,193	145
Total	**36,900**	**32,657**	**19,322**	**13,337**

East Fork Parachute Creek Inventory Unit

This area contains 14,342 acres of Federal land, of which 12,403 acres are roadless. Within the roadless area, 8,330 acres were found to have wilderness character. This includes approximately 7.5 miles of the East Fork Parachute Creek stream corridor and 22.5 miles along eleven small tributaries. Much of the East Fork drainage appears to have been affected primarily by the forces of nature, with little evidence of human activity such as roads and livestock developments.

The main stream has created a deep and scenic canyon. Steep topography and dense vegetation in the middle and lower portions of the drainage provide outstanding opportunities for solitude and for primitive and unconfined recreation such as hiking, horseback riding, photography, wildlife viewing, wildflower study, camping, and sightseeing. The area is also used for hunting and fishing. Eleven separate areas

representing 4,073 acres have noticeable imprints of human activity that detract from naturalness and therefore lack wilderness character. These imprints include roads, ways, fences, stockponds, and spring developments. Although perhaps unnoticeable on their own, the combined effects can be significant.

Several supplemental values were identified in the unit. The unit possesses high scenic values, including a 200-foot waterfall and dramatic box canyon extending to the west. The viewshed consists of steep canyon walls with vertical relief of more than 2,000 feet. Dramatic visual contrast is created by the deep, narrow canyon and changes in form, line, and color. The diversity and stark contrast of the barren cliffs abruptly changing to coniferous forest creates a scenic quality comparable to a national park. The GSRA RMP (1984, revised 1988) listed East Fork Parachute Creek Canyon as one of five high-quality (Class A) scenic areas in the resource area.

In 1996, portions of this unit were classified as a "Very Significant" conservation site by CNHP. This biologically diverse site hosts 21 elements tracked by the CNHP, including nine significant natural plant communities, four rare plant species, one rare butterfly species, one BLM sensitive fish species (the Colorado River cutthroat trout), five rare bird species, and one rare mammal species. The unit also contains cliff seeps that support one of the highest concentrations of populations of hanging garden sullivantia. Other supplemental values include fossil resources in the Green River Formation, cultural resources such as hunting grounds for Native Americans, and ranch structures from the late 1800s.

Trapper Creek Inventory Unit

The Trapper Creek unit includes 11,373 acres of Federal lands, of which 9,073 acres met the definition of roadless. However, areas meeting the definition of "natural" were relatively small and isolated, consisting of 2,700 acres in the western part of Trapper and Northwater Creeks and 1,300 acres in the eastern headwaters of Trapper Creek. These two natural areas are separated by a 2-mile section of Trapper Creek that contains numerous livestock developments, travel routes, fences, and other man-made features that dominate the landscape.

The two natural areas provide outstanding opportunities for solitude, but the remainder of the unit lacks this characteristic due to the collective impacts from numerous human-related developments.

Outstanding opportunities for primitive and unconfined recreation occur throughout much of the unit, especially within the drainages in the western portions of Trapper and Northwater Creeks. As in the East Fork unit, undeveloped recreation could include hiking, horseback riding, photography, wildlife viewing, wildflower study, camping, and sightseeing. The area is also used for hunting and fishing.

Several supplemental values exist in this area, including ten elements deemed "significant" by the CNHP. These include several wetland communities, two species of rare plants, two populations of Colorado River cutthroat trout, and three bird species of concern. Other noted supplemental values included scenic values in the western portions of Trapper and Northwater Creeks, fossil resources, and historic and prehistoric cultural resources.

Areas that were predominantly natural in character were significantly less than 5,000 acres. Therefore, the Trapper Creek Unit did not meet the mandatory wilderness characteristics to warrant further evaluation of wilderness character.

Northeast Cliffs Inventory Unit

This unit contains 5,847 acres of Federal land, of which all but 2 acres related to a road was found to meet roadless criteria. More than 99 percent of the unit (5,799 acres) was found to have wilderness character; the remaining 46 acres was located between an old ditch and its parallel access road in Magpie Gulch.

The Northeast Cliffs unit is long and narrow, about 7 miles by 2 miles. Rugged terrain offers outstanding opportunities for solitude and primitive and unconfined recreation, although access is limited by adjoining private land on the east and steep bluffs on the west. Only the hardiest hikers and hunters are able to enjoy the seclusion offered by the topographic screening and dense vegetation.

An important supplemental value identified in this unit is its scenic quality. Steep, dramatic shale cliffs give way to deep gulches and rugged ridges at lower elevations on the eastern edge of the Roan Plateau. The stark contrast between the vertical white cliffs and the heavily vegetated slopes below accentuates this unit's rugged character. This landscape is regionally significant because it provides a scenic backdrop to the communities of Rifle, Silt, and New Castle and to travelers along I-70 and SH 13.

Other supplemental values found include excellent examples of old-growth Douglas-fir communities, habitat for the uncommon American three-toed woodpecker, and a security area for deer and elk during the hunting season.

Southeast Cliffs Inventory Unit

This unit offers visitors outstanding opportunities for solitude and primitive and unconfined recreation despite its narrow configuration, about 6 miles long and not quite 3 miles at its widest part. The total area within the inventory boundary was 5,338 acres, of which all but 2 acres were found to be roadless. The total area found to have wilderness character was 5,193 acres (97 percent).

Because of the unit's steep and rugged terrain, the area is undeveloped and has few human-related impacts. The few human imprints found were insignificant and do not detract from the area's overall naturalness. The diverse topography of the Southeast Cliffs includes sheer, barren 2,500-foot-high cliffs, separating gently rolling terrain on top of the plateau from the ruggedly dissected ridges below. The varied terrain provides natural screening for those hardy enough to access it.

Access is limited due to private land bounding the unit on the south and southwest, while difficult terrain restricts most visitor use in the western part below the rim. However, once in the area, visitors have excellent opportunities to disperse and enjoy undeveloped types of recreation such as hiking, photography, wildlife viewing, wildflower study, and sightseeing. Horseback riding is possible in some parts as well. The area is currently used for hunting.

An important supplemental value in this unit is its scenic quality. The Southeast Cliffs contain Anvil Points, a prominent rock feature that dominates the cliffs on the southern edge of the Roan Plateau and is a natural landmark along the I-70 corridor. The scenic quality of the cliffs from below is equaled or surpassed by the scenic quality of the cliffs and Colorado River valley from the upper part of the unit.

Other supplemental values include 14 elements along the Anvil Points rim that are tracked by the CNHP. One element, the Parachute penstemon, has been found in only one other location in the world. The unit also includes the Yellow Slide, which some claim to be a meteor impact site. Several oil shale endemic plants, two butterfly species, nest sites for the peregrine falcon, nesting habitat for the Columbia sharp-tailed grouse, deer and elk security areas, aesthetic and scenic qualities, and geological and paleontological values are found there.

3.5.9 Wild and Scenic Rivers

3.5.9.1 Introduction

The WSRA of 1968 established a National Wild and Scenic Rivers System (NWSRS) for the protection of rivers with important scenic, recreational, fish and wildlife, and other values. The act designated 17 river segments for immediate inclusion in the system and prescribed the methods and standards by which other rivers may be added to the system.

As part of the planning process, a BLM interdisciplinary team completed a WSR study under Section 5(d)(1) of the WSRA. BLM's policy is to adhere to the requirements of the WSRA by identifying and evaluating "all rivers on BLM-administered lands to determine if they are appropriate for addition to the NWSRS" (BLM Manual 8351). With the addition of the NOSR lands to BLM's management base, it became necessary to initiate a process that would first evaluate streams and rivers in the recently acquired

lands for their *eligibility* as potential additions to the NWSRS and then to determine the *suitability* of eligible streams—i.e., suitability being a higher standard than eligibility. Inclusion in the NWSRS requires action by Congress.

The examination to determine eligibility was completed by BLM in September 2002 (*Roan Plateau Eligibility Report for the National Wild and Scenic Rivers System*)(BLM 2002e). A suitability study will be conducted sometime after completion of this RMPA/EIS and will undergo a separate NEPA analysis. For this RMPA/EIS, all streams deemed eligible for inclusion in the NWSRS are considered as suitable under some alternatives but not suitable under others to allow analysis of the full spectrum of impact outcomes.

3.5.9.2 Eligibility Process

The WSR eligibility report was prepared by an interdisciplinary BLM team that reviewed all BLM-administered public lands along rivers and streams within the Planning Area. BLM guidance calls for evaluation of stream segments that meet the criteria of "free-flowing" and having "outstandingly remarkable values" (ORVs). The WSRA defines a river as any "flowing body of water or estuary, or a section, portion or tributary thereof, including rivers, streams, creeks, runs, kills, rills, and small lakes." The Roan Plateau eligibility team determined that 31 perennial streams totaling 64 miles of stream length within the Planning Area warranted evaluation. Map 16 shows those streams; Table 3-33 lists the stream segments and summarizes the team's findings.

As shown by Table 3-33, a total of 24 miles of stream length were found to be eligible for WSR designation. Of the 31 perennial streams evaluated, 24 were found to be free flowing—i.e., "existing or flowing without impoundment, diversion, straightening, armoring with riprap, or other modification of the waterway."

The second eligibility criterion involves the assessment of ORVs, which are river-related values that are unique, rare, or exemplary features and that are significant on a regional or national scale. The WSRA calls for evaluation of the scenic, recreation, geology, fish, wildlife, cultural, and historic values, and other similar values, when determining if the segment possesses ORVs. In the case of the Planning Area, botanical/ecological and hydrologic values were also assessed. Only one such value need exist to warrant a determination of eligibility. ORVs in the Planning Area were compared with those in the Utah High Plateau and the Southern Rocky Mountain ecoregions to evaluate regional significance.

The boundaries of any river proposed for addition to the NWSRS are usually limited to that area within 0.25 mile of the ordinary high water mark on each side of the river. Within the Planning Area, analysis was limited to this width on all river segments, except on the western portions of East Fork Parachute Creek, where the boundary was increased to encompass areas of outstanding scenic value. Once a river segment has been determined to be eligible, BLM's policy is to protect and, where possible, enhance any identified ORV pending a subsequent suitability determination and/or designation by Congress (BLM Manual 8351). In the interim, management and authorized uses are not allowed to affect either the eligibility or tentative classification of the segment.

3.5.9.3 Eligibility Findings

Of the original list of 31 streams evaluated, eight were found to have ORVs: Trapper Creek, Northwater Creek, East Middle Fork Parachute Creek, East Fork Parachute Creek, First Anvil Creek, Second Anvil Creek, Golden Castle Gulch, and JQS Gulch (Table 3-33). ORVs fell into three categories: scenic, fisheries, and botanical/ecological.

Table 3-33. Summary of Findings of WSR Eligibility Determination [1]

Name of Stream	*Free Flowing*	*Outstandingly Remarkable Values [2]*	*Eligible*	*Eligible miles*
Ben Good Creek	yes	--	no	--
Bull Gulch	yes	--	no	--
Corral Gulch	yes	--	no	--
Cottonwood Creek	yes	--	no	--
East Fork Parachute Creek	yes	B, F, S	yes	7.5
East Middle Fork Parachute Creek	yes	F	yes	1.1
First Anvil Branch	no	--	no	--
First Anvil Creek	yes	B, F	yes	--
Forked Gulch	no	--	no	--
Golden Castle Creek	yes	B, F	yes	--
Goodrich Creek	yes	--	no	--
Government Creek	no	--	no	--
JQS Branch	yes	--	no	--
JQS Gulch	yes	B, F	yes	1.1
JV Gulch	yes	--	no	--
Northwater Creek	yes	B, F	yes	--
Northwater Branches	yes	--	no	--
Raspberry Creek	yes	--	no	--
Second Anvil Creek	yes	B	yes	1.8
Second Water Creek	yes	--	no	--
Sheep Trail Hollow Creek	no	--	no	--
Third Water Creek	yes	--	no	--
Thirty Two Mile Creek	no	--	no	--
Tichner Creek	yes	--	no	--
Timber Gulch	yes	--	no	--
Trapper Creek	yes	F	yes	6.1
West Forked Creek	yes	--	no	--
Yellow Jacket	yes	--	no	--
TOTAL				**24.0**

[1] *Source: BLM/GSFO Roan Plateau Preliminary Findings Wild and Scenic Eligibility Review (May 2002)*

[2] *B = Botanical/Ecological, F = Fisheries (Colorado River cutthroat trout), S = Scenic*

Scenic Values

Of the 64 miles of streams and creeks analyzed within the Planning Area, only one segment, East Fork Parachute Creek west of the falls and box canyon was found to contain scenic ORVs. This segment includes approximately 1.5 miles of East Fork Parachute Creek, starting at a waterfall and dropping into a dramatic box canyon extending to the west. The waterfall, one of the highest in Colorado, dominates the viewshed within the eastern reach of the canyon. While this scenic segment is not one of a kind, it is unusually rare and distinctive. Few canyons in the region contain a scenic feature of this scale or quality.

Fisheries Values

The value of a stream for fish may be judged on the relative merits of the fish populations, habitat, or a combination. Several streams are nationally or regionally important for sustaining native, genetically pure, and naturally reproducing populations of Colorado River cutthroat trout (Section 3.3.4).

The Colorado River cutthroat trout is the only native trout of the Colorado River Basin and has been designated as a special status species by the States of Colorado, Utah, and Wyoming. In addition, it is classified as a sensitive species by Regions 2 and 4 of the USFS and by BLM in Colorado and Utah.

Once common in most of the larger rivers of the region, including the White, Yampa, Colorado, Gunnison, and the San Juan and its tributaries, the species is now mostly limited to small headwater streams and isolated natural lakes within their historic range. Disappearance of Colorado River cutthroat trout in other areas has resulted from overfishing, interbreeding with other subspecies of cutthroat trout due to stocking by State fish and wildlife agencies, and competition from more aggressive non-native trout species, including the rainbow, brown, and brook trout. Fortunately for the cutthroat, the Planning Area historically received so little used by anglers (due to its isolation and remoteness) that no pressure was placed on CDOW to stock gamefish. Until recently, this would have meant the introduction of non-native trouts, including non-native subspecies of the cutthroat trout. Just as important, the extreme physical barriers between larger streams stocked by CDOW and the isolated streams atop the Roan Plateau prevented upstream dispersal of non-native species and subspecies. As described in Section 3.3.4, the Planning Area contains five conservation populations of Colorado River cutthroat trout, defined as reproducing and recruiting populations at least 90-percent pure (i.e., with less than 10-percent genes of other species or subspecies). These populations are located in JQS Gulch, East Fork Parachute Creek, East Middle Fork Parachute Creek, Northwater Creek, and Trapper Creek. These five creeks contain 15.5 miles of habitat for the Colorado River cutthroat trout. Also, 4 miles of stream length in Trapper and Northwater Creeks contain core conservation populations, defined as having at least 99-percent genetic purity. Therefore, the Roan Plateau populations of Colorado River cutthroat trout are considered nationally and regionally significant (CRCT Task Force 2001).

Botanical/Ecological Values

Seven of the 31 streams evaluated as WSRs in the Planning Area support rare plants or significant plant communities. East Fork Parachute Creek supports several species and plant communities considered rare or imperiled in Colorado, including the Southwest stickleaf, a BLM sensitive plant. East Fork Parachute Creek and its tributaries JQS Gulch, Golden Castle Creek, First Anvil Creek, and Second Anvil Creek, as well as East Middle Fork Parachute Creek and lower Northwater Creek, contain hanging garden environments that support the narrowly endemic hanging garden sullivantia (Section 3.2.4). Nearly two-thirds (62 percent) of the known populations of this species occur in the Planning Area (Section 3.3.3). The occurrences of rare or imperiled plant communities and hanging garden associations in these drainages are outstandingly remarkable or nationally/regionally significant when compared with other areas in the ecoregion.

3.5.9.4 Stream Classification

The process of determining eligibility for designation as a WSR also includes a preliminary classification into one of three categories: wild rivers, scenic rivers, or recreational rivers. This classification is based on the type and degree of human development on adjacent lands at the time of the evaluation. See the WSR eligibility report (BLM 2002e) for a complete description.

Wild Rivers

These are defined as streams that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. They represent vestiges of primitive America. All or portions of seven of the eight eligible streams within the Planning Area were

found to be wild in character: East Fork Parachute Creek, First Anvil Creek, Second Anvil Creek, Golden Castle Gulch, Trapper Creek, Northwater Creek, and East Middle Fork Parachute Creek.

Scenic Rivers

These streams are free of impoundments, with banks and watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads. "Scenic" does not necessarily mean the river corridor has scenery as an outstandingly remarkable value, simply that it may contain more development than a wild segment and less development than a recreational segment. All or portions of five of the eight eligible creeks have a preliminary classification of scenic: East Fork Parachute Creek, First Anvil Creek**,** Second Anvil Creek, JQS Gulch, and Trapper Creek

Recreational Rivers

This classification includes streams that qualify for WSR designation but are less "pristine." Streams eligible for this classification may be readily accessible by road or railroad, may have some development along their banks, and may have undergone some impoundment or diversion in the past. Existing small dams and diversions may be allowed, as may the presence of parallel roads or railroads. Recreational rivers are not necessarily managed for recreational use. Portions of Second Anvil Creek and Trapper Creek were preliminarily classified as recreational rivers.

3.5.10 Forest Products

3.5.10.1 Management Plans and Documents

The forest management objective in the 1984 GSRA RMP, which included the Planning Area, is to "manage all suitable commercial forest land and woodland to meet sawtimber and fuelwood demand and maintain stand productivity."

The forest management objectives in the 1997 WRRA RMP are to "(1) determine the sustainable, annual allowable timberland harvest level on suitable commercial and non-commercial timberlands; (2) manage all timberlands to maintain productivity, extent, [and] forest structure, and for the enhancement of other resources; and (3) provide special management consideration for special or unique forest/woodland areas."

The woodlands objectives in the WRRA RMP are to "(1) determine annual allowable woodland harvest level on suitable/commercial woodlands; (2) determine allowable use levels on non-commercial woodlands; and (3) manage all woodlands to maintain productivity, extent, [and] forest structure and for the enhancement of other resources."

The forest management objective outlined in the DOE operational management plan for NOSRs 1 and 3 (DOE 1988) is as follows: "NOSR timber resources shall be managed to prevent deterioration of the soils and vegetation and the visual resources of the NOSRs and shall be consistent with good fire pre-suppression techniques."

3.5.10.2 Current Management

The Priorities of Implementation section of the 1984 GSRA RMP indicates that forest management plans were to be prepared on the two remaining forest management units (Castle Peak and the NOSRs). Measures were taken in the mid-1980s to draft a forest management plan for the NOSRs. Discussions between BLM and DOE during the 1980s and early 1990s were focused on funding to manage the forest on the NOSRs actively. Despite various meetings and requests for funding, monies were never allocated for forest management. DOE funding was focused on fire protection and livestock grazing management. A timber sale prospectus was developed in 1990 for the potential harvest of various stands of aspen, although lack of funds to carry manpower costs of a sale precluded this action.

Historical files in the GSFO detail tree-planting efforts in Golden Castle Gulch, with the objective of establishing ponderosa pine, white fir, and Douglas-fir during the late 1960s. Discussions with former BLM employees indicate that a contract was issued and planting occurred. Field review of the site in 2000 found no evidence of introduced planting stock or tree establishment.

In summary, few records are available that indicated active or even passive forest management in the Planning Area. A USFS forest management plan written in the mid-1960s recommended an intensive tree-planting program with the objective of establishing ponderosa pine. A sale of Douglas-fir saw logs (45 million board-feet [MBF]) was made to Ray Lyons in 1983 with access from a private road off Piceance Creek (Section 28, T4S, R94W). A public area for cutting of juniper fuelwood has been open for permit since the early 1990s on 32 Mile Mesa off SH 13, about 6 miles north of Rifle. No records of forest product sales or projects from the WRRA area are available.

3.5.10.3 Resource Condition and Capabilities Evaluation

The aspen resource of the Planning Area can be found in varying stages of growth, with many stands in overall decline as evidenced by signs of rot and breakdown. Consequently, merchantability of many stands is questionable. Most of the aspen stands in the Planning Area appear to be self-sustaining, although gradual succession to coniferous forest is indicated by the presence of conifer seedlings in the understory of some sites. Conifer forests of the Planning Area are generally multi-aged and self-sustaining.

In general, the forest resource on the Planning Area is in over-mature condition with expanding signs of decay and mortality. Fir aphids have been recognized as a pest problem since the late 1970s. Decline of subalpine fir and aspen, and mortality from Douglas-fir beetle, were identified in USFS aerial monitoring of the plateau in 1996 (BLM 2002a). Pockets of fir and aspen decline were identified in the headwaters of Northwater and Trapper Creeks. Douglas-fir mortality was noted on the steep slopes along the eastern rim and Ben Good Creek. No reference to these occurrences was made in *Forest Insect and Disease Conditions in the Rocky Mountain Region* (Harris et al 2002). This document included results of the USFS 2001 aerial monitoring.

Timber harvest potential exists within the Planning Area, although optimum yield most likely passed 15 to 30 years ago. The better aspen sites where conifer establishment is occurring in the understory would be "choice" stands for management if maintenance of aspen were a management objective. Most conifer sites, being multi-aged in structure, possess marginal yield capacity and high percentages of low-valued subalpine fir. Very few spruce trees are found on the plateau and, to preserve species diversity, should not be targeted for harvest. The highest and best use for most forested stands is riparian protection, wildlife cover/habitat, and soil protection/stabilization. Pinyon/juniper woodland in dissected lands below the rim offers limited potential for fuelwood harvest, primarily because of rough topography and lack of public access.

3.5.11 Fire

3.5.11.1 Management Plans and Documents

The fire management objectives outlined in the operational management plan for NOSRs 1 and 3 (DOE 1988) have been replaced by updated Fire Management Plans (FMPs) for the GSFO and WRFO. The FMPs were completed to comply with the 1995 Federal Wildland Fire Management Policy and the 2001 Review and Update of the 1995 Federal Wildland Fire Management Policy (BLM 2002f). The policy directs BLM field offices to have an approved FMP for every area with burnable vegetation. FMZs define differing strategies for managing and prioritizing wildland fires and prescribing vegetation treatments for fuel hazard reduction and resource benefit. Table 3-34 is an overview of FMZs.

The 1984 GSRA RMP was amended in September 2002 by incorporating an FMP from EA No. CO-140-2001-0051, which analyzed implementation of wildland fire management in the resource area. A future site-specific document that complies with NEPA is prepared for each prescribed vegetation treatment. The EA and FMP document the goals, values, fire management direction, suppression direction, and guidance for prescribed fires for the GSRA, including the Planning Area.

The WRFO completed an FMP (EA No. CO-017-WR-99-99-EA) in 1999. That FMP identified the appropriate management response on all natural and unplanned ignitions within the WRRA. The fire management objective for the WRFO portion of the Planning Area, as described in the 1997 WRRA RMP, is to "manage (using appropriate management response) naturally ignited fires throughout the unit to promote a vegetation mosaic [and to] conduct prescribed burns or other vegetation treatments on mountain shrub and sagebrush types to achieve age and structural diversity."

Table 3-34. Fire Management Overview

FMZ	Description	*Wildfire Management*		*Vegetation Treatments*		
		Suppression Priority	*Suppression Strategy*	*Wildland Fire Use* [1]	*Prescribed Fire Use*	*Mechanical, Biological, Chemical, Manual Use*
A	Fire not desired	High	Aggressive	No	No, except for burning piles of mechanically removed vegetation.	Yes, fuel hazard reduction to mitigate risks a priority.
B	Unplanned wildland fire not desired	High	Aggressive	No	Yes, fuel hazard reduction to mitigate risks a priority.	Yes, fuel hazard reduction to mitigate risks a priority.
C	Wildland fire desired but must consider significant constraints	Moderate	Appropriate responses	No	Yes, fuel hazard reduction lower priority than "A" or "B." Used to attain desirable conditions.	Yes, fuel hazard reduction lower priority than "A" or "B." Used to attain desirable conditions.
D	Wildland fire desired, with few constraints	Low	Appropriate responses	Yes, under prescribed conditions	Yes, used to attain desirable resource conditions. Fuel hazard reduction is lower priority than "C."	Yes, used to attain desirable resource conditions. Fuel hazard reduction is lower priority than "C."

[1] *Use of wildland fires to accomplish specific, stated resource management goals in predefined geographic areas.*

3.5.11.2 Evaluation of Resource Condition and Capabilities

Natural historical ("pre-settlement") conditions exist in few areas today. The influences of human activities and land uses such as livestock grazing, water development, road construction, recreation, the intentional or inadvertent introduction of exotic plant species, and more than a century of fire suppression have altered the composition of the plant communities and their response to fire.

In many areas, prolonged fire suppression has created conditions of high fuel loading at the ground surface. Fires in these areas may be hotter and more destructive than under more normal conditions. In extreme cases, these fires can "sterilize" the soil by destroying the soil seed bank, surficial organic matter,

and soil organisms. These hotter fires can also kill trees that would survive a lower intensity fire. The development of "ladder fuels" in the form of dense shrubs or small trees in the understory can also lead to the destruction of a forest by spreading the fire from the ground, where it is less threatening, to the tree crowns. These crown fires can then spread rapidly and violently through the forest canopy. Returning these areas to a cycle of periodic, low-intensity fires may require prescriptive vegetation treatments to reduce shrub and tree density. The Planning Area includes areas of invasive non-native species such as cheatgrass, musk and other thistles, houndstongue, and tamarisk that are adapted to shorter fire intervals than the native species. Since these species have both higher survival and more rapid reestablishment (by resprouting or by germination from seeds) following fire, they often increase in dominance compared to the native component. Consequently, reestablishment of a beneficial and self-sustaining plant community in areas that have burned is important to the ecological and visual quality post-fire habitats. Fire rehabilitation will be conducted using appropriate seed mixes and erosion control methods in accordance with BLM procedures. Where practicable, fire rehabilitation will be consistent with overall vegetation and range management goals of the Proposed Plan, including use of performance-based standards and adaptive management to ensure long-term recovery of the damaged area.

3.5.11.3 Current Fire Management

Public lands are managed under four fire management zone classifications for the purposes of wildland fire and prescribed vegetation management. The fire management zone classes (A through D)(Table 3-34) are based on BLM Instruction Memorandum No. 2002-034 (BLM 2001f) and Clarification of Fire Management Categories and RMP-Level Decisions in BLM Handbook H-1601-1 (BLM 2001a).

Atop the Plateau

The top of the plateau is currently managed as FMZ D (Map 29). If predetermined criteria are met, fires may be managed under a Wildland Fire Use (WFU) strategy to achieve desired objectives such as improving vegetation, wildlife habitat, or watershed conditions. Wildland fires under a suppression strategy are managed using the appropriate management response commensurate with predetermined constraints (negative effects to values and zone goals). Wildland fires under a suppression strategy are contained within natural or man-made barriers/firebreaks. Areas in FMZ D have the lowest priority for suppression in a multiple fire situation.

Within the GSRA, no more than 50 percent of the FMZ D area atop the plateau should burn over a 10-year period. Wildland fire suppression guidelines apply for Colorado River cutthroat trout, northern leopard frog, and Parachute penstemon along the Anvil Points rim. Wildland fire suppression restrictions also apply to areas with commercial wood product designation.

Northeast Cliffs and Southeast Cliffs

The cliffs along the northeastern and southeastern margins of the plateau are currently managed as FMZ C (Map 29). The FMP for the GSFO acknowledges that fire is a desirable component of the ecosystem. However, constraints must be considered, including private lands and homes, topography, archaeological and historical sites, visual aesthetics, wilderness characteristics, rare plants, the old-growth Douglas-fir community, big game security areas, and habitat for a variety of other sensitive species. Wildland fires are managed using the appropriate management response commensurate with predetermined constraints. Management strategies are intended to ensure that wildland fire is contained within natural or man-made barriers/firebreaks. FMZ C areas have a lower suppression priority in multiple wildland fire situations than FMZs A or B. No more than 50 percent of the FMZ C areas should burn over a 10-year period. Wildland fire suppression guidelines apply for northern leopard frogs, and suppression restrictions apply to commercial wood product areas.

Lower Elevations along the I-70 Corridor

The lower elevation terrain below the rim is currently managed as FMZ B (Map 29). The GSFO FMP recognizes that fire plays a natural role in the function of the ecosystem. However, an unplanned ignition in these lands could have negative effects unless or until some form of mitigation takes place. All wildland fires in FMZ B, regardless of ignition source, are a high priority and receive prompt suppression action commensurate with human safety in all instances. Fire suppression is usually aggressive to minimize wildland fire size. Wildland fire suppression guidelines apply for bald eagle winter range, Federally listed Colorado River fishes, Great Basin spadefoot toads, and northern leopard frogs. Wildland fire suppression restrictions for commercial wood product areas and ACECs also apply. Managers emphasize prevention/mitigation programs that reduce unplanned ignitions and threats to life, property, and natural and cultural resources.

3.5.12 Hazardous Materials

3.5.12.1 Wastes from Oil and Gas Exploration and Production

Wastes associated with oil and gas exploration and production are exempt from regulation under Subtitle C (hazardous materials) of the Resource Conservation and Recovery Act (RCRA) of 1976 but are regulated under RCRA Subtitle D (solid waste) and State regulations. The RCRA Subtitle C exemption applies, among other things, to produced water, constituents removed from produced water prior to injection or disposal of the spent water, drilling fluids, drill cuttings, rig wash, pit sludges, tank bottoms (sludge) from storage facilities, gas plant dehydration wastes, workover wastes, produced sand, packing fluids, stimulating fluids, and hydrocarbon-bearing soil. This exemption does not apply to listed waste solvents, painting wastes, unused fracturing fluids or acids, used lubricating oils, waste compressor oil and filters, pigging wastes from gathering lines, caustic or acid cleaners, sanitary wastes, pesticide wastes, and radioactive tracer wastes. Additionally, any hazardous substances as listed or defined under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 that are contained within one of the exempted wastes and released into the environment are regulated under CERCLA. For example, produced water is exempt under RCRA Subtitle C, but any CERCLA hazardous substances within the water are regulated under CERCLA if they are released to the environment.

Oil and gas wells are drilled primarily with rotary drilling rigs. In the rotary method, drilling mud is used as a lubricant for the drillbit and to lift well cuttings to the surface. At the surface, the drilling mud is diverted to tanks or pits for cleaning and treatment. Water requirements for drilling a well in the Wasatch or Mesaverde formations range from 5,000 to 15,000 gallons per day. This water is delivered to the site by truck. Operators in the region typically reuse water from the drilling mud to reduce transportation costs. Drilling mud typically contains several additives to enhance the properties of the fluid, including:

- Weighting materials, primarily barium sulfate, to increase the density of the mud
- Corrosion inhibitors, to protect metal components from corrosion
- Dispersants, to break up solid clusters of clay particles
- Flocculants, to cause suspended particles to group together so they can be removed by settling
- Surfactants, such as fatty acids and soaps, to defoam and emulsify the mud
- Biocides, to kill bacteria that may inhabit the mud and clog the formation
- Fluid loss reducers, including starch and polymers, to limit the loss of drilling fluid to subsurface formations

Typical drilling mud reported by Williams Production as being used in the Planning Area includes additives such as barite, sawdust, caustic soda, soda ash, bentonite, lignite, aluminum stearate,

bicarbonate of soda, cottonseed hulls, lime, potassium chloride, sodium polyacrylate, an organic thinner, and a liquid polymer (EZ-Mud). These materials fall within the broad category of well completion, treatment, and stimulation fluids that are exempt under RCRA Subtitle C.

Drill cuttings, consisting of rock debris mixed with some residual drilling mud, are typically not removed from the site. Approximately 100 cubic yards of cuttings are typically generated for each well drilled in the Planning Area. The cuttings are buried in pits 8 to 10 feet deep within the drill pad area, backfilled with soil and subsoil stripped and stockpiled during excavation, and revegetated. The pits are generally unlined.

3.5.12.2 Produced Water

Williams Production, the largest oil and gas developer in the Planning Area, had 740 gas wells in the Roan Plateau region as of January 2003. Each generally yields four barrels of produced water per day, for a total of approximately 3,000 barrels per day. About 60 percent of this water is used for finishing wells, where the water is filtered, chlorinated, and injected to fracture the formation or for other purposes. The remaining water is evaporated in evaporation pond facilities (Cesark, personal communication 2003). Williams does not use onsite pits for evaporation but instead trucks the produced water offsite.

The produced water contains about 10 percent natural gas condensate, a light hydrocarbon that is sold to produce gasoline and reported as "oil" to the COGCC. Produced water ranges in salinity from about 7,000 to 26,000 parts per million (ppm) of total dissolved solids (TDS), with an average salinity of about 20,000 ppm. Most of this salinity consists of sodium and chloride ions (i.e., NaCl, common table salt]).

Information on the chemistry of the produced water was obtained from data reported to CDPHE from the Black Mountain brine disposal facility in DeBeque, Colorado. This facility receives fracturing waters and drilling fluids in addition to produced waters. The water in Pond 1, the first evaporation pond at the Black Mountain facility, was analyzed periodically from 1990 through 2002. Comparisons of average concentrations of pond water reported by Black Mountain with CDPHE water quality standards are provided in Table 3-35. The water quality standards shown include secondary (non-health-based) and primary (health-based) drinking water standards (maximum contaminant levels [MCLs]), agricultural (livestock watering/irrigation) stream standards, and aquatic life (coldwater [trout]) standards. Coldwater fisheries standards in the table are the most stringent value applicable to any of various segments in the East Fork Parachute Creek watershed. Calculated standards used a hardness of 25.

All of the analyte concentrations presented in the table are conservative (i.e., more likely to be overestimates than underestimates) in relation to actual produced waters at the well sites because of concentration associated with evaporation. Also, the chemistry of water at the Black Mountain facility is likely to differ somewhat from the chemistry of produced waters from the Planning Area, since the facility also receives other types of fluids. However, most of their throughput is from regional wells. Note that exceedances (average concentrations that exceed a standard) include the secondary (non-health-based) drinking water standards for calcium, iron, bicarbonate, and chloride; agricultural stream standards for copper and zinc; and aquatic life (coldwater fisheries) standards for cadmium, iron, manganese, and chloride. The most important exceedance is for chloride, reflecting the high salinity of the produced waters. The other exceedances are relatively slight and could be the result of evapoconcentration in the disposal pond. This underscores the importance of keeping produced water from reaching area streams in significant quantities, especially for the small streams atop the plateau in which seasonal flows can be very low and insufficient to achieve the nearly 50-fold dilution required to bring the chloride concentration to within the aquatic life standard.

Table 3-35. Chemistry (mg/L) of Produced/Disposed Waters at the Black Mountain Disposal Site Evaporation Pond, DeBeque, Garfield County, Colorado [1]

Analyte	*Average Value of Analytes in Pond Waters 1990 – 2002*	*MCLs [2]*	*Stream Standards for Agriculture [3]*	*Aquatic Life Standards [4]*	*Groundwater Standards for Agriculture [5]*
Arsenic	<0.001	0.05	0.1	0.05	0.1
Barium	0.28	2.0	--	--	--
Cadmium	0.02	0.005	0.0008	0.01	0.01
Copper	0.4	1.0	0.0027	0.2	0.2
Iron	7.5	0.3	1.0	1.0	5.0
Lead	0.003	0.05	0.014	0.1	0.1
Manganese	0.96	0.05	1.04	0.2	0.2
Mercury	<0.0002	0.002	0.00001	.00077	0.01
Zinc	0.07	5.0	0.036	2.0	2.0
Sodium	6,941	250	--	0.2	--
Calcium	564.8	500	--	--	--
Chloride	11,816	250	--	250	--
Bicarbonate	1,470	250	--	--	--
Carbonate	<0.5	250	--	--	--
Sulfate	63.6	250	--	--	--
Total Alkalinity	1,129.2	500	--	--	--
Total Dissolved Solids	23,000	500	--	--	variable
pH	7.20	--	6.5-9.0	6.5-9.0	6.5-8.5

[1] *Specific water quality standards vary depending on designated water use and location.*

[2] *MCLs = maximum contaminant levels. Colorado and/or EPA secondary (non-health-based) drinking water standards (the 500 ppm standard is for total hardness). Primary (health-based) standards are in italics.*

[3] *Stream standards are Colorado agricultural water standards. Values were calculated using a hardness of 25.*

[4] *Coldwater aquatic life standards are lowest value for various designated stream segments of East Fork Parachute Creek watershed.*

[5] *Colorado State groundwater standards for agricultural uses.*

3.5.12.3 Spills and Releases

BLM has stipulated procedures to be followed in the event of a spill or release from an oil and gas production facility on BLM land (BLM 1999b). These procedures require that BLM be notified in the event of "all spills or leakages of oil, gas, produced water, toxic liquids or waste materials, blowouts, fires, personal injuries, and fatalities." The operator is to report any such releases to the BLM and the Surface Managing Agency (BLM 1999b) immediately for all "Class 1" events (more than 100 barrels of fluid or 500 MCF of gas). Therefore, if more than 100 barrels of produced water were released into the environment, the operator would be required to notify BLM and initiate corrective actions.

BLM will use its delegated authority under CERCLA to respond to uncontrolled releases of hazardous substances on Federal lands, or on private lands with oil and gas produced from a Federal mineral estate. Response actions will be in accordance with the procedures and requirements of the National Contingency Plan (NCP) found in 40 CFR 300. Exemptions to CERCLA hazardous substances can be found in section 101(4) of the Act. The only exceptions to CERCLA are crude oil, natural gas liquids,

liquefied natural gas, or synthetic gas. Thus, all other substances listed as a hazardous substance that are released to the environment are subject to CERCLA, including those from oil and gas operations.

The Colorado Oil and Public Safety Division regulates oil and gasoline in the State and requires that responsible parties report any release of more than 25 gallons of a regulated substance within 24 hours. State regulations, contained at Colorado Code of Regulations (CCR) 8-20.5 section 101 (Oil and Public Safety), define crude oil and natural gas condensates as regulated substances subject to these reporting requirements, but tanks associated with oil and gas production facilities are exempted. Relevant excerpts from CCR 8-20.5 section 101 include the following:

> (13) "Regulated substance" means: (a) Any substance defined in section 101 (14) of CERCLA but not including any substance regulated as a hazardous waste under Subtitle (C) of RCRA; or (b) Petroleum, including crude oil, and any fraction thereof that is liquid at standard conditions of temperature and pressure (60F and 14.7 pounds per square inch absolute).
>
> (14) "Release" means any spilling, leaking, emitting, discharging, escaping, leaching, or disposing of a regulated substance from an underground storage tank into groundwater, surface water, or subsurface soils.
>
> (15) "Reportable quantities" means quantities of a released regulated substance which equal or exceed the reportable quantity under CERCLA, and petroleum products in quantities of 25 gallons or more.
>
> (b) "Above-ground storage tank" does not include:
>
> (I) A wastewater treatment tank system that is part of a wastewater treatment facility.
>
> (II) Equipment or machinery that contains regulated substances for operational purposes.
>
> (III) Farm and residential tanks.
>
> (IV) Above-ground storage tanks located at natural gas pipeline facilities that are regulated under State or Federal natural gas pipeline acts.
>
> (V) Above-ground storage tanks associated with natural gas liquids separation, gathering, and production.
>
> (VI) Above-ground storage tanks associated with crude oil production, storage, and gathering.
>
> (VII) Above-ground storage tanks at transportation-related facilities regulated by the Federal Department of Transportation.
>
> (VIII) Above-ground storage tanks used to store heating oil for consumptive use on the premises where stored.
>
> (IX) Above-ground storage tanks used to store flammable and combustible liquids at mining facilities and construction and earthmoving projects, including gravel pits, quarries, and borrow pits where, in the opinion of the director of the division of oil and public safety, tight control by the owner or contractor and isolation from other structures make it unnecessary to meet the requirements of this article.
>
> (X) Any other above-ground tank excluded by regulation.

Potential regulated releases could be from tanker trucks, onsite tanks, or evaporation ponds. The average condensate tanks at the wellheads are typically 300 barrels per wellhead, and produced water tanks are generally between 200 and 300 barrels per wellhead. Transport trucks range in capacity from 60 to 120 barrels. Produced water typically contains about 10 percent condensate. Therefore, tankers and ponds

can contain more than 25 gallons of natural gas condensate at any given time. As stated above, BLM requires reporting of brine releases that exceed 100 barrels.

3.5.12.4 Existing Environmental Records

A search of several pertinent environmental agency records was conducted for the properties within one mile of the study area. The study area has historically been the focus of extensive resource exploration projects; undocumented sources of environmental contamination that pre-date modern environmental regulations are likely.

Anvil Points Spent Oil Shale Pile

A spent oil shale pile is located on the slopes below the Anvil Points research facility. The pile is in a narrow ravine adjacent to West Sharrard Creek, a tributary that flows to the Colorado River in less than 2 miles. The pile was developed through 40 years of deposition from oil shale mining and processing activities. The pile consists of approximately 300,000 cubic yards of material and is roughly 1,000 feet long and 350 feet high. BLM and CDPHE have conducted analyses of the site and concluded that the pile is the source of arsenic and other heavy metals contamination leaching into both surface and groundwater. Chemical constituents in the pile have also been determined to be hazardous through direct physical contact. In addition, the physical stability of the pile may be questionable due to its steep slope, lack of vegetation, and proximity to West Sharrard Creek.

BLM, in consultation with CDPHE, has completed an engineering design for removal of the pile and associated facilities. The removal action is expected to be initiated in 2007 and completed by the end of 2009. This removal action would be conducted consistent with the land-use restrictions, BMPs, and reclamation standards under this RMPA/EIS where practicable.

CERCLA/Superfund Sites

A search of EPA's CERCLA Information System (CERCLIS) database, dated January 2003, indicated no CERCLA sites within 1 mile of the Planning Area.

RCRA/Hazardous Waste Notifiers

The RCRA Notifiers List is an inventory of transporters; burner/blenders; and large-, small-, and very small-quantity generators of hazardous wastes. None occur on Federal lands in the Planning Area. Large-quantity generators (LQGs) generate more than 1,000 kilograms (2,205 pounds) of hazardous waste per month. Small-quantity generators (SQGs) generate between 100 and 1,000 kilograms (2,205 pounds) per month; conditionally exempt small-quantity generators (CESQGs) generate less than 100 kilograms (220 pounds) per month. No LQGs were found in the RCRA Information System (RCRIS) database within 0.5 mile, and no other facilities were located within 0.25 mile. Table 3-36 lists the SQGs and CESQGs within one mile of the Planning Area. Note that the Unocal shale oil facility is also listed as a treatment, storage, and disposal (TSD) facility.

Table 3-36. RCRA/Hazardous Waste Notifiers Within One Mile of the Planning Area

Facility	*Address/Location*	*Status*	*ID*
American Soda LLP	2717 CR 215, Parachute	Not Classified	COR000016014
Anvil Points Oil Shale Facility	8 miles W of Rifle on I-70	Not Classified	CO9890031876
CDOT – Rifle	SH 13 at milepost 2	CESQG	COD983771791
Development Eng. Inc	1354 CR 246, Rifle	CESQG	CO0890090129
Exxon Co USA	16 miles N of Parachute, CR 215	CESQG	COD000651539

Table 3-36. RCRA/Hazardous Waste Notifiers Within One Mile of the Planning Area

Facility	*Address/Location*	*Status*	*ID*
JQS Trail, Rifle	NW¼, SE¼, Sec. 2, T5S, R93W	Not Classified	COR000005249
KN Energy Inc	1879 CR 264, Rifle	SQG	COR00007179
Occidental Oil Shale Inc	20011 CR 5	Not Classified	COD000716530
Rifle Clough Compressor	Sec. 13, T6S, R93W	CESQG	COD981550064
Rifle Gas Plant	620 CR 264	CESQG	COR000000125
Rulison Compressor	Sec. 21, T6S, R93W	CESQG	COD981550080
Unocal Shale Oil Facility	10735 CR 215, Parachute	CESQG, TSD, CAS	COD980718902

Environmental Covenants

No environmental covenants restrict Public lands within the Planning Area. Landowners and CDPHE have been given the authority to impose environmental covenants that limit access or use of a property due to ongoing contamination and/or remediation projects. One such property is located within the Planning Area vicinity but entirely on private property: the Old Rifle Mill site located in portions of Sections 15 and 18, Township 6 South, Range 93 West. Use restrictions are as follows:

- No habitable structure may be constructed on the property without properly designed radon mitigation as approved by DOE.
- Wells completed in the alluvial aquifer or the Entrada Formation may not be used for domestic or potable water supplies.
- No tilling, excavation, grading, construction, or any other activity that disturbs the ground surface is permitted on the property, without the express written consent of DOE.
- No activities that will in any way damage any monitoring or remedial wells installed by DOE or interfere with the maintenance, operation, or monitoring of the wells are allowed without the express written consent of USDI and DOE.

3.5.13 Renewable Energy

In February 2003, BLM and the National Renewable Energy Laboratory (NREL) issued a report identifying public lands most suitable for increased development of renewable energy (DOE and BLM 2003). The report examined Federal areas, including those administered by BLM in eleven Western States, for the highest energy potential from four renewable sources: wind, solar, geothermal, and biomass. The assessment was undertaken in response to the National Energy Plan. BLM and DOE worked with industry experts to develop screening criteria for each type of energy. Factors considered included geography, infrastructure requirements, access to roads and power transmission lines, and proximity to towns and cities. Findings of the assessment indicated that the region including the Planning Area was not among the 25 highest rated areas for any of these potential energy sources.






CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

4.1.1 Impact Analysis Process

Chapter 4 describes the impacts of land use and resource management actions on the physical, biological, human, and management environments of the Planning Area under the Proposed Plan. These impacts are in the following analyses as direct and indirect onsite impacts, or offsite and cumulative impacts.

Direct impacts result from an action without an intervening step. Indirect impacts are also the result of an action, but with one or more intervening steps. Onsite impacts occur within the Planning Area. Offsite impacts occur outside the Planning Area, but as a result of an action within the Planning Area. The degree to which land uses, management actions, and environmental changes under the implemented alternative would affect other lands depends on the absolute and relative amount of onsite changes, the causal linkage between onsite changes and offsite consequences, and the relationship between changes resulting from the alternative and those that would occur without the alternative. Cumulative impacts result from the interaction of impacts of the implemented alternative with impacts resulting independently from unrelated actions and activities. For this RMPA/EIS, cumulative impacts may include private lands within the Planning Area and both private and public lands outside the Planning Area. Additionally, cumulative impacts are not necessarily limited to the types of actions and activities affecting BLM lands in the Planning Area.

Quantification of cumulative impacts is difficult for the resources, land uses, and management actions addressed by this RMPA/EIS. This is due to (1) unavoidable uncertainties regarding the location, scale, and rate of changes on BLM lands in the Planning Area resulting from the implemented alternative; (2) greater uncertainties about the location, scale, and rate of changes on private lands within the Planning Area that would occur irrespective of the implemented alternative; and (3) even greater uncertainties about the location, scale, and rate of changes due to the general human population growth of the County.

While focusing on the Proposed Plan, the following impact analyses include selected comparisons to the five alternatives analyzed in the Draft RMPA/EIS, particularly Alternative I (No Action) and Alternative III (Preferred Alternative). The five previous alternatives, summarized in Section 2.4, were constructed to represent a reasonable range of land uses and management actions for the Planning Area.

The Proposed Plan (summarized in Section 2.3) was constructed primarily from components excerpted from the five previous alternatives (especially Alternatives II and III) but includes some additional measures to further reduce environmental impacts. One of the most important of these is the adoption by BLM of measures proposed by CDNR as ways to reduce impacts of oil and gas development atop the plateau. These measures were proposed during the Consultation and Coordination process that followed the public comment period of the Draft RMPA/EIS and received a consensus of support from the other Cooperating Agencies (Chapter 6).

A key component of the Proposed Plan is incorporation of a requirement for phased and clustered development of oil and gas resources on top of the plateau, with a focus on developing along ridges and existing roads and with a limit on the amount of allowable disturbed land at any one time. This would rely heavily on the use of diagonal (directional) drilling to optimize recovery of oil and gas resources while significantly reducing the area of associated ground-disturbing activities. For areas at lower elevations below the rim, BLM would manage to maximize clustered development. However, more flexibility is needed in the lower areas due to the adjacency and irregular boundaries of private lands, currently leased Federal lands, and currently unleased Federal lands subject to future leasing under all alternatives except No Action.

4.1.1.1 Direct and Indirect Onsite Impacts

Of the potential impacts associated with future management of the Planning Area, the most marked in terms of direct physical change and the indirect consequences of change is the anticipated increasing level of oil and gas development. Therefore, much of the analysis focuses on the direct and indirect impacts expected to result from the construction of well pads and roads and the associated human activity.

The starting point for analysis of the Proposed Plan is the RFD for oil and gas development in the Planning Area, prepared by BLM as part of the planning process (Appendix H). The RFD is intended as a technical and scientific approximation of anticipated levels of oil and gas development during the planning timeframe. As such, the RFD and the planning process of which it is part are not intended to define the specific numbers and locations of wells and pads needed to develop the oil and gas resource. Instead, they are intended to allow flexibility during resource development while providing sufficient specificity to support the impact analysis and alternative selection processes. The actual level of oil and gas development associated with any specific alternative is likely to differ substantially from the RFD due to alternative-specific measures aimed at protection and management of other uses and resources.

Assumptions of the RFD incorporated into the impact analyses of Chapter 4 include the following:

- The assumed drilling rate, based on existing leases in the Planning Area, is completion of one well per 20 days per drill rig below the rim, and one well per 30 days atop the plateau (due to a greater thickness of overlying strata)(Appendix H).
- The assumed drilling season is 6 months per year on top of the plateau due to snow accumulation at these higher elevations, and 7 months per year below the cliffs due to the 5-month TL (December – April) for big game winter range.
- The assumed number of wells in 20 years is based on the assumptions above, as well as 10-acre downhole spacing for Mesaverde wells, and 160-acre downhole spacing for Wasatch wells, collocated with Mesaverde well pads.

Areas of surface impact of oil and gas development assumed for all alternatives include:

- 1.9 acres of long-term surface disturbance for single-well pads and associated surface facilities (including a pro-rata share of compressor facility impacts)
- 2.5 acres of long-term surface impacts for multi-well pads, including the same components as single-well pads
- 1.5 acres of temporary impacts for pads, comprising areas revegetated within 2 years

Estimates of miles of access roads needed to accommodate the anticipated levels of oil and gas development differ among alternatives, as follows:

- For Alternatives I through V – 0.6 mile of new or upgraded existing roads per pad, using an assumed surface density of one pad per 40 acres.
- For the Proposed Plan – Atop the plateau, 12 miles of upgraded existing roads from Cow Creek Road access point to center of developable area, plus 0.3 mile of new road per pad, using 160-acre surface density. Below the rim, 0.6 mile of new or upgraded road per pad.

The actual number of drill rigs active at any one time, the number of wells and pads constructed during 20 years, the resultant acres of surface disturbance, and miles of new or upgraded access roads under any of the alternatives may differ from the assumed numbers due to factors subject to change through time, such as natural gas prices, technological advances, or new requirements related to other land uses and resource management goals.

4.1.1.2 Offsite and Cumulative Impacts

All of the environmental impacts associated with implementation of any of the alternatives would be in addition to ongoing existing impacts on Federal lands in the Planning Area, private lands in the Planning Area, and both public and private lands adjacent to or near the Planning Area. For example, information for COGCC shows a current total of approximately 5,500 wells in Garfield County, while data provided by Garfield County show a county-wide projection of a total of 10,000 to 20,000 wells over the next 20-years. In comparison, the Planning Area currently includes approximately 800 wells, of which 200 are on BLM lands.

Even where an estimate of cumulative impacts due to offsite causes is available (e.g., 10,000 to 20,000 wells in Garfield County in 20 years), it is not known how much long-term surface disturbance would result, to what degree adverse impacts would be avoided or mitigated, and how the impacts would affect other resource values and land uses such as hunting, OHV travel, visual quality, livestock grazing, and so forth. Therefore, the descriptions of cumulative impacts for the individual resources addressed in Sections 4.2 through 4.5 are necessarily qualitative.

Also germane to the discussion of cumulative impacts are the boundaries used to define impact sources and levels. These differ by resource. For example:

- For wide-ranging wildlife such as deer and elk, the cumulative impact area may include offsite habitats that are used to some extent by onsite populations and that are subject to impacts from development in the offsite areas.
- For air quality, the cumulative impact area may be an entire airshed, including all emission sources that affect the same air quality parameters as potentially affected by the implemented alternative.
- For surface water quality, the cumulative impact area may be one or more watersheds, including all pollutant sources that affect the same water quality parameters as potentially affected by the implemented alternative.
- For socioeconomics, the cumulative impact area may be one or more towns or counties, including all sources of positive and negative impacts on tax revenues, employment, housing, and quality of life considerations reasonably (i.e., not too remotely) affected by changes related to the implemented alternative.

While these are only examples, they illustrate that cumulative impact boundaries not only differ considerably among resources, but that the boundaries may be either natural or artificial.

Beyond the 20-year timeframe, BLM believes that quantitative impact assessments are speculative and unreliable, and hence inappropriate. This is due to a large number of economic, geopolitical, environmental, regulatory, technological, and other factors that could affect conditions beyond 20 years and are themselves subject to change in unexpected ways or degrees. In general, however, it can reasonably be assumed that the Planning Area would continue to support existing multiple uses beyond the 20-year planning horizon. These include development of energy resources, grazing of domestic livestock, and recreation, including motorized and mechanized travel.

4.1.2 Protective Stipulations and Other Restrictions on Surface Use

The RFD (Appendix H) does not incorporate all of the land management direction and multiple-use considerations that BLM must take into account as part of its responsibilities under FLPMA. Therefore, in developing the Proposed Plan and other alternatives, assumptions in the RFD were subjected to various "screens" or "filters" representing restrictions designed to protect specific resource values and meet BLM's multiple use and sustainability mandates. Protection of specific resources is accomplished by a combination of management actions and the surface-use stipulations described in Section 2.2. These include:

- **NGD (No Ground Disturbance) –** BLM would not allow long-term ground-disturbing activities (i.e., with an impact that would last longer than 2 years). For oil and gas leases, this stipulation is termed **NSO** (No Surface Occupancy).
- **SSR (Site-Specific Relocation)** – BLM may place special restrictions, including shifting a ground-disturbing activity by more than 200 meters from the proposed location to another location to protect a specific resource. In oil and gas leases, this stipulation is termed **CSU** (Controlled Surface Use).
- **TL (Timing Limitation)** – BLM may allow specified activities within the area, and at a proposed location, but not during certain sensitive seasons. Examples include raptor nesting areas, bald eagle winter roosting areas, and big game winter range. It is important to note that TL restrictions can apply to NGD/NSO and SSR/CSU areas, as well as to areas with standard restrictions and limitations.

Note that on split-estate lands (i.e., Federal minerals but private surface), the NGD/NSO, SSR/CSU, and TL restrictions would be applied only for activities related to mineral exploration and development, such as drilling for oil and gas. This is because the Federal mineral estate creates a nexus by which BLM may regulate aspects of these activities that occur on the surface as well as the subsurface. BLM does not regulate or manage other types of activities on split-estate lands (e.g., grazing, recreation, utilities rights-of-ways, etc.).

In addition to the restrictions and limitations on surface uses and management activities outlined above, BLM will require BMPs and set reclamation standards to ensure adequate protection and restoration of specific resource values. Examples from among the comprehensive list in Appendix I include the required use of:

- culverts at stream crossings
- special road design or dust suppression techniques to reduce impacts from aerial deposition of particulates on nearby streams and vegetation
- biodegradable erosion-control fabrics to ensure soil stability and enhance revegetation
- fences to exclude livestock from sensitive habitats
- specialized revegetation using only native species and possibly requiring that woody plants (trees and shrubs) be included in the seed mix or planted as containerized stock ("tubelings")

These measures, and the protective stipulations cited above, would be applied not just to oil and gas development and grazing, but also as appropriate to recreation, development of salable minerals, aquatic and riparian habitat enhancements, forest management activities (including timber harvesting and prescribed fires), and construction or routine maintenance in rights-of-way and easements.

As described in Section 2.3, it is also BLM's goal, in implementing the Proposed Plan or any other alternative selected, to encourage or require clustering, collocation, or consolidation of facilities where feasible and where the result would be to reduce impacts.

Table 4-1 presents the restrictions on surface use that would apply to BLM lands in the Planning Area under the Proposed Plan and other alternatives. The "deferred leasing" category shown in Table 4-1 for Alternative III reflects the component in which the area of Federal mineral estate atop the plateau would not be leased or developed for oil and gas until at least 80 percent of the total wells anticipated below the rim have been drilled. Although deferred drilling may affect the types and levels of impacts both above and below the rim, it is not a protective measure *per se* because all of the lands would become available for oil and gas development at some point, probably during the 20-year period of analysis. The no-lease and deferred-lease categories apply only to oil and gas, while the other restrictions apply to all land uses or management actions that could result in adverse impacts to resources.

Table 4-1. Acres (ac) and Percent (%) of Surface Use Restrictions in the Planning Area

Category	*Alt. I No Action*	*Alt. II*	*Alt. III Preferred*	*Alt. IV*	*Alt. V*	*Proposed Plan*
BLM Lands Atop the Plateau = 34,758 Acres						
No Lease (Oil and Gas) [1]	33,355 ac (96%)	10,382 ac (29.9%)	0	0	0	0
Deferred Lease [2]	0	0	34,758 ac (100%)	0	0	0
No Ground Disturbance (NGD/NSO) [3]	221 ac (0.6%)	15,365 ac (44.2%)	11,364 ac (32.7%)	11,364 ac (32.7%)	7,408 ac (21.3%)	15,821 ac (45.5%)
Site-Specific Relocation (SSR/CSU) [3]	525 ac (1.5%)	1,572 ac (4.5%)	15,179 ac (43.7%)	15,179 ac (43.7%)	10,750 ac (30.9%)	18,937 ac (54.5%)
Standard Restrictions and Limitations [3]	657 ac (1.9%)	7,440 ac (21.4%)	8,215 ac (23.6%)	8,215 ac (23.6%)	16,600 ac (47.8%)	0
BLM Lands Below the Rim = 38,844 Acres						
No Lease (Oil and Gas) [1]	10,912 ac (28.1%)	11,000 ac (28.3%)	0	0	0	0
Deferred Lease [2]	0	0	0	0	0	0
No Ground Disturbance (NGD/NSO) [3]	13,691 ac (35.2%)	15,835 ac (40.8%)	19,564 ac (50.4%)	19,564 ac (50.4%)	14,201 ac (36.6%)	22,590 ac (58.2%)
Site-Specific Relocation (SSR/CSU) [3]	7,731 ac (19.9%)	5,443 ac (14.0%)	14,415 ac (37.1%)	12,307 ac (31.7%)	10,767 ac (27.7%)	11,896 ac (30.6%)
Standard Restrictions and Limitations [3]	6,510 ac (16.8%)	4,574 ac (11.8%)	2,873 ac (7.4%)	4,981 ac (12.8%)	13,786 ac (35.7%)	4,358 ac (11.2%)
Total BLM Lands in the Planning Area = 73,602 Acres						
No Lease (for Oil and Gas) [1]	44,267 ac (60.1%)	21,382 ac (29.1%)	0	0	0	0
Deferred Lease [2]	0	0	34,758 ac (47.2%)	0	0	0
No Ground Disturbance (NGD/NSO) [3]	13,912 ac (18.9%)	31,200 ac (41.4%)	30,928 ac (42.0%)	30,928 ac (42.0%)	21,609 ac (29.4%)	38,411 ac (52.2 %)
Site-Specific Relocation (SSR/CSU) [3]	8,256 ac (11.2%)	7,015 ac (9.6%)	29,594 ac (40.2%)	27,486 ac (37.3%)	21,517 ac (29.2%)	30,833 ac (42.2%)
Standard Restrictions and Limitations [3]	7,167 ac (9.7%)	14,006 ac (19.0%)	13,080 ac (17.8%)	15,188 ac (20.6%)	30,476 ac (41.4%)	4,358 ac (5.9%)

[1] *Existing leases would not be affected.*

[2] *Leasing and drilling deferred until 80% of anticipated total wells (Federal and private, new and existing) below the rim have been effectively completed, estimated at 16 years).*

[3] *See text for definitions and assumptions.*

Throughout Chapter 4, reference is made to the application, extension, retention, or deletion of existing stipulations vis-à-vis new leases under the Proposed Plan. These references are meant to describe whether the type and level of protection provided by new stipulations would differ from that provided under the 1999 FSEIS and associated ROD and RMP Amendment.

As pertains to oil and gas development, existing stipulations would continue to apply to existing leases, while new stipulations would apply only to new leases issued subsequent to this RMPA/EIS process. However, many of the proposed new stipulations are based on, and in most cases essentially identical to, existing stipulations. Note that the protective stipulations for oil and gas leases also include provisions by which an exception, modification, or waiver could be granted. These are defined as follows (see Appendix C):

- Exception – A case-by-case exemption with a specified duration and for which it has been demonstrated that suspending the stipulation would not adversely affect the resource value being protected.
- Modification – A fundamental change in the stipulation based on data demonstrating that one or more components are no longer needed to protect the resource value.
- Waiver – A permanent exemption to a stipulation, based on monitoring data, changed conditions, or other situation demonstrating that a less restrictive measured would adequately protect the resource.

While an NGD/NSO, SSR/CSU, or TL restriction may be subject to an exception, modification, or waiver, granting one of these changes would, by definition, not adversely affect the resource value that was the subject of the restriction. Therefore, the impact analyses throughout Chapter 4 assume that the restrictions and limitations would apply throughout the Planning Area and 20-year planning period.

4.1.3 General Levels of Impacts

In an attempt to reduce the necessarily complex impact analysis process to readily understandable terms, the following subsections use a qualitative approach for summarizing impacts to specific resources, management actions, and uses. For adverse (negative) impacts, these general impact categories are:

- **None –** Unlikely to impair the resource.
- **Negligible –** May impair the resource, but not at levels that would be noticed by the public, cause the resource value to drop to a lower category, or violate a regulatory standard or environmental law. A more severe impact may be negligible if it is of temporary (duration <2 years).
- **Minor –** Likely to impair the resource at levels that would be noticed by the public, but not to a degree that would detract significantly from the overall value of that resource or a specific use. Unlikely to cause the resource value to drop to a lower category or violate a regulatory standard or environmental law. Relatively few impacts are likely to be permanent (duration >50 years).
- **Moderate –** Likely to impair the resource at levels that would be noticed by the public and detract significantly from the overall value of that resource or a specific use. Could cause the resource value to drop to a lower category but unlikely to violate a regulatory standard or environmental law. Some impacts are likely to be permanent (duration >50 years).
- **Major –** Definitely would impair the resource at levels that would be noticed by the public and would eliminate most or all of the value of that resource or a specific use. Expected to cause the resource value to drop to a lower category and could violate a regulatory standard or environmental law unless mitigated. Many impacts are likely to be permanent (duration >50 years).

Note that impacts to a specific resource under a given land use or management scenario may also be beneficial (positive). The same terms defined above are also used to describe beneficial impacts,

although generally in a more relative sense. For some specific resources discussed in subsequent sections of this chapter, the adverse impacts are defined more quantitatively, while the beneficial impacts remain as general levels of effect. In terms of duration, impacts may be temporary (<2 years) or long-term (>2 years).

Although the impact definitions above may be applied to any resource, land use, or management action, it is impossible to develop terminology that applies equally well to all analyses. Therefore, some of the impact analyses employ specific definitions for negligible, minor, moderate, and major which, while consistent with the terms above, are better suited to the specific resource.

Tables 4-2 and 4-3 summarize the assumed level of oil and gas development and associated surface impacts under the Proposed Plan and other alternatives. Table 4-2 provides information separately for areas atop the plateau and below the rim to assist in the analysis of impacts in these environmentally distinct areas. Table 4-3 presents summary information on potential cumulative impacts, incorporating current and anticipated future (20-year) conditions for the entire Planning Area (Federal and private mineral estates). Actual numbers of oil and gas wells and pads, miles of access roads, and acres of long-term or temporary surface disturbance could vary due to a variety of circumstances that may change during the 20-year life of the Plan, including technical, economic, and societal considerations.

The totals shown in Table 4-3 for Alternatives I through V differ slightly those shown in the Draft RMPA/EIS. This reflects a larger number of existing wells than at the time the Draft was prepared, as well as some different assumptions under the current RFD (Appendix H). Note also that Table 4-3 assumes similar levels of development on available acres of private lands below the rim (after subtracting slopes steeper than 50 percent) as on available acres of Federal lands below the rim (after subtracting slopes steeper than 50 percent, plus other NGD/NSO areas). Although the lack of a winter range TL on private lands affects the seasonal distribution of available drilling locations—some drilling on Federal lands apparently shifts to nearby private lands during the winter—this analysis assumes that it would not affect the total number of wells on private versus Federal lands in 20 years.

It should be pointed out that the Planning Area contains some additional leasable mineral resources, including oil shale, coal, and coalbed natural gas. Oil shale is not currently considered economically viable but could be leased and developed in the future. Research tracts are currently being pursed in the Piceance Basin, but not in the Planning Area. Coal occurs at depths too great for economic recovery at current prices or with current technology. Coalbed natural gas, like coal, is present at depths and/or quantities that do not support development with current technology and economics.

Because of the low likelihood of recovering these leasable mineral resources during the 20-year period of analysis, this RMPA/EIS assumes that the Planning Area would not be subject to entry under the Mineral Leasing Act for the purpose of development during the life of the Plan. Similarly, no locatable minerals (e.g., base metals or precious metals) are known to occur that would result in entry and development under the 1872 Mining Law. Some salable materials (rock and gravel) do occur, but economic use does not currently exist and is not anticipated as part of this RMPA/EIS. Therefore, the following impact analyses make little reference to potential development of these other mineral resources.

Table 4-2. Surface Impacts of Oil and Gas Development on Federal Lands in 20 Years (ac = acres, mi = miles)

Category	*Alternative I No Action*	*Alternative II*	*Alternative III Preferred*	*Alternative IV*	*Alternative V*	*Proposed Plan*
Atop the Plateau = 34,758 Acres						
Area Available for Surface Facilities[1, 2]	1,182 ac (3.4%)	9,011 ac (26%)	23,394 ac (67%)	23,394 ac (67%)	27,350 ac (79%)	18,937 ac (54.5%)
Estimated New Pads (Wells) [3]	7 (10)	66 (87)	39 (51)	126 (168)	175 (234)	13 (210)
Long-term Disturbance for Pads [4]	20 ac	135 ac	104 ac	180 ac	244 ac	32 ac
Long-term Disturbance for Roads [4]	11 ac (4 mi)	108 ac (40 mi)	62 ac (23 mi)	203 ac (76 mi)	280 ac (105 mi)	43 ac (16 mi)
Total Long-term Disturbance [2, 3]	31 ac (<0.1%)	243 ac (0.7%)	166 ac (0.5%)	474 ac (1.4%)	641 ac (1.8%)	75 ac (0.2%)
Temporary Disturbance [5]	20 ac	196 ac	114 ac	373 ac	518 ac	58 ac
Below the Rim = 38,844 Acres						
Area Available for Surface Facilities [1]	14,241 ac (37%)	12,009 ac (31%)	19,280 ac (50%)	19,280 ac (50%)	24,643 ac (63%)	16,254 ac (41.8%)
Estimated New Pads (Wells) [3]	247 (845)	244 (818)	363 (1,273)	323 (1,156)	409 (1,348)	180 (1,360)
Long-term Disturbance for Pads [4]	618 ac	610 ac	840 ac	808 ac	1,022 ac	450 ac
Long-term Disturbance for Roads [4]	502 ac (148 mi)	495 ac (146 mi)	755 ac (218 mi)	658 ac (194 mi)	832 ac (245 mi)	287 ac (108 mi)
Total Long-term Disturbance [4]	1,120 ac (2.9%)	1,105 ac (2.8%)	1,595 ac (4.1%)	1,466 ac (3.8%)	1,854 ac (4.8%)	737 ac (1.9%)
Temporary Disturbance [5]	730 ac	720 ac	1,073 ac	956 ac	1,208 ac	260 ac
Total BLM Lands in the Planning Area = 73,602 Acres						
Area Available for Surface Facilities [1]	15,423 ac (21%)	21,021 ac (29%)	42,674 ac (58%)	42,674 ac (58%)	51,993 ac (71%)	35,191 ac (47.8%)
Estimated New Pads (Wells) [3]	254 (855)	310 (905)	402 (1,324)	449 (1,324)	584 (1,582)	193 (1,570)
Long-term Disturbance for Pads [4]	638 ac	745 ac	944 ac	988 ac	1,266 ac	482 ac
Long-term Disturbance for Roads [4]	513 ac (152 mi)	603 ac (186 mi)	817 ac (241 mi)	861 ac (270 mi)	1,112 ac (350 mi)	330 ac (124 mi)
Total Long-term Disturbance [4]	1,151 ac (1.6%)	1,348 ac (1.8%)	1,761 ac (2.4%)	1,940 ac (2.6%)	2,495 ac (3.4%)	812 ac (1.1%)
Temporary Disturbance [5]	750 ac	916 ac	1,187 ac	1,329 ac	1,726 ac	318 ac

Footnotes for Table 4-2	
Alternatives I through V	***Proposed Plan***
[1] Leasable area minus ND/NSO restrictions.	[1] Leasable area minus NGD/NSO restrictions.
[2] Atop the plateau: Leasing and drilling atop the plateau would be deferred until 80% of the total wells anticipated below the rim under Alternative III have been effectively completed to total depth and a production test performed.	[2] Atop the plateau: Leased as Federal Unit specifying minimum spacing between pads, use of clustering, staged development, and placement of oil and gas facilities on ridgetops with slopes of 20% or less.
[3] 40-acre surface density, except 20-acre surface spacing for directional drilling below cliffs. Downhole spacing as follows: Mesaverde: atop the plateau: 40 acres; below the rim: 80% at 10 acres, 20% at 20 acres; Wasatch: 160 acres throughout.	[3] Atop the plateau: Minimum of 0.5 mile between pads (160-acre surface density) and clustering of up to 17 wells per pad (10 Mesaverde with 10-acre downhole spacing and Wasatch at 160-acre downhole spacing. Below the rim: Manage to maximum clustering practicable. Assumed surface density for impact assessment: 40 acres on 25%, 80 on 50%, and 160 acres of 25%. Downhole spacing: 10 acres for Mesaverde and 160 acres for Wasatch.
[4] Pad impacts as follows: 1.9 acres for single-well pads, 2.5 acres for multi-well pads. Road impacts as follows: 0.6 mile of new or upgraded road per pad. Atop the plateau: 80% new roads 30 feet wide and 20% existing roads widened by 20 feet. Below the rim: 20% new roads 30 feet wide and 80% existing roads widened by 20 feet.	[4] Pad impacts as follows: 2.5 acres for multi-well pads. Road impacts as follows: Atop the plateau: 12 miles from Cow Creek access point to approximate center of developable area, plus 0.3 mile per pad. Below the rim: 0.6 mile of new or upgraded road per pad. Both areas: 20% new roads 30 feet wide and 80% existing roads widened by 20 feet.
[5] Includes 1.5 acres at each pad and 10 feet on each side of new or upgraded roads.	[5] Includes 1.5 acres at each pad and 10 feet on each side of new or upgraded roads.

Assumed Drilling Scenario for Proposed Plan

The number of oil and gas wells assumed to be drilled on Federal land in the Planning Unit during the 20-year period of analysis is derived from assumptions used in the RFD (Appendix H) and current drilling levels in the Planning Area. The assumptions used for the purpose of impact analyses in this RMPA/EIS are summarized below.

Atop the Plateau – BLM assumes that for most of the 20-year period, two drill rigs would be operating on Federal lands on top of the plateau. This assumption is based on the much thicker section of bedrock that must be penetrated, combined with difficult access and an assumed 6-month drilling season due to inclement winter weather and snowpack. Additionally, BLM assumes that only one rig would be operating for the first 4 years as part of the initial exploration and "ramping up" phase. Other assumptions, taken directly from the RFD, are that a drill rig can complete 6 wells per year, based on 30 days per well and 6 months of drilling. Together, these assumptions result in an estimated 210 wells atop the plateau during the 20-year period of analysis.

Below the Rim – BLM assumes that seven drill rigs would be operating on Federal lands below the rim for most of the 20-year period. Assumptions taken directly from the RFD include an average of 10 wells per drill rig per year, based on 20 days per well and a 7-month drilling window due to the 5-month TL for big game winter range. BLM also assumes that only six rigs would operate for the first 4 years because of current drilling programs in the area. Together, these assumptions result in an estimated 1,360 wells in 20 years.

Combined Area – Summarizing the analyses presented above for the upper and lower plateau, the assumed development scenario for Federal lands includes one drill rig atop the plateau and six below the rim for the first 4 years, and then two drill rigs on top and seven below for the remaining 16 years. The combined total of new wells is therefore assumed to be 1,570 wells at the end of the 20-year period. The actual number and distribution of rigs, and the actual number of wells, may vary from the assumed level due to a variety of economic, geopolitical, environmental, and technological factors, including availability of drill rigs and crews. Changes due to currently unanticipated factors associated with other resources, land uses, or management priorities for BLM could also affect future development rates. However, the assumed total of 1,570 wells in 20 years is believed to be reasonable for the purposes of analysis of impacts under the Proposed Plan and comparison with the five previous alternatives.

Table 4-3. Cumulative Impacts of Oil and Gas Development on Federal plus Private Land in the Planning Area in 20 Years

Category	*Alt. I No Action*	*Alt. II*	*Alt. III Preferred*	*Alt. IV*	*Alt. V*	*Proposed Plan*
Atop the Plateau = 53,798 Acres						
Area Available for Oil and Gas Facilities [1, 2]	17,227 ac (32%)	25,056 ac (47%)	39,439 ac (73%)	39,439 ac (73%)	43,395 ac (81%)	34,926 ac (65%)
Total Pads (Wells) [3]	66 (259)	125 (336)	98 (298)	188 (417)	234 (483)	72 (459)
Long-term Disturbance [4]	299 ac (0.6%)	510 ac (0.9%)	434 ac (0.8%)	741 ac (1.4%)	908 ac (1.7%)	344 ac (0.6%)
Temporary Disturbance [5]	194 ac	370 ac	288 ac	547 ac	692 ac	232 ac
Below the Rim = 73,209 Acres						
Area Available for Oil and Gas Facilities [1, 2]	38,951 ac (53%)	36,719 ac (50%)	43,990 ac (60%)	43,990 ac (60%)	49,353 ac (67%)	41,122 ac (56%)
Total Pads (Wells) [3]	688 (2,717)	685 (2,690)	804 (3,145)	764 (3,028)	850 (3,220)	597 (3,232)
Long-term Disturbance [4]	2,968 ac (4.1%)	2,952 ac (4.0%)	3,435 ac (4.7%)	3,306 ac (4.5%)	3,694 ac (5.0%)	2,447 ac (3.3%)
Temporary Disturbance [5]	2,033 ac	2,022 ac	2,374 ac	2,259 ac	2,510 ac	1,392 ac
Combined Area = 127,007 Acres						
Area Available for Oil and Gas Facilities [1, 2]	56,178 ac (44%)	61,775 ac (49%)	83,429 ac (66%)	83,429 ac (66%)	92,748 ac (73%)	76,048 ac (60%)
Total Pads (Wells) [3]	754 (2,976)	810 (3,036)	902 (3,443)	952 (3,445)	1,084 (3,703)	669 (3,691)
Long-term Disturbance [4]	3,267 ac (2.6%)	3,462 ac (2.7%)	3,869 ac (3.0%)	4,047 ac (3.2%)	4,602 ac (3.6%)	2,791 ac (2.2%)
Temporary Disturbance [5]	2,227 ac	2,392 ac	2,662 ac	2,806 ac	3,202 ac	1,624 ac

[1] *Same as Table 4-2, except for private lands excludes only steep slopes (no NGD/NSO).*

[2] *Same as Table 4-2.*

[3] *Same as Table 4-2, except average of 40-acre surface density and 10-acre downhole spacing for private lands above and below the rim. Number below the rim includes 197 existing wells in currently leased areas of Federal lands and 583 existing wells on private lands; number atop the plateau includes 7 wells on private land (RFD, Appendix H).*

[4] *Same as Table 4-2.*

[5] *Same as Table 4-2.*

4.2 PHYSICAL ENVIRONMENT

4.2.1 Geological Resources

4.2.1.1 Introduction

As described in Sections 3.5.5 and 3.5.6, the Planning Area does not contain mineral resources (other than fluid mineral resources, oil shale, and some potential salable construction materials) that would affect or be affected by implementation of any of the alternatives analyzed as part of this RMPA/EIS. Additionally, the area is not known for rockhounding because of a virtual lack of metallic minerals or gemstones. Therefore, the major geologic issues are potential geologic hazards and the Anvil Points Cave system. Issues related to the presence of paleontological resources within the Planning Area are discussed in Section 4.2.2.

4.2.1.2 Impacts of Proposed Plan

Geologic hazards are associated primarily with rockfall hazard along the Roan Cliffs. The combination of topographic relief in excess of 900 feet, steep slope angles, and instability associated with interbedded resistant and erosive layers contribute to rockfall. Indeed, the visual quality of the cliffs is due in large part to slope instability, which results in continual erosion and exposure of fresh bedrock and debris cones (talus and scree). Slopes steeper than 50 percent would be protected by an NGD/NSO stipulation under all of the alternatives, but only in areas with BLM surface or mineral estate. Consequently, the rockfall hazard in the non-BLM portion of the Planning Area could be greater.

The Anvil Points Claystone Cave is located within an existing oil and gas lease with an NSO to protect this resource from surface disturbance. Similar protection would be applied to other land uses and management activities under an analogous NGD restriction. Therefore, negligible negative impacts to the cave are expected from ground-disturbing land uses or management actions. However, the cave remains vulnerable to potential for moderate to major impacts from unregulated recreation.

4.2.2 Paleontological Resources

4.2.2.1 Introduction

While high erosion rates on steep slopes in the Planning Area may be an issue in terms of rockfall hazard (see above), they have the benefit of constantly exposing subsurface materials, including new fossils. Exposed for long periods of time, these fossils erode from the confining sediments, often "float" on the ground surface, and gradually deteriorate. Cumulative impacts such as mechanical breakage and disarticulation of surface fossils due to trampling by animals and damage caused by human activities undoubtedly occurs in the Planning Area. Collecting of common invertebrates and plant fossils is a traditional and ongoing recreational activity in western Colorado. Although several fossil enthusiasts have reported vertebrate and other scientifically important fossil discoveries to land managers and BLM-permitted paleontologists, illegal collection of surface fossils still occurs and is an ongoing problem. Recreational activities such as exploring off designated roads and trails, either on foot or by mechanized means, create the need for further protective measures to preserve fossil resources.

When oil and gas activity, pipelines, and associated roads are cut into outcrops, paleontological resources are placed at risk of destruction. The ROD for the 1999 FSEIS outlines stipulations for what are now called Condition 1 and Condition 2 paleontological areas. Prior to ground-disturbing activities in a Condition 1 area (and prior to sample surveys in a Condition 2 area for larger projects), the GSFO Geologist must determine, in consultation with the BLM Regional Paleontologist, whether an inventory should be conducted by an accredited paleontologist approved by BLM. This determination is based on whether the area is likely to yield fossils of scientific importance.

Condition 1 areas (void of well-developed soils, lacking thick vegetation, and with unsafe slopes) should be recommended for a paleontological survey for all projects. Larger projects, greater than 500 acres or longer than one linear mile, should be surveyed for Condition 2 (likely to be fossiliferous). The purpose of the surveys is to add to the knowledge base of paleontological resources in the area and help in decision-making concerning actions that may affect these resources. When scientifically important paleontological resources are already known to be present or are found as the result of these surveys, the resources should be avoided, monitored, and/or mitigated as appropriate given the type of action and specific resources.

Fossil resources on BLM lands are managed under FLPMA, NEPA, specific Federal regulations, and other guidance outlined in BLM 8270 Manual and Handbook for the Management of Paleontological Resources (BLM 1998b) and in accordance with DM 411 for the Management of Museum Collections. The BLM 8270 Handbook ranks formations according to their paleontological potential, as follows:

- **Condition 1** – Areas that are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. Consideration of paleontological resources would be necessary if the Field Office review of available information indicates that such fossils are present in the area.
- **Condition 2** – Areas with exposures of geologic units or settings that have high potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. The presence of geologic units from which such fossils have been recovered elsewhere may require further assessment of these same units where they are exposed in the area of consideration.
- **Condition 3** – Areas that are unlikely to produce vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils based on deep soils, surficial geology, igneous or metamorphic bedrock, and extremely young alluvium, colluvium, or eolian deposits. However, if possible it should be noted at what depth bedrock may be expected in order to determine whether fossiliferous deposits may be uncovered during ground-disturbing activities.

Although these guidelines apply primarily to vertebrate fossils, they are designed to help protect rare plant and invertebrate fossils, especially "type" localities. Likewise, many fossils, though common and unimpressive in and of themselves, can be important indicators of paleoenvironment, depositional regime, and chronostratigraphy (i.e., temporal relationships). Based on the definitions developed using the BLM 8270 Manual, the upper member of the Wasatch Formation and the A-B groove of the Parachute Creek Member of the Green River Formation would be considered as having Condition 1 paleontological potential. Until other fossiliferous units can be identified, all other Tertiary and all Quaternary deposits would be considered Condition 2.

4.2.2.2 Impacts of Proposed Plan

Direct and Indirect Onsite Impacts

Impacts to paleontological resources under the Proposed Plan would be similar to the Preferred Alternative of the Draft RMPA/EIS. The Sharrard Park Paleontological area would continue to be protected, and motorized or mechanized travel would mostly be limited to designated routes, except cross-country travel by snowmobile. Because the Sharrard Park area has been specifically identified in public documents, increased vandalism and illegal fossil collecting is possible.

Designation of the Hubbard Mesa area for open OHV travel (i.e., not limited to designated routes) would represent potentially serious threat to paleontological resources in that area. Construction of any new routes should be preceded by a paleontological survey to minimize the potential for damaging a high-quality outcrop.

Atop the plateau, management to maintain WSR eligibility along East Fork Parachute Creek adds a level of protection for Condition 1 paleontological resources of the A-B groove of the Parachute Creek

Member. The WSR areas are protected from direct and indirect impacts associated with ground-disturbing activities by NGD/NSO restrictions and the inaccessibility from the steep slopes where they occur. However, unless special provisions area made, the NGD/NSO restrictions can also hinder scientific access to paleontological resources.

Areas with SSR/CSU restrictions provide some additional protection for fossil resources, because these restrictions include a requirement for a paleontological survey prior to ground-disturbing activities and monitoring during construction. Thus, SSR/CSU areas provide opportunities not only to protect the fossil resources but, just as important, to catalog and study them. The overall effect of the Proposed Plan would be negligible, with potentially moderate beneficial impacts of SSR/CSU designations offsetting potentially moderate negative impacts in the Hubbard Mesa area.

Some of the impacts to fossil resources could represent an irreversible and irretrievable commitment of natural resources (Section 4.6).

Offsite and Cumulative Impacts

Differing levels of paleontological resource protection or discovery under the alternatives analyzed would not be expected to have demonstrable offsite or cumulative impacts. Potentially, the increased levels of oil and gas development would make the area less suitable for fossil enthusiasts. Thus, while the Sharrard Park Paleontological Area would continue to receive SSR/CSU protection, the increased "industrialization" of nearby areas might detract from the overall fossil-hunting experience and shift some use to offsite localities. However, given the relatively small amount of this type of use compared to other recreational activities and other, non-recreation-oriented land uses, any shift to offsite areas would be negligible.

Long-term cumulative impacts of oil and gas development in the Planning Area are associated primarily with the fact that a considerable amount of future development would occur on private land within the Planning Area and nearby areas with the same type of fossil-bearing rock exposures. Because private landowners do not require paleontological assessments before and during construction activities, much less any mitigation of at-risk resources, some important fossil specimens or paleontological data could be lost. Additionally, private landowners may restrict access to significant fossil locations on public land that are not readily accessible except across their property. Oil and gas development both within and outside BLM lands within the Planning Area is likely to exacerbate the problem by limiting public access except on designated roads.

4.2.3 Soils

4.2.3.1 Introduction

Direct soil impacts of concern in the Planning Area include soil erosion, mixing of horizons, changes in infiltration from compaction and fire, and chemical contamination. Some or all of these impacts can occur from OHV travel, recreation, grazing, range management activities, fire management, oil and gas development, and ground-disturbing activities associated with rights-of-way such as roads, pipelines, and electric transmission corridors. Impacts on the physical, biological, and chemical properties of the soils can have indirect effects on sedimentation, infiltration and permeability, soil biota, and plant productivity. The categories of impacts used in this analysis (i.e. negligible, minor, moderate, or major) are described in Section 4.1.

Soil erosion is a concern for future management of the Planning Area, particularly regarding anticipated oil and gas development. Impacts may include reduced ecological, visual, and agricultural (livestock) quality due to removal of vegetation cover, mixing of soil horizons, soil compaction, and contamination from drilling and production wastes or fuel spills. Exposed, mixed, compacted, or contaminated soils exhibit loss of productivity, decreased infiltration, increased runoff, and increased erosion. Wind erosion

is not as important a factor in the Planning Area, although the combination of increased areas of bare soils and increased road traffic would increase the generation of fugitive dust (airborne particulates).

Although soil erosion is a natural process that occurs even in "pristine" areas, the rate of erosion can be greatly accelerated by anthropogenic (human-use-related) activities such as grazing, cultivation, forestry, recreation, and construction that remove vegetation cover and disturb the soil surface. Soil loss can occur as sheet, rill, or gully erosion associated with precipitation runoff, as well as from wind erosion. The most important factors affecting runoff erosion are the intensity and duration of precipitation, inherent erodibility of the soil, slope length and steepness, vegetation cover, and erosion control practices (Wischmeier and Smith 1978).

Soil erosion rates can be increased by as much as an order of magnitude (i.e., tenfold) during construction, when vegetation has been cleared, topsoil removed and stockpiled, and subsoils exposed to rainfall and snowmelt. In the Universal Soil Loss Equation, input values used to represent the ameliorating effect of plant cover are 12 times as high with 60 percent grass cover, and 5 times as high with 40 percent grass cover, as for areas with zero percent grass cover (Wischmeier and Smith 1978). This increase in erosion potential is exacerbated when the disturbance occurs in soils that are inherently more erodible (Section 3.2.3). For example, soils with a "very severe" erosion hazard can lose 12 to 30 tons per acre per year under normal conditions, compared to only 1 to 2 tons per acre per year for soils with a "low" erosion hazard.

Surface disturbance from oil and gas development would be spread over time throughout and beyond the 20-year period of analysis, reducing the amount of new disturbance in any given year. This is important because runoff, erosion, and sedimentation associated with wells are highest initially, when soils are freshly disturbed, and decline as revegetation gradually reduces the amount of bare soil. Runoff and erosion are likely to be greater from roads, although smaller in total area, than from oil and gas pads, because roads may slope and may approach or cross streams, while oil and gas pads are relatively flat and could not be located adjacent to a stream or on a steep slope.

Because of the importance of reducing soil loss and protecting sensitive ecological resources on Federal lands in the Planning Area, BLM has established and NGD/NSO for areas steeper than 50 percent due to the high potential for erosion and the difficulty of rehabilitating these areas (Map 14). SSR/CSU restrictions have been established for areas steeper than 30 percent having soils with a severe or very severe erosion hazard, based on the NRCS (SCS 1985) soil survey of the Rifle area (see Map 15). The application of these protective stipulations to the alternatives considered in this RMPA/EIS is discussed in the following subsections.

Assessing the potential severity of soil erosion from oil and gas development is not as simple as comparing the amount of newly disturbed ground to the total project area. For example, achieving a level well pad often requires cut-and-fill slopes that affect the erosion potential related to pad construction. Additionally, NGD/NSO and SSR/CSU restrictions to avoid problematic areas and BMPs and reclamation standards to reduce erosion potential are likely to vary in their effectiveness. In general, areas atop the plateau or less subject to soil erosion, based on a relatively low proportion of soils in the severe or very severe erosion classes and the denser vegetation cover. However, the small sizes and low flow volumes of streams at the higher elevations make these drainages susceptible to adverse impacts from relatively small amounts of sediments. In comparison, the area below the rim has naturally sparser vegetation and a higher proportion of highly erodible soils, which contribute to naturally higher levels of suspended solids (sediment loads) in Parachute Creek (see Table 3-2b) and the Colorado River. Therefore, a given amount of inflow of eroded soils from ground-disturbing activities in the Planning Area would represent a proportionately much small incremental increase for streams below the rim than for those above.

An indirect impact of particular importance for this RMPA/EIS is the potential transport of eroded soil material to streams, where it may adversely affect water quality, riparian vegetation, and aquatic

organisms, including genetically pure populations of the Colorado River cutthroat trout and other sensitive plant and animal species.

Areas of bare soil are also a source of suspended (windblown) particulates in the form of fugitive dust that may be transported into aquatic habitats and deposited on plant foliage, reducing plant vigor and affecting local air quality.

The management and expected impacts to the soil resources of the Planning Area associated with each alternative are described below. The general management of the soil resources is based on Land Heath Standards. All of the alternatives would manage soils to meet or exceed Land Health Standard 1. Areas with wilderness character and areas eligible for designation as WSRs are discussed in Sections 4.5.8 and 4.5.9.

Some of the soil impacts described in the following subsections may represent an irreversible and irretrievable commitment of natural resources.

4.2.3.2 Impacts of Proposed Plan

Direct and Indirect Onsite Impacts

The Proposed Plan would have less direct impact on soils than any of the alternatives in the Draft RMPA/EIS except for Alternative I (No Action). This is due to the requirement for phased and clustered oil and gas development atop the plateau and the goal of clustering below the rim. Additionally, the Proposed Plan would have more area protected by NGD/NSO and SSR/CSU restrictions than any alternative except Alternative II. These include the specific soils-related protections of an NGD/NSO for slopes steeper than 50 percent and an SSR/CSU for slopes steeper than 30 percent on erosive soils. In this context, erosive (highly erodible) soils are those map units identified in the soil survey of the Rifle Area as having a high erosion hazard (SCS [NRCS] 1985).

The estimated 193 new oil and gas pads and 124 miles of new or upgraded access roads under the Proposed Plan would result in total long-term disturbance of 812 acres and temporary disturbance of 318 acres. However, these totals are less than 50 percent of the long-term impact acres, and less than 25 percent of the temporary impact acres, under Alternative II—the environmentally most protective alternative of the Draft. The total long-term ground disturbance under the Proposed Plan represents 1.1 percent of the Federal lands on the Planning Area. In comparison, the analogous figure for the five previous alternatives ranged from 1.6 percent to 3.4 percent.

For the area atop the plateau, the reduction in ground-disturbing impacts is accomplished not only by clustered development (with a minimum of 0.5 mile between pads), but also by focusing development on ridgetops with slopes of 20 percent or less. The latter measure avoids most of the valley sideslopes. In addition to causing less physical disturbance and increased erosion loss of soils, it also provides greater distances of well pads from streams, as well as fewer new road crossings of streams.

Although the oil and gas impacts under this alternative would have negligible soil impacts overall, impacts would continue to be more severe at a localized scale due to long-term changes in soil fertility or structure, loss of topsoil, compaction, loss of plant cover, and other changes. These areas of localized impact may create ecological and visual scars extending well beyond the end of the 20-year analysis period. BMPs to minimize these impacts include requirements for salvaging and replacing topsoil. A related component of the Proposed Plan that was not contained in any of the previous alternatives is the requirement that no more than 350 acres (approximately 1 percent of the Federal lands atop the plateau) be in a disturbed condition at any one time. In this regard, "disturbed condition" means areas from which plant cover has been removed, but excluding areas in at least their second year of revegetation and showing satisfactory progress toward revegetation success (Appendix J).

Examples of BMPs (see Appendix I for a comprehensive list) that may be required to reduce the potential for soil damage or loss in specific locations include:

- use of erosion-control fabric to stabilize development-related bare slopes steeper than 2 to 1 (horizontal to vertical)
- construction of water bars or other erosion-control features on vehicle routes constructed or used to access oil and gas pads or roads used for grazing access and recreational travel
- testing of soil for agronomic (growth) characteristics prior to reclamation of long-term disturbances and adding organic matter, applying nutrients, or undertaking other measures to improve quality as a growth medium (not an issue for temporary impacts)
- requirements for enhanced revegetation, including use of woody plants as containerized stock to hasten soil stabilization

The Proposed Plan would share with Alternatives II through V the restriction of motorized and mechanized travel to designated routes, except that it would allow cross-country travel by snowmobiles with at least 12 inches of snow cover and would designate the Hubbard Mesa OHV Riding Area as open for cross-country travel. Based on current and anticipated growing levels of OHV use in the Hubbard Mesa area, the open designation in this area is likely to result in potentially major localized impacts to soils from physical disturbance, compaction, and damage to vegetation. The resultant increase in soil erosion and sediment transport would be likely to affect water quality in Government Creek, which receives runoff from the Hubbard Mesa area. However, the increased suspended load in Government Creek would be unlikely to affect water quality in the Colorado River, to which Government Creek is a minor tributary. Outside the Hubbard Mesa OHV Riding Area, the Proposed Plan would also be unlikely to substantially increase sediment loads in perennial streams supporting aquatic life, based on the various protections provided.

Vegetation goals would focus on improving the diversity, production, and native species composition of upland and riparian/wetland areas. Livestock grazing would be managed to conform to BLM grazing regulations and meet Land Health Standards as well as vegetation community objectives. Because the Proposed Plan makes greater use of active management than Alternatives I and II, which relied primarily on natural processes, the rate of range improvement is expected to be more rapid. Over time, the Proposed Plan is expected to have moderate to major positive benefits on vegetation condition, which in turn would benefit the soil resource.

Fires can affect soil by removing plant cover, destroying surficial organic matter, altering the temperature and moisture regimes (by altering the amount and type of plant overstory), altering patterns of snow accumulation and snowmelt, and (if sufficiently hot) modifying soil infiltration rates by creating a hydrophobic or "water-repellent" surface. Because of higher temperatures and occurrence during less favorable seasons (during summer when vegetation may be drought-stressed), uncontrolled wildland fires typically have a greater impact than lower intensity prescribed fires. However, wildland fire management under any of the alternatives is related primarily to other factors, such as management of forest and range health and risks of damage to private property, crucial habitats, watershed processes, and oil and gas facilities.

Overall, soil impacts under the Proposed Plan would be minor due to the combination of road closures, prohibition against cross-country OHV travel except for Hubbard Mesa and snowmobiles, and rangeland improvements combining to offset much of the adverse impact associated with oil and gas development. The phased and clustered development atop the plateau, and to a lesser degree the assumed level of clustering below the rim, would also reduce the severity of soil impacts from oil and gas development.

Indirect impacts to soils associated with soil erosion have been described above and include both direct disturbance during construction of roads and drill pads or potentially from cross-country OHV use and indirect impacts from loss or reduced vigor of plant cover that stabilizes the soil. Impacts of reduced soil quality include greater erosion potential and resultant sediment transport to streams, potential entrainment

as fugitive dust, visual degradation, and reduced vegetation cover due to soil instability, lower fertility, and compaction.

Especially because of the slow recovery rate of natural plant communities in semi-arid regions, the loss of vegetation associated with soil impacts would indirectly reduce wildlife carrying capacity in proportion to the amount of land taken out of forage production and no longer providing cover or, for small ground-dwelling species, habitable land.

Under any of the alternatives, including current conditions, sediment transport to streams could affect water quality for the Colorado River cutthroat trout, as well as other aquatic species and terrestrial species that rely on water. However, the clustered development requirement and the restriction of development to ridgetops in the area on top of the plateau, combined with the restriction of motorized and mechanized travel to designated routes and planned range improvement measures, would minimize this risk compared to Alternatives II through V. Alternative I would not allow oil and gas development atop the plateau, but would allow cross-country OHV travel and implement less aggressive range improvement measures.

Offsite and Cumulative Impacts

Offsite impacts of soil erosion within the Planning Area would mostly be limited to offsite transport of sediments and, to a lesser degree, offsite impacts on air quality. Considering the currently sparse vegetation across much of the lower portion of the Planning Area, naturally high rates of soil erosion would continue in this area. However, due to the naturally high sediment loads in area streams and the measures described above for reducing soil erosion, these offsite impacts are expected to be negligible under all of the alternatives, including the Proposed Plan.

Cumulative onsite impacts would be minor, since the proportion of the area disturbed would remain a small percentage of the total area. In general, cumulative impacts of land uses on Federal lands are likely to be substantially less than those on private lands due to generally fewer and less stringent protections. Even on private lands, development on areas with slopes steeper than 50 percent is not anticipated, lessening the potential impacts on private lands. However, avoidance of slopes steeper than 30 percent with erosive soils, and BLM measures related to revegetation and range improvement, are not as likely to accompany development on private lands.

Assessing the potential for cumulative offsite impacts of soil erosion assumes that urbanization of private lands both inside and outside the Planning Area is likely to continue at current or accelerated rates. This has the potential to disturb much larger areas than those on BLM lands. Nonetheless, the combination of increased roads and access to the Planning Area, continued population growth and resultant increase in OHV travel, and increasing amounts of long-term disturbance associated with oil and gas development could result in observable adverse impacts from erosion and sediment transport to streams.

4.2.4 Water Resources

4.2.4.1 Types of Impacts

Water quality impacts can result from a number of causes, including transport of eroded soils into streams due to livestock grazing, introduction of waste matter into streams from domestic livestock, and "low-water" crossing points of roads, routes, and ways used by motorized vehicles. While these potential impact sources exist and would continue under any of the alternatives, a potentially greater source of potential impacts to water quality would result from additional oil and gas development. Potential oil and gas impacts relate to both the transport of soil eroded from roads and drill pads and the potential for release of chemical pollutants into area ponds, streams, or tributary ephemeral drainage swales.

Sedimentation

Sedimentation is the buildup of eroded soil particles in surface water channels. Erosion is a natural process; however, certain land-use activities may accelerate the process. Erosion and sedimentation can be increased by activities that move soil/sediment particles and/or activities that reduce the density or quality of vegetative cover, including livestock grazing and range manipulation, grading and clearing for roads or well pads, on- and off-road OHV use, and fire or fire management. Additionally, activities or management prescriptions that reduce the quantity or quality of ground cover can increase surface water runoff, thereby potentially increasing sedimentation of water channels.

Once soil particles have been detached and suspended in surface runoff, they can contribute to degradation of surface water quality and aquatic habitats. Impacts to water quality due to sedimentation are highly variable. Generally, sedimentation can degrade water quality by increasing turbidity and salinity, and introduce contaminants held in the soil particles. Sediments can also bury plants and rocks and accumulate in streambeds.

In the Planning Area, streams would be protected by setback restrictions and by BMPs and reclamation standards for ground-disturbing activities within the watershed. Nonetheless, construction of well pads, roads, pipelines, and related facilities would result in large amounts of soil being moved locally in the short term, potentially resulting in temporary decreases in water quality in nearby streams. In the Planning Area, which includes large areas of soils with naturally severe or very severe erosion rates (5 to 30 tons/acre/year), it is possible that any increase in sedimentation from oil and gas development during the 20-year period of analysis, or from other land-use or management activities, would not be distinguishable from natural erosion rates in the area.

The portion of a given source of sedimentation that actually reaches a stream can be near zero where an eroding slope deposits most of the soil particles at the base of a hill, to 100 percent where an eroding slope leads directly to a stream.

Chemical Pollution

Each phase of oil and gas extraction can create wastestreams that, if not handled correctly, could degrade surface and ground water quality. Table 4-4 describes typical wastestreams. The severity of the effects may be highly variable, depending on the content of the waste-stream, amount and location of discharge, geologic formation and permeability of soils, and climatic conditions.

Table 4-4. Potential Wastestream Outputs from Oil and Gas Extraction Processes

Stage	*Wastestreams*
Well Development	Drilling muds, organic acids, diesel oil, crankcase oils, and acidic stimulation fluids (hydrochloric and hydrofluoric acids)
Production	Heavy metals, dissolved solids, organic compounds, and high levels of salt. May also contain additives including biocides, lubricants, and corrosion inhibitors.
Maintenance	Completion fluid, well-cleaning solvents, paint, and stimulation agents. The volume of associated wastes (wastes related to maintenance) is typically very small, about one barrel per well per year.

Source: Profile of the Oil and Gas Extraction Industry (EPA 2000)

The primary wastestreams from oil and gas extraction are associated with drilling wastes and produced water. During drilling, as much as 0.06 to 0.14 barrels of drill cuttings are produced for each vertical foot drilled, based on a 7.875-inch gauge bore and 12-inch washout. The drilling mud may contain bentonite clay and various contaminants (Section 3.5.12).

Drill cuttings, including rock fragments and unsalvaged mud, typically are not removed from the site. Up to 100 cubic yards of cuttings (for an 8,000-foot deep well and a 7.875-inch gauge bore) may be left at each drill pad per well drilled. The mud pits are typically unlined, 8 to 10 feet deep, and backfilled with the excavated soil and subsoil material after drilling is completed. Drilling mud may be reconditioned and reused. Drilling mud is typically monitored continuously (24 hours a day) during drilling operations to avoid accidental release from a site. In the event of an inadvertent discharge, its high viscosity would limit the rate of overland flow, allowing it to be contained before reaching a stream (in combination with the setback distances from streams of at least 200 meters).

According to a recent study by the EPA (2000), the primary byproduct of the production phase, and of the industry, is produced water. While disposal of produced water by underground injection is common in some regions, it is not common in the Roan Plateau area, and BLM has not approved any injection wells in the Planning Area. Use of pits or ponds to dispose of produced water by evaporation (and to a lesser extent infiltration into the soil) is also common in some areas but less so in the Planning Area. Alternative I (and the other alternatives) would specify that any drilling atop the plateau be a self-contained operation in which produced water is trucked offsite for disposal.

Table 3-35 (Section 3.5.12) summarizes the chemistry of produced water from the Black Mountain brine disposal facility in Colorado. While the data from this facility may differ slightly from the chemistry of evaporation ponds at oil and gas development sites in the Planning Area, they provide a basis for analyzing the potential impacts of disposal of contaminated produced water. At this facility, sodium, chloride, dissolved solids, iron, manganese, benzene, and toluene exceeded Colorado's MCLs for drinking water and groundwater by a factor of 10 or more. The reported analyte concentrations presented in Table 3-35 are conservative (more likely to overestimate than underestimate) produced waters at the well sites because of concentration associated with evaporation. According to Williams Production, the largest producer of oil and gas in the Planning Area, approximately 4 barrels of water are produced per well each day (Cesark 2003).

Potential regulated releases could occur from tanker trucks, onsite tanks, or evaporation ponds. The size of potential spills can vary. The average condensate tank capacity is typically 300 barrels per wellhead, and produced-water storage tanks are generally between 200 and 300 barrels per wellhead. Transport trucks range in capacity from 60 to 120 barrels. Produced water typically contains about 10 percent condensate. The tankers and/or ponds can contain more than 25 gallons of natural gas condensate at any given time. BLM requires reporting of brine releases that exceed 100 barrels.

Discharge or seepage of drilling mud or produced water, if not handled correctly, could have localized major direct impacts to surface water. The effects are highly dependent on the level of contamination, the method of disposal, and the amount disposed. However, drilling permits require operators to ensure that exploration and production waste is properly stored, handled, transported, treated, recycled, or disposed to prevent significant environmental impacts to water resources. These requirements aim to minimize or eliminate adverse impacts associated with oil and gas extraction processes.

Adverse impacts to water quality could occur as a result of accidental discharges, leaks, or spills at development sites. In the case of small or one-time discharges of contaminated drilling mud or produced water, direct impacts to water quality are considered minor because effects are temporary and limited to the immediate area. However, the impacts could be major for a specific resource in a specific area. For example, a sudden accidental release from a tanker trunk—e.g., from tipping over and rupturing at a stream crossing—would cause major impacts to water quality at the site and for some distance downstream. In the small streams that characterize most of the Planning Area, a spill of up to 120 barrels of brine or other pollutant (e.g., fuel) could kill most or all of the aquatic biota, and some of the adjacent riparian vegetation, along whatever downstream distance would be required for dilution below toxic levels. A requirement for culverted road crossings of streams, as specified for reducing stream erosion and protecting aquatic and riparian vegetation and wildlife, would probably reduce the potential for truck

accidents at stream crossings, which often require a relatively steep descent to, and departure from, the crossing point. Standard operating procedures for these incidents are summarized in Section 3.5.12.

Reduced Water Quantity

Water yield is dependent on both natural factors and land management. Natural factors include climate, geology and soils, slope, channel conditions, and vegetation type and density. Land use or management activities that result in alteration of these natural factors plays a role in altering water yield, including grading or compaction of 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 (EPA 1999). Such reductions 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 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 the basin.

4.2.4.2 Impacts of Proposed Plan

This section evaluates the changes to water resources in the Planning Area from implementation of management actions for the Proposed Plan, with selected comparisons to the five previous alternatives. To evaluate effects on water quality and water rights, threshold criteria were developed to differentiate the extent and intensity of impacts under each alternative. Categories of adverse impacts on water quality used in this RMPA/EIS include:

- **None** – Not likely to affect the resource.
- **Negligible** – Changes in water quality may be detectable and measurable in analytical samples but not upon observation in the field. No regulatory standards would be exceeded. Changes in water quality or quantity would not affect current uses or have discernible impacts on water-dependent resources.
- **Minor** – Degradation of water quality could result in exceedances of regulatory standards, but these would be transitory (e.g., in response to a pulsatile event) and limited to the vicinity of the causal sources. Changes in water quality may be discernible in the field as well as in analytical samples. Changes in water quality or quantity could temporarily impair some current uses or water-dependent resources in localized areas.
- **Moderate –** Degradation of water quality could result in more widespread, but transitory, exceedances of regulatory standards. Changes in water quality may be discernible in the field. Changes in water quality or quantity would temporarily impair some current uses water-dependent resources beyond the vicinity of the source, or the most sensitive current uses and water-dependent resources in localized areas.
- **Major** – Water quality would be degraded to a degree that causes ongoing and/or widespread exceedances of regulatory standards. Changes in water quality and/or quantity would be discernible in the field and cause long-term impairment of all current uses and water-dependent resources.

The same terms are applied in a more relative sense to describe beneficial impacts. The following subsections summarize impacts to water quality and quantity under the Proposed Plan. Because surface water is a renewable resource (i.e., continually replenished by natural processes), and because no aspect of the proposed alternatives would represent a permanent consumptive use or depletion of surface water, none of the impacts discussed below would represent an irreversible and irretrievable commitment of natural resources. Impacts to groundwater could be considered an irreversible and irretrievable commitment of a natural resource due to the much slower rate at which changes in water quality or quantity would be reversed by natural processes (Section 4.6). However, the potential for contamination

of usable water zones and domestic groundwater, or adverse impacts on groundwater quantity, from oil and gas drilling on BLM lands is considered negligible under all alternatives. This is due to the requirement that operators isolate and protect usable water zones, the relatively few domestic water wells on or near public lands, and the limited water-bearing zones below the rim (TRW 1982, BLM 1998c). Atop the plateau, groundwater is more abundant but has not been significantly developed for domestic uses due to its depth and the lack of permanent residents. However, more than 40 springs have been developed by BLM for use by livestock or wildlife.

Direct and Indirect Onsite Impacts

Sedimentation — The Proposed Plan is assumed to result in a smaller number of oil and gas pads and fewer miles of new access roads than any of the alternatives analyzed. This is the result of required phased and clustered development atop the plateau and a management emphasis on clustered development below the rim. Although 14,000 acres of additional lands would be available for oil and gas surface facilities than under Alternative II, some 17,000+ acres of additional SSR/CSU restrictions would be established. Importantly for water quality considerations, the greatest benefit of these measures would be seen atop the plateau, where numbers of well pads would exceed Alternative I (No Action) by only 6 (13 versus 7), while the numbers of wells would exceed Alternative I by 200 (210 versus 10). Besides fewer acres of long-term disturbance atop the plateau than Alternatives II through V, the Proposed Plan would also focus development onto ridgetops. Due to the more gentle slopes and greater distances from streams associated with ridgetop development, transport of eroded soils and road materials to surface waters would also be reduced.

WSR-eligible streams would continue to have NGD/NSO restrictions, as would streams and adjacent slopes or tributaries with high quality or moderate quality for Colorado River cutthroat trout. NGD/NSO restrictions would also apply to riparian and wetland corridors. All of area atop the plateau not protected by one of these NGD/NSO restrictions would be protected with an SSR/CSU, including the Parachute Creek WMA and two drainage-based ACECs (East Fork Parachute Creek and Trapper/Northwater Creek). All of these areas would be subject to the BMPs described above for soils (Section 4.2.3).

Restriction of motorized and mechanized travel to designated routes, except for over-snow travel by snowmobiles and open travel in the Hubbard Mesa OHV Riding Area, would also reduce the risk of sediment-impacts on area streams atop the plateau. Below the rim, some increased sediment transport associated with open travel designations in Hubbard Mesa could increase sediment loads in receiving waters of the Government Creek drainage. However, currently high erosion rates in this area, combined with the ephemeral nature of the drainages, reduces the potential for detectable impacts to aquatic or riparian/wetland resources. Throughout the Planning Area, the combination of active range management and administrative solutions to reduce grazing impacts and help meet Land Health Standards would tend to reduce the risk of water quality impacts from sedimentation of area streams.

Vegetation goals would focus on improving the diversity, production, and native species composition of upland and riparian/wetland areas. Livestock grazing would be managed to conform to BLM grazing regulations and meet Land Health Standards as well as vegetation community objectives. Because the Proposed Plan makes greater use of active management than Alternatives I and II, which relied primarily on natural processes, the rate of range improvement is expected to be more rapid. Over time, the Proposed Plan is expected to have moderate to major positive benefits on vegetation condition, which in turn would benefit surface water quality.

Chemical Pollution — Additional oil and gas development would increase the potential for accidental spills or other discharges of contaminated drilling mud or produced waters over time. With 83 percent more wells than the No Action Alternative and 66 percent more wells than the Preferred Alternative, the potential for a pollutant spill would increase proportionately but remain low. Additionally, the phased and clustered development atop the plateau, and the focus on ridgetop development, under the Proposed

Plan would substantially reduce the risk of direct spills into streams from trucks and overland flow of well-site pollutants than any alternative except the No Action.

In the case of small or one-time discharges of contaminated drilling mud, produced water, or other pollutants, the potential for direct adverse impacts is considered minor overall. However, impacts of a catastrophic release such as spillage of a tanker truckload into a sensitive stream segment could be major for localized resources. Potentially affected resources could include the Colorado River cutthroat trout and other sensitive aquatic or terrestrial receptors exposed to the water. Impacts could extend a considerable distance downstream, depending on the volume and rate of pollutant release, the volume and flow velocity of the receiving water, and the toxicity and dispersal behavior of the specific pollutant (highly viscous mud versus soluble contaminants versus an immiscible surface sheen resulting from the inability of oil and water to mix).

The potential for contamination of usable groundwater from oil and gas operations is considered negligible, based on the requirement that operators isolate and protect usable water-bearing zones and the limited amount of water-bearing zones on public lands below the rim (TRW 1982, BLM 1998c). Although four significant aquifers occur on top of the plateau, the only known well is associated with a BLM cabin near the center of the upper plateau. The limited number of water wells is related to the depth to usable groundwater and the lack of permanent residents. While many of the springs, both developed and undeveloped, are used for livestock watering and sustain wetlands or streams, the risk of damage to these resources from drilling-related contamination of groundwater is also low due to the requirements placed on drilling operations and, for the hydrologic resources atop the plateau, the small number of oil and gas wells during 20 years.

Water Quantity — Under the Proposed Plan, no areas would be closed to oil and gas leasing. However, the protective stipulations (NGD/NSO and SSR/CSU) and BMPs described above would specifically address protection of aquatic and riparian resources, including large portions of watersheds. These measures would reduce impacts to water quantity as well as to water quality.

Although road and well pad construction under this alternative would tend to increase runoff and hence water yield, any increases would be minor due to the small amount of increase in barren area involved (e.g., 1.1 percent of the BLM lands in the Planning Area under the Proposed Plan) and required setback distances from streams. Therefore, impacts to water quantity from increased runoff are considered negligible.

An additional consideration affecting water quantity involves the source and disposition of waters used for oil and gas activities. The Proposed Plan (and other alternatives) would establish an LN requiring that water used for drilling be either trucked into the area from an offsite source (i.e., not pumped from area streams) or piped into the area from an offsite source. This is especially important for the small streams atop the plateau, where the aquatic habitat value is substantially limited by existing flow volumes characteristic of streams in headwaters regions. For the Colorado River Basin as a whole, BLM has estimated future depletions from oil and gas drilling activities on BLM lands in the Planning Area at 0.55 acre-feet per well per year. This computes to 43 cfs per year under the Proposed Plan, using assumptions of 200 barrels per well per day, 78.5 wells per year, and a weighted average of 22 days per well (20 below the rim, 30 atop the plateau). If the depletion were distributed uniformly throughout the year, it would represent a an average decrease of 0.06 cfs, or less than 0.002 percent of the average flow in the Colorado River near the Planning Area.

Additional depletions could result from use of Colorado River Basin waters in dust suppression of roadways used for oil and gas access. Because dust suppression would be required only on roadways actively used for oil and gas access, and only during portions of the year, the exact number of miles or acres of roads requiring dust suppression per year is not known. Methods to reduce depletions related to dust suppression include surface treatments such as magnesium chloride or gravel. Surface treatments would not be allowed in areas where they could adversely affect surface waters. Other water

conservation measures could include onsite treatment and reuse of imported or produced waters for dust suppression or other applications.

Some minor water development for grazing or wildlife enhancement is possible, but the amount of any related depletions due to increased evaporative loss from stockponds or "guzzlers" would be negligible at the scale of the Planning Area. Additionally, successful enhancement of areas not meeting Land Health Standards due to livestock use could decrease runoff due to increased vegetation cover. However, the result of this impact is generally beneficial, because contributions to runoff as shallow subsurface flow following infiltration into a vegetated hillside are less "flashy" and more protracted than in poorly vegetated situations, even if actual flow to the stream is reduced. The 1984 GSRA RMP allows for enhancing water yield by vegetation manipulation, which alters the timing, duration, and intensity of runoff. Treatments could include thinning of brush, prescribed fires, and timber harvests.

Based on these considerations, the Proposed Plan is not expected to result in substantial depletions of surface water or groundwater during the 20-year planning period. Potentially, flow volumes in localized areas could increase slightly if water piped or trucked from other basins or sub-basins is treated and disposed or reused onsite.

Channel Morphology and Stability – Indirect impacts on surface water resources include changes in channel morphology and stability. Land-use changes may increase runoff by decreasing infiltration and evapotranspiration (e.g., due to reduction in vegetation cover) and increasing the amount of impermeable surface (roads, structures, compacted soil). Generally, channel area increases to accommodate the increased discharge, including channel deepening, widening, or both. Large quantities of sediment introduced directly to the channel or riparian zone can aggrade channels, fill pools, and choke channel substrates with fine sediment.

Under the Proposed Plan and Alternatives II through V, surface runoff and sediment delivery to streams would be addressed by combinations of NGD/NSO and SSR/CSU restrictions, limiting cross-country recreational travel in most of the Planning Area, and various BMPs, reclamation standards, and range improvement measures. Proper placement of well pads, roads, and pipelines and satisfactory implementation of measures to stabilize and revegetate areas of temporary disturbance would further contribute to reducing potential impacts to streams.

Because of the combination of measures to reduce the risk of increased sediment loads and the anticipated negligible effect on flow volumes, the morphology and stability of streams within the Planning Area are also not expected to be affected by any of the alternatives. Potentially, the introduction of water into the system by treating and discharging imported waters used for drilling could increase surface flows at and below the discharge point. However, proper methods and locations for these discharges (e.g., into ponds to be used for stock watering) would minimize the potential for increased channel erosion. Also, because of the requirement for phased and clustered development atop the plateau, localized additions to the water balance in any one area would be temporary as well as minor.

Another possible source of more extensive impacts to channel morphology and stability, as well as water quality and surface water yield, is the abrupt reduction in vegetation cover as a result of either a prescribed fire or wildland fire in the currently forested watersheds atop the plateau. To a lesser extent, this risk also applies to some forested lands below the rim. By removing vegetation cover, including the tree canopy, and altering the surficial soil (see Section 4.2.3.2), intense fire events can result in greater volume, velocity, and sediment load of runoff entering directly into a stream from upslope areas or carried in along tributary channels.

In light of the constraints associated with oil and gas development, combined with the sensitive wildlife and fisheries values related to the current forest habitat, the top of the plateau has recently been reclassified from FMZ D to C (see Section 4.5.11). This change reflects recognition that, while fire can be an effective tool for some aspects of forest management, the adverse consequences of fire reduce its

desirability atop the plateau. Areas along and below the cliffs would continue to be rated as FMZ B, with a greater constraint on prescribed or wildland fire.

Offsite and Cumulative Impacts

Offsite impacts to water resources include transport of sediments or contaminants through surface runoff or streamflow to downgradient receptors, including Parachute Creek, Government Creek, and the Colorado River. The impact of sediments and chemical pollutants in offsite streams, lakes, or ponds from land use and management activities on BLM lands in the Planning Area is expected to be much less than for private lands in the Planning Area due to additional various land uses and management actions in other portions of these watersheds. An exception to this generalization would be if a chemical pollutant were discharged into waters on BLM lands in sufficient quantities to be transported to offsite waters at concentrations that adversely affect water quality for aquatic life, livestock watering, recreation, or other uses.

A quantitative assessment of cumulative impacts on surface water is not possible, due to unavoidable uncertainties about (1) the location, scale, and rate of oil and gas development on BLM lands, private lands, and other lands both inside and outside the Planning Area; (2) impacts from other types of land uses associated with the regional population growth; and (3) the application and effectiveness of environmental protections associated with non-BLM lands. However, the long-term surface disturbance from new wells on BLM lands in 20 years (812 acres) represents about 29 percent of the cumulative total for the Planning Area (compare Tables 4-2 and 4-3). Also, the total number of BLM and private wells in the Planning Area at the end of 20 years (approximately 3,700) is in comparison to a projected total of 10,000 to 20,000 in Garfield County for the same time-frame (Section 3.4.3).

Also, oil and gas development is in addition to ongoing industrial, commercial, and residential development associated with the current annual population growth of 3.9 percent in Garfield County and 4.5 percent in the area west of Rifle (Section 3.4.3). Urbanization increases impervious surfaces, thereby increasing surface runoff and potentially increasing sediments and contaminants in local surface waters. These potential impacts may be minimized in urbanizing areas due to local and county requirements for detention of surface runoff (and especially storm flows), with the effect of delaying or reducing the amplitude of discharge from storm events and achieving some water treatment by allowing sediments and associated contaminants to settle out. If not managed properly, however, urban runoff can cause serious erosion of receiving streams by increasing the magnitude of storm runoff. The resultant channel erosion can damage both the aquatic habitat and adjacent riparian habitat—a common situation in urban areas prior to the implementation of local and county requirements for drainage improvements in conjunction with development.

Urbanization also typically includes irrigation of landscaping. However, this may be less than the amount of irrigation associated with the agricultural lands used for development. Increased runoff from urbanization may benefit receiving waters by reducing the flashiness of storm events and adding irrigation returns to the base flows, thereby increasing the volume and persistence of surface flows.

Another issue associated with both oil and gas development and urbanization in the region is potential for increased salinity of the Colorado River and other streams. Current sources of salinity include naturally high levels contributed by saline springs and runoff from areas of saline soils. Existing oil and gas development and runoff from highways, roads, and parking lots may contribute substantial additional salinity. Within the Planning Area, BLM requires measures to reduce or avoid discharge of saline waters to streams (e.g., see Section 4.5.5).

4.2.5 Climate and Air Quality

4.2.5.1 Introduction

The burning of fossil fuels (natural gas, crude oil, coal, etc.) produces various emissions, including so-called greenhouse gases (GHGs). These GHGs (primarily carbon dioxide [CO_2]) are widely believed to cause global warming but, at a minimum, contribute to air pollution. The continued or increased production and combustion of natural gas from resources underlying the Planning Area, which would occur under any of the alternatives, would produce GHGs. However, the amount of GHGs potentially produced from Planning Area resources is an extremely small fraction of global emissions and lower than it would be if other fuels (coal, oil, etc.) were being used instead. Therefore, no significant adverse impacts to climate are anticipated from implementation of any of the alternatives, because they would not add to the demand or consumption of fossil fuels.

Potential air quality impacts were analyzed to determine maximum "near-field" (local) ambient air pollutant concentrations and hazardous air pollutant impacts, as well as to determine maximum "far-field" (regional) impacts on ambient air pollutant concentrations, visibility, and atmospheric deposition ("acid rain").

Air pollution impacts are limited by State and Federal regulations, standards, and implementation plans established under the Clean Air Act and administered by CDPHE-APCD. Colorado regulations require that proposed air pollutant emission sources—including dehydrators, separators, and natural gas compressors—undergo a permitting review. Therefore, CDPHE-APCD has the authority to review emission permit applications and to require emission permits, fees, and control devices prior to construction and/or operation. In addition, Section 116 of the Clean Air Act authorizes Tribal, State, and local air quality regulatory agencies to establish air pollution control requirements more (but not less) stringent than Federal requirements. Additional site-specific air quality analysis would be performed, and additional emission control measures, including Best Available Control Technology (BACT), may be required to protect air quality resources.

Under FLPMA and the Clean Air Act, BLM cannot conduct or authorize any activity that does not conform to all applicable Federal, Tribal, State, and local air quality laws, statutes, regulations, standards, and implementation plans. An extensive Air Quality Impact Assessment was prepared to analyze the potential impacts and is available for review (Trinity 2006).

Finally, a word regarding dispersion modeling analyses and their use in planning and decision-making: All dispersion models, regardless of their level of complexity, are mathematical approximations (based largely on fluid dynamics) of the behavior of the atmosphere. Therefore, particularly given the uncertain nature of the number and placement of sources under the alternatives in this analysis, the results need to be viewed appropriately as estimates of possible future concentrations and not exact predictions in time and space.

Because of this, dispersion modeling is generally conducted using assumptions which ensure that the modeled results do not underestimate actual future impacts so that appropriate planning decisions can be made. For example, sources may be assumed to operate for longer periods or emit more pollutants than actual conditions to ensure that health-based standards are protected. On the other hand, analyses are not conducted assuming "worst-case" conditions across the board, because this typically leads to results that are unreasonable and unrealistic. Hence, dispersion modeling uses the best available information and methods (EPA-approved models, emission factors, etc.) when possible, and the best scientific and professional judgment in attempting to ensure that projections of future air quality are neither under predicted nor unrealistically over predicted.

The remainder of this section describes the methodologies and results for modeling of near-field and far-field air quality in the Planning Area during the 20-year period of analysis. Note that the air quality

analyses and impacts presented in the Draft RMPA/EIS were limited to Alternatives I, II, IV, and V, since the Preferred Alternative (Alternative III) had not yet been formulated. However, as described in the Draft, impacts under Alternative III were assumed to be less than the "upper bound" or "worst case" alternative (Alternative V) due to a smaller number of wells and fewer acres of surface disturbance. Additionally, it should be recognized that, while activities may have some impacts on air quality, these are likely to be minor in comparison to oil and gas drilling and production.

The near-field analysis (Section 4.2.5.2) uses 25 well pads arranged in a 5 x 5 matrix. The far-field analysis (Section 4.2.5.3) uses the upper bound assumptions of Planning Area and regional oil and gas development incorporated into Alternative V of the Draft RMPA/EIS. Those included an assumed 3,055 new wells for BLM and private lands, combined with reasonable but conservative assumptions (i.e., more likely to overestimate than to underestimate impacts) regarding sources such as vehicle emissions, compressor emissions, fugitive dust from well pads and unpaved roads, etc.

4.2.5.2 Modeling Methodology

Near-Field Analysis

Methods and results of the near-field air quality analysis are presented below. A more detailed description of the near-field modeling methodology and results is presented in the Air Quality Technical Support Document (TSD)(Trinity 2006), which served as the basis for the Draft RMPA/EIS and the current document. Individual tables showing results for each year and pollutant, including the location of each maximum impact, are provided in Appendix E of the TSD (Trinity 2006). Plots showing the location of each maximum impact and the wind roses for each year of meteorological data for both stations are provided in Figures A-34 through A-85 of Appendix A of the TSD (Trinity 2006). The input and output files for the post-processing are provided on CD in Appendix F of the TSD (Trinity 2006).

A separate screening model analysis was conducted to estimate potential impacts from flaring associated with natural gas production. This is presented at the end of this section.

The near-field modeling methodology generally follows that used in a previous modeling analysis for the Glenwood Springs area performed by the National Park Service (NPS 1998). Trinity Consultants, the primary modeling contractor for the far-field analysis, was also consulted to ensure that, where applicable, the two methodologies (near-field and far-field) were consistent. Finally, further details were developed in response to comments from EPA Region 8 (EPA 2003b) on Trinity's protocol for far-field modeling (Trinity 2003b) and subsequent meetings with EPA's NEPA and Air Quality staffs.

The ISCST3 model, as contained in Lakes Environmental ISC-AERMOD View software (Lakes 2002) package, was used for all near-field modeling. Unless stated otherwise, the regulatory default options built into the model were used. All modeling assumed flat terrain, rural dispersion conditions, and building down-wash effects for a hypothetical compressor building.

The near-field modeling was performed in flat terrain because the exact location of any group of wells, as modeled here, is unknown. It would not be possible to conduct this type of modeling exercise with a hypothetical arrangement of sources in complex (mountainous) terrain, because the choice of terrain features would be completely arbitrary. While placing the arrangement of modeled sources in a complex terrain environment might produce higher resultant concentrations, the results of such an effort would be of little value due to the sensitivity of the model to the location and orientation of the terrain selected.

A hypothetical grouping of sources was used that provides an estimate of potential near-field pollutant impacts. These sources include well pads, glycol dehydrators, natural gas compressors, and an unpaved road traversing the source area. Details of the source types and configurations are discussed in Section 3.11 of the TSD (Trinity 2006). Appropriate operating parameters were used for each source, and were in all cases, unless otherwise stated, the same as those used in the modeling by Trinity.

Only the following sources were included in the near-field modeling (inventory and RFD sources were not included):

- 25 well pads arranged in a 5 x 5 matrix, with 300-meter spacing between the centers of adjacent pads, which is approximately equivalent to a 20-acre well spacing with 1.9 acres disturbed per pad.
- A glycol dehydrator collocated at the center of each well pad.
- Six natural gas compressors, modeled as point sources, equally spaced within the 5 x 5 well matrix.
- An unpaved road (approximately 1,700 meters long) diagonally traversing the source area.

Meteorological data for the period 1987-1991 from Grand Junction, Colorado, were used in the modeling. The raw surface and upper air data were processed using the EPA-approved PCRAMMET meteorological processing software to combine the surface and upper air data into a model-ready format.

Wind roses for the 5-year period from each location are presented in the TSD. Individual wind roses for each year can be seen in Appendix A of the TSD (Trinity 2006).

Model receptors (points at which the model estimates concentrations) were placed according to the scheme outlined in Table 4-5. This receptor spacing differs somewhat from that used in the 1998 Glenwood Springs analysis, but in all cases the changes meant including more receptors and/or closer spacing to ensure that the maximum modeled concentration was captured and occurred within the receptor domain. A graphic representation of the source configurations and model receptors is presented in Figures 3-1 and 3-2 of the TSD.

Table 4-5. Receptor Distances and Spacing for Near-Field Modeling

Pollutant(s)	*Source Type(s)*	*Receptor Distances (meters)*	*Receptor Spacing (m)[1]*
PM_{10}, $PM_{2.5}$	Roads	50 – 1, 500	50
	Pad Construction	50 – 1,700	50
All other Criteria Pollutants	Pad Construction	100 – 4,000	100
	Compressors and Glycol Dehydrators	4,000 – 10,000	2,000
Hazardous Air Pollutants (HAPs)	Compressors	100 – 4,000	100
	Glycol Dehydrators	4,000 – 10,000	2,000

Criteria Pollutants

Carbon Monoxide (CO) — Maximum potential CO emissions from natural gas-fired compressors (units were assumed to run 8,760 hours without stopping) were used to determine the maximum potential 1-hour and 8-hour average CO concentrations. The maximum modeled concentrations were 220.0 micrograms (µg) per cubic meter (m^3)(1-hour) and 77.2 µg/m^3 (8-hour).

When background concentrations were added (8,000 µg/m^3 [1-hour]; 4,444 µg/m^3 [1-hour]), the total concentrations were 8,229 µg/m^3 (1-hour) and 4,521 µg/m^3 (8-hour). These concentrations are well below the applicable Colorado and National AAQS for CO of 40,000 µg/m^3 (1-hour) and 10,000 µg/m^3 (8-hour).

Particulate Matter — Particulate matter in relation to air quality modeling is expressed in terms of PM_{10} (particles less than 10 microns [µm = micrometers; 0.00001 meters] in diameter) and $PM_{2.5}$ (particles less 2.5 µm in diameter), because these small sizes represent particulates capable of entering the lungs and of being transported over long distances. To address the concerns of some stakeholders and Cooperating

Agencies, modeling of PM_{10} and $PM_{2.5}$ was divided into two parts: (1) analysis of a hypothetical road diagonally crossing the area of the well pads by itself; and (2) analysis of all particulate matter sources grouped together. It should be noted that different receptor configurations were used for the two analyses (Trinity 2006) and that all particulate matter sources were modeled with emissions limited to the hours from 0700 to 1900, the period when these sources are generally active. Also, since most of these sources are temporary in nature, PSD increments would not apply.

- **PM_{10} –** For the road-only analysis, the maximum modeled potential PM_{10} concentrations were 6.6 $\mu g/m^3$ (24-hour) and 1.0$\mu g/m^3$ (annual). When background concentrations were added (54 $\mu g/m^3$ [24-hour]; 24 $\mu g/m^3$ [annual]), the total concentrations were 60.6 $\mu g/m^3$ for the 24-hour average and 25 $\mu g/m^3$ for the annual average. These concentrations are well below the applicable Colorado and National AAQS of 150 $\mu g/m^3$ (24-hour) and 50 $\mu g/m^3$ (annual).

  For all sources (well pads [construction, traffic], compressors, roads), the maximum modeled potential PM_{10} concentrations were 57.7 $\mu g/m^3$ (24-hour) and 13.6 $\mu g/m^3$ (annual). When background concentrations were added (54 $\mu g/m^3$ [24-hour]; 24 $\mu g/m^3$ [annual]), the total concentrations were 112 $\mu g/m^3$ for the 24-hour average and 37.6 $\mu g/m^3$ for the annual average. These concentrations are well below the applicable Colorado and National AAQS of 150 $\mu g/m^3$ (24-hour) and 50 $\mu g/m^3$ (annual).

- **$PM_{2.5}$ –** For the road-only analysis, the maximum modeled potential $PM_{2.5}$ concentrations were 0.96 $\mu g/m^3$ (24-hour) and 0.15 $\mu g/m^3$ (annual). When background concentrations were added (19 $\mu g/m^3$ [24-hour]; 7 $\mu g/m^3$ [annual]), the total concentrations were 20 $\mu g/m^3$ for the 24-hour average and 7.2 $\mu g/m^3$ for the annual average. These concentrations are well below the proposed National AAQS for $PM_{2.5}$ of 65 $\mu g/m^3$ (24-hour) and 15 $\mu g/m^3$ (annual).

  For all sources (compressors, wells pads, roads, vehicles), the maximum modeled potential $PM_{2.5}$ concentrations were 8.4 $\mu g/m^3$ (24-hour) and 1.9 $\mu g/m^3$ (annual). When background concentrations were added (19 $\mu g/m^3$ [24-hour]; 7 $\mu g/m^3$ [annual]), the total concentrations were 27.4 $\mu g/m^3$ for the 24-hour average and 8.9 $\mu g/m^3$ for the annual average. These concentrations are well below the proposed National AAQS of 65 $\mu g/m^3$ (24-hour) and 15 $\mu g/m^3$ (annual).

Again, it should be noted that the two particulate matter analyses used different receptor configurations due to the arrangement of sources; therefore, the all-sources analysis does not automatically show higher modeled concentrations.

Sulfur Dioxide (SO_2) — The maximum short-term (3-hour and 24-hour) and long-term (annual average) SO_2 emissions would occur from compressors used to move the gas through the pipelines (well drilling engines were screened out of the analysis as insignificant). The maximum modeled concentrations (including representative background values) would be 110 $\mu g/m^3$ (3-hour), 39 $\mu g/m^3$ (24-hour), and 11 $\mu g/m^3$ (annual). Therefore, all predicted short-term and long-term SO_2 concentrations comply with the Colorado SO_2 Ambient Air Quality Standards (3-hour) of 700 $\mu g/m^3$, as well as the NAAQS of 365 $\mu g/m^3$ and 80 $\mu g/m^3$ (24-hour and annual average), respectively. The 3-hour State standard is more stringent than the National AAQS.

Nitrogen Oxides (NO_2) — Maximum NO_2 impacts during operations were predicted using "reasonably foreseeable" compressor NO_x emission rates. The maximum potential near-field NO_2 concentrations were determined by multiplying maximum NO_x concentrations by 0.75, in accordance with standard EPA methodology (EPA 1995a). The maximum predicted annual potential NO_2 concentration was 2.2 $\mu g/m^3$. When this value is added to the assumed representative background concentration (34 $\mu g/m^3$), the resulting predicted maximum total impact is 36.2 $\mu g/m^3$, which is also below the applicable Colorado and National AAQS of 100 $\mu g/m^3$ (annual).

Hazardous Air Pollutants (HAPs)

Maximum HAPs impacts during operations were predicted for the hypothetical arrangement of sources as described above. The emissions sources include six compressors (benzene, ethylbenzene, formaldehyde, toluene, and xylene) and 25 individual glycol dehydrators (benzene, toluene, ethyl benzene, hydrogen sulfide, and xylene). Since neither Colorado nor EPA has established HAP standards, 24-hour and annual HAP concentrations were predicted using the ISCST3 model and compared to a range of State Acceptable Ambient Concentration Levels (AACLs) and/or EPA Reference Concentrations (RfCs). These thresholds are presented in Table 4-6.

Results of the near-field HAPs modeling shows that the annual benzene concentration (1.12 $\mu g/m^3$) and annual formaldehyde concentration (0.30 $\mu g/m^3$) exceed the low end of the range of AACLs presented in the table. Therefore, an incremental cancer risk analysis was performed for these two carcinogenic compounds, which are emitted from sources such as those modeled.

Table 4-6. Summary of Acceptable Ambient Levels for Hazardous Air Pollutants (HAPs)

Benzene ($\mu g/m^3$)	*Ethylbenzene ($\mu g/m^3$)*	*Formaldehyde ($\mu g/m^3$)*	*Hydrogen Sulfide ($\mu g/m^3$)*	*Toluene ($\mu g/m^3$)*	*Xylenes ($\mu g/m^3$)*	*Agency*
0.12 (annual)	1,000 (24-hour)	0.077 (annual)	0.9 (24-hour)	400 (24-hour)	1,500 (24-hour)	Washington Department of Ecology (WAC) 176-460-150
53 (24-hour)	14,467 (24-hour)	-	467 (24-hour)	6,267 (24-hour)	14,467 (24-hour)	Utah Department of Environmental Quality (UDEQ) Toxic Screening Level [1]
-	-	-	140 (24-hour)	-	-	North Dakota Department of Health, Division of Environmental Engineering, 33-15-02 or Air Toxics Policy
13 - 45 [2] (annual)	-	8 [3] (annual)	-	-	-	EPA IRIS Database 1/10,000 (1×10^{-4}) Risk Level
-	1,000 (24-hour)	-	1.0 (24-hour)	400 (24-hour)	100 (24-hour)	EPA Integrated Risk Information System (IRIS) Database RfC [3]

[1] *The Toxic Screening Level (TSL) for Utah can be found in Utah Administrative Code R307-401(1)(d).*

[2] *The range of values shown here represents the air unit risk of 1 in 10,000 (1×10^{-4}) excess cancers, taken from EPA's Integrated Risk Information System (IRIS) database.*

[3] *EPA's IRIS database contains information on reference concentration for chronic inhalation exposure (RfC)(EPA 1997, per Trinity 2003a).*

Two estimates of incremental cancer risk were made: one that corresponds to a most likely exposure (MLE) condition and one that corresponds to a maximally exposed individual (MEI). The MLE consists of a residential dwelling occupied by the same family for 20 years, while the MEI consists of a full-time worker with occupational exposure for 20 years. These receptors were assumed to be located at the exposure distances shown in Table 4-5. Exposures to known carcinogens were assumed to be at the maximum predicted annual concentrations for BLM sources only. The assumed 20-year residential duration greatly exceeds the average of 9 years for occupancy of a home by the same family (EPA 1993). The 20-year occupational duration is for an onsite worker.

Because the EPA unit risk factors reported in Table 4-6 are based on a 70-year (lifetime) exposure, the modeled 20-year duration was adjusted to represent 20/70 (0.286) of a lifetime. For the MLE (residential), a second adjustment was made to compensate for the average amount of time spent at home. The onsite fraction used was 0.64 (i.e., slightly less than two-thirds of a resident's time being spent at home), based on EPA (1993). For the remainder of each day, the MLE calculation assumes that the resident would be exposed to HAPs at 25 percent of the maximum annual average concentration. Therefore, the MLE adjustment factor is (0.286) x [(0.64 x 1.0) + (0.36 x 0.25)] = 0.209. Because the MEI (occupational) scenario assumed an onsite worker, no second adjustment was made to account for time spent away from home.

Under the MLE scenario, the estimated individual cancer risks associated with long-term exposure to benzene (compressors, dehydrators) and formaldehyde (dehydrators) are below 1.0×10^{-4} (1.8×10^{-6} to 5.1×10^{-7} and 8.1×10^{-7}, respectively). Under the MEI analysis, the individual cancer risks for benzene (2.5×10^{-6} to 7.0×10^{-7} and formaldehyde (1.1×10^{-6}) and the total cancer risk for the inhalation pathway (3.2×10^{-6} to 3.8×10^{-6}) fall toward the lower end of the threshold range of presumptively acceptable risks of 1.0×10^{-6} to 1.0×10^{-4} (one excess cancer per 1 million people to one excess cancer per 10,000 people, respectively)(EPA 1998). Therefore, the long-term cancer risk analyses indicate no basis for concern.

It should be noted that the risk calculations are based on the maximum modeled concentration found anywhere in the vicinity of the hypothetical arrangement of sources. These maximum concentrations occurred within a few hundred meters of the edge of the sources and dropped off quickly with increasing distance from the sources. It is unlikely that any individual would be living this close to the sources. Therefore, the risk values calculated above should be viewed as an upper bound on the range of possible risks associated with near-field impacts, with risks to actual residents likely being lower.

Natural Gas Flare

As mentioned above, a separate modeling exercise was conducted for potential natural gas flaring emissions. As suggested at a meeting of the air quality stakeholders for this project (BLM 2003c), the flare modeling was performed with the SCREEN3 model (EPA 1995c). The SCREEN3 model is a simple single-source screening model that assumes a constant wind direction for an entire hour, and reports a 1-hour concentration. A predetermined matrix of wind speeds and atmospheric stabilities are processed to find the maximum concentration. These results show that all modeled concentrations are well below the NAAQS. Detailed results are presented in the TSD.

Far-Field Analysis

Methods and results of far-field air quality modeling for each alternative are presented below. Detailed modeling results, including the location and date of each maximum impact, are provided in the TSD (Trinity 2006). Plots showing the receptor grid, terrain, and location of each maximum impact are provided in Figures A-8 through A-29 of Appendix A of the TSD. Output, input, and list files are provided on CD in Appendix F of the TSD.

The modeling analysis performed by Trinity Consultants and BLM's National Science and Technology Air Quality (NSTC-AQ) staff followed a general modeling procedure used in previous NEPA assessments and Clean Air Act New Source Review (NSR) permit applications. The CALPUFF model was used to estimate potential impacts on air quality and AQRVs from proposed and other "reasonably foreseeable" sources in the modeling domain. The CALPUFF modeling domain included the entire Vernal Field Office (VFO) and GSFO areas, several mandatory Federal Class I areas, and other sensitive Class II areas specified by BLM and the States. This modeling domain covers most of northeastern Utah and western Colorado and portions of southwestern Wyoming. The CALPUFF modeling system consists of three main component models:

- CALMET – A meteorological model that develops hourly wind, temperature fields, and other meteorological fields on a three-dimensional modeling domain. Associated two-dimensional fields

such as mixing height, surface characteristics, and dispersion properties are also include in the CALMET output.

- CALPUFF – A transport and dispersion model that moves puffs of emitted material from modeled sources, simulating dispersion and transformation processes along the way. The movement of these puffs is dictated by the meteorological fields generated by CALMET.
- CALPOST – Processes the CALPUFF output files to produce tables that summarize the results. Separate CALPOST runs are needed for individual pollutants and for each AQRV scenario

Outputs from the air quality modeling are used to assess potential impacts on near- and far-field air quality and AQRVs. The following assessments were conducted:

- Prediction of the potential direct and cumulative air quality impacts of emissions from existing and foreseeable oil, gas, and mineral development scenarios (five alternative scenarios).
- Comparison of potential direct and cumulative air quality impacts plus the existing background concentration to the applicable NAAQS and to any State AAQS that are more stringent.
- Visibility assessment impacts within mandatory Federal Class I areas and specific Class II areas of concern.
- Atmospheric deposition of total sulfur and nitrogen within mandatory Federal Class I areas and specific Class II areas of concern.

For the CALMET inputs, a search of meteorological stations using Trinity's proprietary database showed that 28 surface and 68 precipitation meteorological stations were within the modeling domain or near the domain boundary. From these stations, 14 surface stations and 38 precipitation stations were selected based on data counts of at least 6,000 and their distance from the RMP areas. Data from four upper air stations were used. These data, combined with MM5 data for 1996, were processed to produce a single year of meteorological data for input to CALPUFF.

To develop the sources to be included in the CALPUFF modeling, Trinity conducted a review of all sources provided in the Utah and Colorado source inventory and all Title V permits available on the UDEQ and CDPHE websites. The review was conducted on a per-pollutant basis since each pollutant had a different monitoring baseline date.

Subsequent to Trinity's review of Colorado State permits, BLM NSTC-AQ staff undertook a review of a small portion (based on a screening procedure developed by NSTC-AQ staff; see Section 3.3.1.3 of the TSD for details) of the approximately 250 inventory sources to determine if all the information provided by the States was correct.

Approximately 10 facilities (26 sources) were selected for detailed review. Approximately 20 sources were removed or had some of their source parameters changed. At the request of CDPHE, the American Soda facility (17 sources) was added. As discussed in Section 3.4 of the TSD (Trinity 2006), the modeling domain was set such that it extends 50 km beyond all sources and Class I receptors. Therefore, only sources inside 50 km of the modeling domain boundary are modeled. Figure A-1 in the TSD shows the modeling domain boundary.

Receptor locations were placed at 3-km intervals within the two BLM resource areas. No receptors were placed within 4 km of a source (see near-field analysis). For each Class I and Class II area, a grid of receptors was placed at 2-km spacing within the area. Figures A-4 through A-27 in Appendix A of the TSD (Trinity 2006) show the receptor grid for each sensitive area and the RMP areas.

For the criteria pollutant (NAAQS) and HAPs results, background concentrations were added to produce the total modeled concentrations (Tables 4-7 and 4-8). For the HAPs analysis, CDPHE recommended using the data from EPA Urban Air Toxics Pilot Project as the background concentration (Chick 2002).

These concentrations were collected in the City of Grand Junction, Colorado, between May 2001 and April 2002. Recommended concentration estimates are summarized in Table 4-8, below.

Table 4-7. Background Concentrations Used for Modeling of Criteria Air Pollutants

Pollutant	*Annual ($\mu g/m^3$)*	*24-Hour ($\mu g/m^3$)*	*8-Hour ($\mu g/m^3$)*	*3-Hour ($\mu g/m^3$)*	*1-Hour ($\mu g/m^3$)*	*Monitoring Station Location Description*
PM_{10}	24	54	-	-	-	Rifle, Garfield County (1998-2000 data collected by CDPHE) [1]
$PM_{2.5}$	7	19	-	-	-	Grand Junction, Mesa County (1999-2001 data collected by CPHE) [1]
NO_2 [2]	34	-	-	-	-	Woodmen and Colorado College stations, Colorado Springs, El Paso County (1998-2000 data) [1]
CO [3]	-	-	4,444	-	8,000	Grand Junction, Mesa County (Average of 1999-2001) [1]
SO_2 [4]	11	39	-	110	-	Colorado College, Colorado Springs, El Paso County (1998-2000) [1]

[1] *Background concentration recommended by CDPHE in the review comments provided by Nancy Chick, dated on December 20, 2002 (Chick 2002, per Trinity 2003a).*

[2] *NO_2 concentration recommended by CDPHE is originally stated in 0.018 ppm, annual average (Chick 2002, per Trinity 2003a).*

[3] *CO concentrations recommended by CDPHE are based on 3 years average and are originally stated in ppm, as follows: 8-hr, 3.74 ppm; 1-hr, 6.1 ppm.7 ppm (Chick 2002, per Trinity 2003a).*

[4] *SO_2 concentrations recommended by CDPHE are originally stated in ppm: annual, 0.004 ppm; 3-hour, 0.042 ppm; 24-hour, 0.015 ppm (Chick 2002, per Trinity 2003a).*

Table 4-8. Background Concentrations Used for Modeling of Hazardous Air Pollutants [1]

Agency	*Benzene*	*Ethylbenzene*	*Formaldehyde*	*Toluene*	*Xylenes*
Annual Mean (ppbv) [2]	0.90	0.84	5.78	3.70	3.63
24-hour Maximum (ppbv) [2]	2.72	10.68	14.00	33.26	43.66
Annual Mean ($\mu g/m^3$)	2.87	3.65	7.11	13.95	15.75
24-hour Maximum ($\mu g/m^3$)	8.68	46.35	17.22	125.39	189.48

[1] *Values from Chick (2002).*

[2] *ppbv = parts per billion, by volume*

4.2.5.3 Results of Modeling for Alternative V (Bounding the Proposed Plan)

The following subsections present the CALPUFF modeling results for Alternative V for criteria pollutants (NAAQS and PSD increments), HAPs, visibility, deposition, and Acid Neutralizing Capacity (ANC) from BLM sources only. As described previously, no separate model runs were made for the Proposed Plan, because the sources of all pollutants would be no greater than for Alternative V, analyzed in the Draft RMPA/EIS. Therefore, Alternative V (the most development-intensive of the alternatives analyzed in the Draft) would bound the expected air quality impacts under the Proposed Plan.

Criteria Pollutants

Modeling shows no exceedances of the NAAQS for any pollutant, nor were any predicted potential concentrations found that could exceed the Class I or Class II increments for emissions from BLM sources.

Hazardous Air Pollutants

The results of the near-field HAPs modeling show no concentration values (excluding background concentrations) that exceeded any of the AACLs/RfCs for BLM sources only. However, when background concentrations are included, the annual concentrations for benzene (2.87 $\mu g/m^3$) and formaldehyde (7.15 $\mu g/m^3$) as well as the 24-hour concentration for xylenes (189.5 $\mu g/m^3$) exceed their respective AACLs. As with previous Alternatives, BLM sources contribute less than 1% to the total modeled concentrations.

An incremental cancer risk analysis (excluding background concentrations) for benzene under the MLE scenario yielded individual risks of 1.8×10^{-10} to 6.5×10^{-10} for long-term exposure to benzene, while the results for formaldehyde showed a risk value of 1.1×10^{-7}. All MLE risks are well below the lower end of the range of presumptively acceptable risks (1×10^{-6}; EPA 1998).

Under the MEI analysis, the individual cancer risk for benzene was 2.5×10^{-10} to 8.9×10^{-10}, while formaldehyde showed a maximum individual risk of 1.5×10^{-7}. These risks values are also below the range of presumptively acceptable risks.

Because risk calculations are based on the maximum modeled concentration found anywhere in the modeling domain, the calculated risk levels are an upper bound on the range of possible risks associated with far-field impacts, with risks to actual residents likely being lower.

Visibility Screening Analysis

Results of the visibility screening analysis for Alternative V are the same as for Alternatives I through IV; there were no modeled impacts that exceeded the 1.0 deciview (dv) threshold for any of the Class I areas. Results of an analysis using the USFS threshold of 0.5-dv change are available in the TSD (Trinity 2006).

Although Class II areas have no visibility protection under State or Federal law at this time, they were included in the analysis to provide decision-makers with a more complete picture of potential regional impacts.

Deposition

All calculated potential values of sulfur and nitrogen deposition for BLM sources were well below the applicable thresholds of 3 kilograms per hectare per year (kg/ha/yr) for total sulfur and 5 kg/ha/yr for total nitrogen. One kg/ha/yr is approximately 0.9 pounds per acre per year.

Acid Neutralizing Capacity (ANC)

Results of this analysis indicate that impacts to all lakes considered in the modeling would be well below the thresholds of 10-percent change level for lakes with background ANC values equal to or above 25 micro-equivalents per liter (µeq/L), or a total change of less than 1.0 µeq/L for lakes below 25 µeq/L.

4.2.5.4 Cumulative Impacts

The CALMET/CALPUFF dispersion model was used with MM5 meteorological data from 1996 plus numerous surface, precipitation, and upper air data to predict maximum potential far-field cumulative air quality impacts at downwind PSD Class I Wilderness Areas. The results were used to (1) determine if PSD Class I increments and NAAQS might be exceeded, (2) calculate potential nitrate and sulfate deposition (and their related impacts) in sensitive lakes, and (3) predict potential impacts to regional visibility. Concentrations were also predicted in the impact analysis area to determine compliance with the NAAQS and Class II increments.

Potential emissions from other reasonably foreseeable facilities not represented by the measured background values were combined with those resulting from implementation of Alternative V (representing the greatest degree of oil and gas development, and used as a surrogate for the Proposed Plan) to determine potential cumulative air quality impacts. The results discussed below therefore

represent the highest cumulative impact from the alternatives analyzed. Detailed information on the sources outside the Planning Area is presented in the TSD (Trinity 2006).

Estimates of compression requirements in the Draft RMPA/EIS were made based on the projected number of wells and a rule of thumb for the horsepower (hp) requirement per unit of gas (1,100 hp per 10 MMCF of gas). Assuming that this remains valid, a simple comparison of projected well numbers can be used to project increases and/or decreases in potential impacts from compressor emissions.

Criteria Pollutants

The modeling results show no exceedances of the NAAQS for any pollutant. Predicted potential concentrations were also compared to the applicable Class I and Class II PSD increments. No modeled concentrations exceeded any PSD increment for any criteria pollutant.

Hazardous Air Pollutants

The results of the far-field HAPs modeling show that the annual benzene and formaldehyde concentrations (2.93 $\mu g/m^3$ and 7.18 $\mu g/m^3$ respectively, including background concentrations) and the 24-hour concentration of xylenes (191 $\mu g/m^3$, including background) were the only values that exceeded any of the AACLs. An incremental cancer risk analysis was performed for benzene and formaldehyde emitted from the proposed sources modeled (xylenes are not considered carcinogenic).

Under the MLE scenario, estimated individual cancer risks associated with long-term exposure to benzene range from 1.4×10^{-6} to 4.8×10^{-6}, while the formaldehyde risk was estimated to be 2.0×10^{-5}. These values are within the EPA (1998) range of presumptively acceptable risks of 1.0×10^{-4} to 1.0×10^{-6}.

Under the MEI analysis, individual cancer risks for benzene were 1.8×10^{-6} to 6.5×10^{-6}, while the risk for formaldehyde was 2.8×10^{-5}. Again, the values are within the range of presumptively acceptable risks.

Because risk calculations are based on the maximum modeled concentration found anywhere in the vicinity of the hypothetical arrangement of sources, the calculated risk levels are an upper bound on the range of possible risks associated with far-field impacts, with risks to actual residents likely being lower.

Visibility Screening Analysis

Results of the visibility analysis performed by Trinity (2004) for BLM sources and all sources are presented in Table 4-9. The results indicate that potential BLM sources, along with existing inventory sources, could result in a perceptible or "just noticeable" impact (1.0-dv reduction) on visibility at several of the PSD Class I areas in the study domain. Results of an analysis using the USFS threshold of 0.5-dv change may be found in the TSD (Trinity 2006). As with the alternatives analyzed, the Class II areas have no visibility protection under existing State or Federal laws but are included to provide decision-makers with a more complete picture of potential impacts throughout the region.

Refined Visibility Analysis

Because the screening visibility showed potential impacts at one or more Class I areas, a daily refined analysis was conducted based on hourly IMPROVE (2002) optical monitoring data measured at Canyonlands National Park for the years 1986-2002. Daily optical values were calculated based on at least 6 hours of valid data each day (Archer 2002, per Trinity 2006). Also, the maximum relative humidity was limited to no more than 90 percent. The basis for limiting aerosol growth at 90 percent relative humidity is that direct optical monitoring devices are not reliable at humidity values above this level, and measurements above 90 percent were not reported as "valid" by the IMPROVE data contractor.

Table 4-9. Results of Screening-Level and Refined Modeling of Cumulative Visibility Impacts [1]

PSD Class	Name of Class I or Class II Area	Days >1.0 Deciview Change		
		Screening-Level Modeling	Refined Modeling	
			Minimum	Maximum
I	Black Canyon of the Gunnison National Park	2 (0)	0	1(0)
I	Eagle's Nest Wilderness	0	--	--
I	Flat Tops Wilderness	1 (0)	0	0
I	La Garita Wilderness	0	--	--
I	Maroon Bells-Snowmass Wilderness	0	--	--
I	Mt. Zirkel Wilderness	1 (0)	0	1(0)
I	Rawah Wilderness	0	--	--
I	Weminuche Wilderness	0	--	--
I	West Elk Wilderness	1 (0)	0	0
II	Colorado National Monument	3 (0)	--	--
II	Dinosaur National Monument	3 (0)	--	--
II	Holy Cross Wilderness	0	--	--
II	Hunter-Frying Pan Wilderness	0	--	--
II	Raggeds Wilderness	0	--	--

1 All sources for Vernal, UT, and Glenwood Springs, CO, Resource Areas. BLM sources show in parentheses. Class II areas and Class I areas with no impact in screening analysis did not have a refined analysis conducted.

Air Resource Specialists, Inc. (2002, per Trinity 2006) states that these data are not labeled as valid because "…small random temperature or absolute humidity fluctuations along the path can lead to condensation of water vapor causing meteorological interferences. Thus, in accordance with the philosophy expressed above [viz., of ensuring that impacts are not underestimated], the 90 [percent] relative humidity limit was selected for this test." Therefore, the maximum relative humidity was limited at 90 percent for optical data comparison. Again, the Federal Land manager's AQRV Workgroup (FLAG) 1.0-dv (10 percent change in extinction) "just noticeable change" cumulative source threshold was used to assess the significance of potential impacts. The results of the refined modeling analysis are also presented in Table 4-9.

Note that the refined visibility results show that operations of proposed BLM and Inventory sources could result in a "just noticeable" (1.0-dv reduction) impact on visibility at only two Class I areas (the Black Canyon of the Gunnison and Mt. Zirkel), with maximum potential impact of 1 day per year at each site. No BLM sources (Vernal or Glenwood Springs) cause significant impacts to this, or any, Class I area.

Acid Neutralizing Capacity

Where background lake chemistry data were available, an analysis of potential changes to ANC was performed using the procedure recommended by the USFS (2000). This screening methodology takes deposition values of sulfur and nitrogen estimated by CALPUFF and converts these values into a potential change in the ability of a given lake to neutralize acid precipitation. These values were compared to a 10-percent change in ANC for lakes with background ANC values equal to or greater than 25 micro equivalents per liter (μeq/L). For lakes with background ANC values less than 25 μeq/L, the threshold is no more than 1.0 μeq/L total change in ANC.

The results indicate that none of the lakes analyzed would be adversely affected by modeled sources.

4.2.5.5 Discussion of Air Quality Impacts under the Proposed Plan

The multiple conservative assumptions used throughout the modeling underscore that actual air quality impacts are likely to be less than the modeled values. For example, some pollutant sources were assumed to operate 100 percent of the time throughout the modeled period. The maximum modeled concentration was used for health risk calculations, although it is unlikely that anyone resides at the maximum location. Fugitive dust sources were conglomerated into area sources, likely increasing local $PM_{2.5}$ and PM_{10} concentrations. Roads were assumed to emit dust equally throughout the year; in actuality, dust emissions are reduced or eliminated when roads are frozen or wet. After considering these factors, it is reasonable to conclude that impacts on air quality of implementation of any the alternatives would be as follows compared to existing conditions (terms are defined in the introduction to Chapter 4):

- Hazardous Air Pollutants – none to negligible (benzene, formaldehyde)
- Priority Pollutants – none
- Visibility – none to negligible
- Deposition of Sulfur and Nitrogen – none
- Acid Neutralizing Capacity – none

As described above, these qualitative impact level values recognize that the calculated values are likely higher than actual conditions.

Regulation of oil and gas development activities by State and Federal authorities would be expected to avoid or minimize the potential for violations of applicable standards. For example, if monitoring indicates that fugitive dust emissions are leading to exceedances of the NAAQS standards, more restrictive operational constraints or more stringent BMPs would be required.

In summary, based on the information summarized in Table 4-2 and the assumptions used in the near-field and far-field air quality modeling, it can be concluded that:

1. Assumed levels of oil and gas development within the Planning Area during the 20-year period of analysis are not projected to cause an exceedance of any applicable standard or threshold affecting human health and the environment.
2. Air quality impacts related to the number of gas wells and associated facilities would be somewhat less under the Proposed Plan than predicted for Alternative V.
3. Air quality impacts related to emissions from vehicles and fugitive dust from well pads and unpaved roads would be substantially less under the Proposed Plan than predicted for Alternative V and somewhat less than for the Preferred Alternative.

4.3 BIOLOGICAL ENVIRONMENT

4.3.1 Upland Vegetation and Riparian/Wetland Areas

4.3.1.1 Introduction

Vegetation in the Planning Area is conceptually subdivided into the general community types described and quantified by area in Section 3.3.1. A distinction is made between upland vegetation and those areas classified as riparian/wetland areas. Additionally, noxious weeds are considered a separate vegetation category. These distinctions are carried through the following discussion.

The following subsections address potential impacts to Planning Area vegetation from management actions and land uses in the Proposed Plan. Selected comparisons are also made to one or more of the five alternatives analyzed in the Draft RMPA/EIS.

Impacts from two categories of management actions are analyzed and assessed. The first includes direct management of vegetation resources for its intrinsic ecological value, guided by specific objectives for the major natural plant communities in the Planning Area. The second category comprises actions directed at other resources but which impact vegetation. These include oil and gas development, livestock grazing and range management, and travel management. In addition to the above management action categories, a fifth, Special Management Designations and Restrictions, is carried through this analysis. This summarizes the impacts of special area designations as well as surface use restrictions and other protective measures on vegetation resources. Although vegetation resources would be affected to some degree by all of the future land uses and management actions associated with implementation of the final Plan arising from this RMPA/EIS process, impacts resulting from development of oil and gas are likely to be the most important (i.e., detectable, demonstrable, and deleterious) as they represent the largest potential surface disturbances.

Some impacts are direct, while others are indirect and affect vegetation through a change in another resource. Direct impacts to upland vegetation are considered to include disruption or removal of rooted vegetation resulting in a reduction in areas of native vegetation; reduction of total numbers of plant species (species richness) within an area; and/or reduction or loss of total area, diversity, structure, or function of wildlife habitat. Direct impacts to riparian/wetland areas include those expressed for upland vegetation as well as increased sedimentation due to local surface disturbance, soil and bank erosion, and changes to channel morphology.

Because the large majority of direct impacts to vegetation are the result of physical ground disturbance, these impacts are usually analyzed in terms of relative area of disturbance. For this analysis, ground-disturbing activities are assumed to be distributed among upland and riparian/wetland areas in proportion to their relative distribution in the Planning Area, unless otherwise limited by surface-use restrictions, as listed in Table 4-1. These are described in detail in Appendix C. Assumed numbers of wells and well pads and acres of surface disturbance associated with oil and gas development under the Proposed Plan and other alternatives are summarized in Table 4-2.

A number of indirect impacts to vegetation resources are also a potential result of proposed management actions. Potential indirect impacts include disruption or reduction of pollinator populations; loss of habitat suitable for colonization due to surface disturbance; introduction of noxious weeds by various vectors or conditions that enhance the spread of weeds; and general loss of habitat due to surface occupancy, surface compaction, or trampling. Upgradient physical disruption can result in sedimentation into occupied habitat and/or potential habitat. Failed reclamation or mitigation may also cause indirect impacts to these resources. Indirect impacts to riparian/wetland areas also include disruption of hydrological processes, decreased ability to trap sediments and nutrients and to moderate surface flow, decreased infiltration for groundwater recharge, increased run-off, and focused grazing pressure or wildlife use in less-impacted riparian/wetland areas. Additional indirect impacts from increased erosion and sedimentation could occur to riparian/wetland areas located downgradient from surface disturbances, even if the resource itself may be purposely avoided to reduce direct impacts. Most indirect impacts are assumed to result from direct impacts in proportion to the relative amount of surface disturbance.

Cumulative impacts are discussed in terms of past, present, and future actions in non-BLM portions of the Planning Area and the surrounding region, as well as the additive effects of multiple management actions on vegetation resources within the Planning Area. For this discussion, this region is considered to be the area comprising two large regional watersheds that define the regional vegetation map: Parachute-Roan Creek and Colorado River-Plateau Creek (Section 3.3.1).

For this analysis, it is assumed that all BMPs listed in Appendix I would be implemented for all ground-disturbing activities. In addition, it is assumed that any entity causing a permitted ground-disturbing activity would comply with specified reclamation and revegetation practices, as well as annual monitoring and adaptive management of these sites, until BLM deems success criteria are achieved.

Standardized definitions are used to categorize impacts of specific management actions on vegetation resources. A range of estimated disruption areas is associated with each category. When quantitative analysis is not possible, categories are based upon the potential physical impacts in terms of BLM Colorado Land Health Standards (Appendix F). For riparian/wetland areas, these categories are based on the potential physical impacts in terms of Colorado Land Health Standard #2. For upland areas, these categories are based upon the potential physical impacts to this resource in terms of Colorado Land Health Standard #3.

The following general terms are used to define levels of adverse impacts to vegetation:

- **None –** No physical disruption of the resource. Effects are unlikely to be detectable. No impairment of the resource value in terms of Land Health Standards.
- **Negligible –** Physical disruption to less than 5 percent of the resource. Effects may be detectable but of short duration (would last no more than one growing season) and not of concern to the general public. Unlikely to impair the resource value in terms of Land Health Standards.
- **Minor –** Physical disruption to less than 5 percent of the resource. Effects would be detectable but temporary (would last no more than 2 years) and unlikely to be of concern to the general public. Likely to cause some impairment of the resource value in terms of Land Health Standards.
- **Moderate –** Physical disruption to 6 to 15 percent of the resource. Effects would be readily visible and maybe of concern to the general public. Effects may increase over time or be long-term to permanent. May cause substantial impairment of the resource value in terms of Land Health Standards.
- **Major –** Physical disruption to more than 15 percent of the resource. Effects would be highly visible and of concern to the general public. Effects likely to increase over time and be long-term or permanent. Likely to cause substantial impairment of the resource value in terms of Land Health Standards.

4.3.1.2 Impacts of Proposed Plan

Under the Proposed Plan, vegetation would be managed for its intrinsic ecological value, guided by specific management objectives for the major natural plant communities in the Planning Area as well as Land Health Standards for this resource. Vegetation management would also be impacted by aspects of other resource management, such as rangeland, travel and recreation as well as oil and gas development and special management designations and restrictions.

Direct and Indirect Onsite Impacts

Vegetation Management — The condition of upland vegetation communities throughout the Planning Area would be expected to continue to be generally good, moving in an upward trend due to a number of actions intended to protect and/or enhance the health and productivity of native plant communities, guided by achievement of specific community objectives as well as more general Land Health Standards. Required use of BMPs would limit direct negative impacts to vegetation during ground-disturbing activities, and reclamation standards would promote rapid reestablishment of native vegetation. The reclamation standards would include seeding with native species, planting containerized native shrubs in specific situations where woody plants are appropriate, and deferring livestock grazing for up to two growing seasons following such actions. In addition, the requirements in this Proposed Plan for annual monitoring/reporting of revegetation conditions against performance-based criteria would also contribute

to an emphasis on high-quality revegetation of disturbed areas. It is expected that this combination of management actions would result in direct moderate positive impacts to upland vegetation.

The Proposed Plan incorporates the Alternative II emphasis on noxious weed inventory, detection, and monitoring. These management actions would allow for a far more focused and effective application of the current weed management program by providing data and information upon which to base a number of important decisions such as incipient population locations, priority-to-control strategies, and the efficacy of different integrated methods for particular species and locations. Over time, this focus on noxious weed management would indirectly have a moderate positive impact on upland vegetation.

Riparian areas and river corridors are a focus of protection and management under this alternative. This includes a specific objective for maintaining proper hydrologic function and protection of vegetated areas adjacent to these resources. Management objectives for these vegetation types include achieving late-seral stage and attributes to support PFC through general resource management, as well as specific adjustments to livestock grazing systems and exclusions to promote achievement of these objectives. Due to these protections and specific management actions, a large number of riparian/wetland areas would be expected to return to PFC over time, resulting in major positive impacts within the Planning Area.

Grazing and Rangeland Management — Livestock grazing would be managed to conform to BLM grazing regulations and meet Land Health Standards as well as vegetation community objectives. Allotment management plans, to be developed and reviewed in collaboration with grazing permittees on a regular schedule, would provide a basis for monitoring of rangeland health and making grazing management decisions. A combination of administrative solutions (e.g., season-of-use revisions, livestock exclusions, and stocking level adjustments), range improvement projects (e.g., construction of fences and stockponds to direct livestock use), and BMPs and reclamation standards would be applied to meet resource objectives. These include achieving a late-seral community stage as well as PFC for riparian/wetland areas. Focused management to resolve conflicts between vegetation resource conditions and livestock grazing, as well as generally improving range condition, would produce moderate positive impacts to vegetation in both upland and riparian/wetland areas over time.

Travel and Recreation Management — Except for the Hubbard Mesa OHV Riding Area, travel in the Planning Area would be limited to designated routes. This prohibition of cross-country travel would prevent continued expansion of unauthorized travel routes throughout most of the Planning Area, and the associated impacts of physical damage to vegetation, fragmentation of plant communities, increased soil erosion or compaction, and creation of invasion corridors for noxious weeds. When combined with the closure and revegetation of existing routes, these proposed management actions would result in moderate positive impacts to upland and riparian/wetland areas, except in the Hubbard Mesa OHV Riding Area. This 2,640 acre area would be subject to increasing loss of herbaceous vegetation and soil erosion from these activities as well as well as continual possibility of weed invasion, resulting in moderate negative impacts to this area.

Oil and Gas Development — Development of fluid mineral resources under the Proposed Plan would result in an estimated 193 well pads and an associated 812 acres of new long-term disturbance (1.1 percent of BLM lands in the Planning Area) during the 20-year period of analysis (Table 4-2). An additional 318 acres of temporary impacts are also estimated. The combination of long-term and temporary impacts (1,130 acres) constitutes 1.5 percent of BLM lands in the Planning Area.

Potential direct and indirect negative impacts of this development to vegetation resources, supporting ecological processes, and biological diversity above the rim would be reduced by the requirement of phased and clustered oil and gas development atop the plateau and the goal of managing toward clustered development below the rim. Atop the plateau, key components of the Proposed Plan would include a minimum separation of 0.5 mile between well pads, location of pads on ridgetops with slopes of 20 percent or less, limiting development at any one time to a single "development area," and limiting the amount of "currently disturbed" ground at any time to 350 acres (approximately 1 percent of BLM lands

atop the plateau). In this context, "currently disturbed" means areas where vegetation has been stripped or otherwise removed or destroyed, and for which revegetation has not been initiated, has been in progress for less than two growing seasons, and/or is not showing satisfactory progress toward achieving revegetation success standards (Appendix J).

These siting components would tend to focus the 75 acres of estimated long-term disturbance resulting from oil and gas development above the rim (Table 4-2) in the mixed mountain shrubland and mountain grassland communities that occur on the ridgetops and lower angle slopes. If all of this disturbance would occur in these communities, it would represent less than one percent of the 20,744 acres they comprise within the Planning Area (Table 3-11).

If assumed BMPs, reclamation standards, and mitigation monitoring are implemented as described above, disturbances to upland plant communities and riparian/wetland areas would be minor. Impacts of oil and gas development on riparian/wetland areas would be negligible except in areas where steep slopes or other resource management concerns such as visual resources, sensitive species, and wildlife preclude shifting of an oil and gas activity within the specific SSR/CSU. This could result in negligible to minor direct impacts to vegetation of riparian/wetland areas, especially below the rim. Exceptions may include some negligible to localized minor negative impacts to upland areas, mostly below the rim, where allowed ground-disturbing activities would be cumulative to habitat degradation from ongoing ground-disturbing activities, drought effects and existing weed infestations.

Special Management Designations and Restrictions — In general, few special resource management actions would result in impacts to upland vegetation. Some indirect benefits may occur as a result of selected ACEC and WMA management prescriptions (Tables 2-2 and 2-3, respectively). Large and sometimes overlapping NGD/NSO polygons indirectly result in some positive impacts for other resources. These benefits result because limits on long-term ground-disturbing activities for the protection of most other resources also reduce direct loss of vegetation, fragmentation of upland habitat, and introduction of weeds along routes and the edges of disturbance zones. Under the Proposed Plan, negligible to minor positive impacts to upland vegetation would result from special resource management actions.

The Proposed Plan would also result in a number of direct and indirect positive impacts to riparian/wetland areas above the rim due to the ACEC and WMA management prescriptions (Tables 2-2 and 2-3, respectively). Prohibitions on long-term ground-disturbing activities within WSR-eligible stream corridors would protect an area of 0.25 mile on either side of stream centerlines from ground-disturbing activities that might impair ORVs until a suitability analysis has been completed.

Also above the rim, a broad protection zone would be afforded riparian/wetland areas due to a NGD/NSO restriction specific to protection of high value habitat for genetically pure populations of Colorado River cutthroat trout. An overlapping, but much narrower zone of protection is afforded from an NGD/NSO restriction for riparian/wetland vegetation. In addition, an SSR/CSU restriction would provide controls on the specific location of proposed surface uses within a 500-foot buffer outside the edge of riparian or wetland plant communities.

It is anticipated that as a result of special resource management, riparian/wetland vegetation above the rim would generally experience local and widespread moderate positive impacts under the Proposed Plan. Below the rim, protections and benefits for the fewer and smaller riparian/wetland areas would be limited to the NGD/NSO and SSR/CSU restrictions specifically for the vegetation.

Offsite and Cumulative Impacts

Offsite impacts under the Proposed Plan would be the same for all alternatives; activities in these areas are generally expected to follow current trends, regardless of management within the Planning Area. In terms of impacts from oil and gas development, comparing assumed cumulative impacts to those for only Federal lands (Tables 4-2 and 4-3) shows that the offsite impacts (i.e., on private lands within and

surrounding the Planning Area) would be proportionately greater than for the Federal lands. This reflects the greater proportion of available surface on private lands, where only areas steeper than 50 percent are assumed to be unavailable (versus other NGD/NSO restrictions on Federal lands). In terms of cumulative impacts to vegetation it is important to note that a higher proportion of private lands within the Planning Area are below the rim, where upland habitat is already more degraded than above the rim.

Based on assumptions used in the RFD (Appendix H), approximately 2,904 wells could be developed on Federal and private lands in 20 years, assuming comparable development rates in proportion to the acres available for drilling operations (Table 4-3). This estimate includes the assumed 1,570 wells on Federal lands. Because more of the private lands are located below the rim than are Federal lands—64 percent versus 53 percent—the relative impacts on upland and riparian/wetland areas on private lands would be greater. This is compounded by an assumed lesser emphasis on clustering (e.g., with an assumed 40-acre surface density throughout, versus a goal of 160-acre surface density on new Federal leases) and the fact that private landowners negotiate their own agreements with oil and gas companies regarding reclamation standards, road designs, and other environmentally protective aspects of development. Failure to perform adequate reclamation or avoid riparian/wetland vegetation during offsite development could in turn potentially result in indirect impacts to BLM lands through the increased incidence of noxious weed and other undesirable plant introductions or transport of eroded soils and sediments. Degradation of these areas would also cause a decrease in the areal extent of natural vegetation communities throughout the larger area.

Although management of livestock grazing under the Proposed Plan is expected to result in improvements to vegetation resources, the same management on private lands cannot be assumed. Therefore, any potential negative impacts from livestock use in offsite areas—including erosion, siltation, and other impacts to streams as well as general vegetation degradation and noxious weed infestations—could negatively affect lands within the Planning Area.

Cumulative impacts on vegetation would also result from public travel on public lands within and surrounding the Planning Area. In general, public lands receive much greater use than private lands. Therefore, the beneficial road closures and cross-country travel restrictions for motorized and mechanized uses (except for Hubbard Mesa and over-snow travel by snowmobiles) under the Proposed Plan would help offset an anticipated increase in use of both public and private lands and the indirect and direct negative impacts these activities have on vegetation resources.

Noxious weeds and other populations of other undesirable vegetation are assumed to occur at approximately the same densities offsite as within the Planning Area. If unmanaged, the presence of these populations offsite would serve as a constant infestation source for the Planning Area, especially in areas where human traffic and livestock or wildlife movement can serve to spread weed seeds into new sites, counteracting active and coordinated management under the Proposed Plan.

The minor potential negative impacts discussed for riparian/wetland areas below the rim within the Planning Area would be cumulative to prior degradation of these areas due to livestock grazing, unregulated stream crossings, noxious weed proliferation, and drought effects (Section 3.3.1). These negative factors are assumed to be present and unmitigated in many riparian/wetland areas in the greater region as well. Therefore, negative impacts due to management actions being considered for incorporation into the RMPA have the potential to be cumulatively greater than when assessed in isolation.

A quantitative assessment of cumulative impacts on vegetation resources is not possible, due to (1) unavoidable uncertainties about the location, scale, and rate of oil and gas development on BLM lands, private lands, and other lands both inside and outside the Planning Area; (2) impacts from other types of land uses and land developments associated with the 4.5-percent annual population growth of the surrounding area; and (3) the application and effectiveness of environmental protections on non-BLM lands. However, the long-term surface disturbance from new wells on BLM lands in 20 years (812 acres)

represents 29 percent of the cumulative total for private plus Federal, existing plus projected development (Tables 4-2 and 4-3). Also, the total number of BLM and private wells projected for the Planning Area at the end of 20 years (approximately 3,700) is in comparison to a projected total of 10,000 to 20,000 in Garfield County for the same time-frame (Section 3.4.3).

Regardless of management actions within the Planning Area, direct and negative impacts to vegetation resources would result from ongoing human development throughout the general region, which would bring new roads, housing projects, commercial development, and increasing recreational use of wildlands. The same indirect impacts to native vegetation discussed above would also result. In many cases, the loss or fragmentation of native plant communities is highly visible. These impacts would continue on a regional scale and would be in addition to impacts expected from land uses and resource management activities in the Planning Area. If negative impacts to these resources continue to increase as expected, their condition on public lands would become even more important because of their intrinsic value, the biodiversity they represent, and the continuation of the ecological values they support.

Summary of Impacts to Upland and Riparian/Wetland Vegetation

The Proposed Plan provides protection of riparian/wetland areas from surface disturbance by several, sometimes overlapping, restrictions and conditions. Additionally, several management actions proposed in this alternative would affect upland and riparian/wetland vegetation. These include direct management of the resources themselves as well as management of noxious weeds, travel, recreation, rangeland, and oil and gas development. The potential impacts of these actions to upland and riparian/wetland vegetation are discussed above and summarized in Table 4-10. The Proposed Plan and Alternative II would have the least adverse impacts to upland and riparian/wetland vegetation and the most positive impacts.

Table 4-10. Summary of Impacts to Upland and Riparian/Wetland Vegetation [1, 2]

Land Use or Management Action	*Alt. I No Action*	*Alt. II*	*Alt. III Preferred*	*Alt. IV*	*Alt. V*	*Proposed Plan*
Upland Vegetation Management	Minor to Moderate (-)	Moderate (+)	Minor to Moderate (-)	Minor to Moderate (-)	Moderate to Major (-)	Moderate (+)
Riparian/Wetland Vegetation Management	Minor to Moderate (-)	Major (+)	Moderate (+)	Moderate (+)	Moderate to Major (-)	Major (+)
Grazing and Rangeland Management	Minor (+)	Moderate to Major (+)	Moderate (+)	Moderate (+)	Moderate (-)	Moderate (+)
Travel and Recreation Management	Localized Major (-)	Moderate (+)	Moderate (+)	Moderate (+)	Moderate (+)	Moderate (-) to Moderate (+)
Oil and Gas Development	Minor (-)	Minor (-)	Minor (-)	Minor (-)	Minor to Moderate (-)	Minor (-)
Special Management Designations and Restrictions	Negligible (+)	Moderate (+)	Minor (+)	Minor (+)	Negligible (+)	Moderate (+)

[1] *Overall impact level after combining adverse (-) and beneficial (+) effects of land uses and management actions and after incorporating BMPs described in text and Alternative I.*

[2] *Does not include special status species; see Section 4.3.4 and Table 4-14.*

4.3.2 Terrestrial and Aquatic Wildlife

4.3.2.1 Introduction

In general, the occurrence, abundance, and distribution of wildlife are most strongly affected by habitat type, quality, and accessibility. All of these habitat characteristics may be severely altered as a result of increased human activity and resource development, as well as by resource management activities aimed

at specific wildlife or other environmental concerns. These include (1) actions aimed at preserving or enhancing fish and wildlife resources, and (2) other actions, including oil and gas development, vegetation management, livestock management, and travel management.

Impacts to fish and wildlife resources from implementation of the Proposed Plan are summarized in the following subsections, with selected references to Alternatives I through V. These impacts can be either direct or indirect and can result from any activity involving removal or modification of vegetation and increased levels of human activity. Major impacts associated with human intrusion into an ecosystem are discussed below.

Information regarding potential impacts on special status species is presented in Section 4.3.4. These include Federally listed, proposed, or candidate threatened or endangered species; BLM and USFS sensitive species; migratory birds, including neotropical migrants; BCCs; and State-listed threatened, endangered, or special-concern species in Colorado.

Impact Types

Direct Habitat Loss — Direct habitat loss occurs when required life-sustaining conditions are lost, e.g. through removal of vegetation or draining a pond. Vegetation impacts are the most significant for future land use and management actions. Removal of vegetation affects wildlife by reducing the extent or quality of habitat in terms of food, cover, and structure for nesting and other uses. These impacts are relatively simple to quantify by comparing the amount of habitat loss to the amount preserved. For example, removal of vegetation during construction of a road or well pad essentially strips the affected area of any wildlife value. While closure and reclamation of temporarily disturbed areas can eventually restore lost habitat values, the disturbance may have a long duration (20 or more years for a well) or require years or decades for recovery of pre-disturbance structure and function (pipeline corridors, reclaimed roads).

Habitat Modification — Changes in habitat are generally less obvious and less severe than losses of habitat but can be significant, especially if small impacts accumulate across large areas. Examples include removal of forage by domestic livestock, trampling of soils by domestic livestock, invasions of weeds in areas where native plant vigor or cover is reduced, and removal of tree cover during timber harvesting. Modification of aquatic habitats can also occur as a result of increased human use and resource development, including diversions for agricultural and other uses. Low-water crossings or culverted crossings of roads can create impassable segments that interfere with upstream-downstream movement by fish and aquatic macroinvertebrates. A change in grade at the crossing point can create depositional or erosional regimes that affect the type of substrate, channel stability, and water quality. Roadway approaches to streams are often relatively steep and may provide an ongoing source of sediments that can make the substrate unsuitable for spawning or feeding, and increased suspended loads can smother fish eggs, suffocate larvae, and change the temperature or other physicochemical characteristics.

Habitat modification can also be beneficial and is an important tool in wildlife management. Examples include use of prescribed fires to stimulate new growth on senescent (older) woody vegetation, thinning of overly dense shrubs to enhance forage production, construction of protective fencing along riparian areas, and creation of alternative watering features to reduce the need for cattle to access streams.

Habitat Fragmentation — This type of impact is increasingly recognized as an important, and often the most important, impact of human population growth and associated development on wildlife. Impacts of habitat fragmentation relate to the reduced size of individual habitat blocks and the increased percentage of "edge" on smaller blocks as compared to larger blocks. Thus, two 50-acre blocks of habitat may support fewer individuals of a particular species than one 100-acre block, and four 25-acre blocks may be incapable of sustaining any individuals of that species. Fragmentation may benefit as many species as it harms by creating conditions favorable for "edge species" (those that prefer the interface between two or

more habitat types) and "habitat generalists" (those that are not restricted to a specific habitat to meet their needs). However, species adversely affected by fragmentation—"habitat-interior" species and most "habitat-specialist" species—include many of the special status species described in Section 3.2.3. These and other habitat-interior or habitat-specialist species have suffered disproportionate levels of adverse impact from human population growth and resource development. Therefore, while some species benefit from fragmentation, they tend not to be the species of special concern within a given area, while species adversely affected by fragmentation typically are. Moreover, species benefiting from habitat fragmentation include most of the species commonly associated with human habitation, including farmlands, ranchlands, and rural or suburban residential development.

Habitat-interior species may avoid habitat edges because the species are either (1) less well-adapted there than edge specialists and habitat generalists, or (2) more secretive and likely to seek the greater seclusion available away from an edge. Gutzwiller et al. (1998) found that more detectable (brightly colored or loudly and frequently singing) forest birds were more furtive than less detectable species. In general, the more detectable species are migrants. The need for bright colors and loud or frequent songs is associated with the greater likelihood of having to find a new mate each year due to mortality during migration and the need to establish a territory and form a pair bond more quickly. Maurer and Heywood (1993) noted that neotropical migrant songbirds (Section 3.2.3) tend to be more detectable and more frequently are habitat-interior and habitat-specialist species; these species include warblers, vireos, and tanagers. Selected studies on the effect of habitat fragmentation are summarized below.

- Hargis et al. (1999) found that American martens respond negatively to small amounts of fragmentation and do not occupy forests when more than 25 percent of the tree canopy has been removed by logging of patchwork clearcuts.
- Moore and Hooper (1975, cited in Whitcomb et al. 1981), Forman et al. (1976), and Galli et al. (1976) all reported that numbers of bird species in forests were positively correlated with patch (habitat block) size. Whitcomb et al. (1981) reported that neotropical migrant forest-interior species (see Section 3.2.3) were rare in blocks of 2.5 to 12 acres, intermediately abundant in blocks of 15 to 35 acres, and abundant in blocks of 175 acres or more, occurring at 80 to 90 percent of their normal density in extensive unfragmented tracts. McIntyre (1995) reported that small tracts (<8 acres) had only 742 total birds and an average of 2.9 species per patch, compared to 1,041 total birds and 3.9 species per patch for large tracts (up to 325 acres). Keller and Anderson (1992) reported similar effects of timber cutting on forest bird species.
- Forman and Alexander (1998) reported reduced use by habitat-interior birds extending 150 meters away from forest roads and 1 to 2 kilometers away from grassland roads. Forman (2000) reported that the "road-effect" zone averages 200 meters (660 feet or 0.125 mile) wide for secondary roads. Ingelfinger (2001) reported that numbers of sagebrush steppe songbirds are reduced by up to 60 percent within 100 meters of high-traffic roads (>12 vehicles per day) associated with oil and gas development and by up to 50 percent within 100 meters of low-traffic roads.

While the discussion above focuses on fragmentation associated with human activity and development, it can also occur as a result of natural changes. Chief among these in forested habitats are the effects of major wildland fires. By destroying forest canopies that provide contiguous habitat for arboreal species and contiguous cover for ground-dwelling species, fires can create unforested openings that impede movement by forest-interior species and increase the amount of edge. The change in fire management for the top of the plateau to one with a higher priority on suppression is based in part on the sensitive forest and aquatic habitats there (Section 4.5.11).

Reduced Habitat Effectiveness — In addition to the effects of reduced patch size, increased edge, and shifts in vegetation composition associated with habitat fragmentation are impacts associated with increased human activity. This is because most sources of habitat fragmentation—e.g., roads, trails,

timber clearcuts, conversion of habitats to agricultural or residential uses, and energy developments—are also associated with increased levels of human activity.

While some species are more tolerant of human activity than others, virtually all species have some threshold of disturbance above which they would abandon an area or use it at a significantly reduced level. The result is a *de facto* loss of habitat, because avoided areas meet no survival needs. The amount of habitat actually available to wildlife is called "effective habitat," and reductions in the amount of effective habitat (or "habitat effectiveness") can greatly exceed any direct habitat loss. For example, Reed et al. (1996) calculated that the effective habitat loss associated with construction of new roads in an area open to logging was 2.5 to 3.5 times the actual habitat loss, assuming a "road-effect" zone extending 100 meters from a road.

The scientific literature contains a number of studies on the effects of roads, logging activities, and oil and gas activities on deer and elk, two species of special interest and concern in the Planning Area. Particularly relevant studies are summarized below. When reviewing these studies, however, it is important to note that the term "avoidance" as used in these articles does not mean total avoidance but instead refers to disproportionately low use based on the type or extent of habitat present.

- For elk, Ward (1976) and Irwin and Peek (1979) reported reductions in use within 400 meters (0.25 mile) of little-used, slow-speed National Forest roads. Hershey and Leege (1976) reported reduced use within 400 meters (0.25 mile) of forest roads in summer range. Frederick (1991) found that 73 percent of use by elk occurred in the 50 percent of an area more than 400 meters (0.25 mile) from a road. Lyon (1979) reported that use by elk was reduced by 37 percent within 0.1 mile of a road and by 57 percent within 0.2 mile. Pedersen (1979) and Rost and Bailey (1979) reported that use by elk decreased within 250 meters (820 feet) of paved roads. Czech (1991) reported reduced use within 500 meters of a logging road after it was opened to public use. Gillin and Irwin (1985) reported reduced use of calving habitat within about 1,200 meters (0.75 mile) of seismic exploration roads in more open (unforested) summer range.
- Thiessen (1976) reported for a study area in Idaho that 75 percent of use by elk was in the 25 percent of the site that was roadless. Similarly, Frederick (1991) found that 73 percent of use by elk occurred in the 50 percent of an area more than 400 meters (0.25 mile) from a road.
- However, both Lyon (1979) and Perry and Overly (1976) noted that the actual extent of reduced habitat use along roads was affected by the amount of vehicular traffic and the density of nearby vegetation cover. Pedersen (1979) and Rost and Bailey (1979) also noted that paved roads had more impact than unpaved roads, and the latter more impact than primitive roads (presumably related to differences in the frequency and speed of vehicular traffic). Witmer and DeCalesta (1985) found that open spur roads showed a significant reduction up to 250 meters away.
- Regarding the duration of road impacts, Witmer and DeCalesta (1985) found no reduction in use within 250 meters of spur roads after the roads were closed to vehicles. Edge and Marcum (1985) found that elk avoided logging roads by distances of 500 to 1,000 meters on working days but showed no avoidance of the roads on weekends. Similarly, Johnson et al. (1990) reported that elk returned to areas of both summer range and winter range when construction activities that had caused them to leave an area had ceased. Czech (1991) reported that tolerance of logging roads by elk was correlated with the distance to hiding cover.
- In a study of the effects of oil and gas development on elk in southwestern Wyoming, Powell (2003) found reduced use within 500 meters of roads and drill pads during fall, winter, spring, and calving season (early summer). However, although he reported reduced use within 500 meters, he did not collect data for narrower zones, so it is not known whether the overall reduction was uniform or greater in closer proximity to the disturbance. Also, the habitat types that dominated the 500-meter

zone were dominated by grasses and low-growing sagebrush and saltbush providing little visual screening.

- More recently, Sawyer and Nielson (2005) reported that elk showed reduced use of areas within 2.8 kilometers (1.7 miles) of roads on summer range. In winter, the zone of reduced use was 1.2 kilometers (0.75 miles), which the authors attributed to greatly reduced human use of the roads.
- Regarding the duration of impacts on elk from oil and gas development, Hiatt and Baker (1981) found that an oil well drill pad was temporarily avoided but that the access road was not. Johnson et al. (1990) also found that elk avoided oil and gas activities temporarily but returned to these areas when the activities ceased. Knight (1980) reported that elk showed alarm responses when exposed to a continually shifting seismic exploration line but not in relation to regular activities at an oil and gas well pad and access road. Van Dyke and Klein (1996) reported that elk responses to oil drilling activities were not permanent but instead that "elk compensated for site-specific environmental disturbance by shifts in use of range, centers of activity, and use of habitat rather than abandonment of range."
- Regarding the benefits of road closures, Irwin and Peek (1979) found that elk tended to remain on summer range later into the fall in areas of closed roads than in areas of open roads accessible to hunters. Witmer and DeCalesta (1985) found that habitats adjacent to closed roads showed no reduced elk use, while open spur roads showed a significant reduction up to 250 meters away. Holland (1989) reported that impacts were reduced by 70 percent for roads limited to public access (administrative use only) and by 90 percent for permanent closures.
- For deer, Knight et al. (2000) found that use by mule deer was reduced within 200 meters of a road (i.e., the road-effect zone is 200 meters, or 0.125 mile). Lyon (1979) found that the reduction in habitat use was greater in areas of sagebrush than pinyon/juniper, apparently due to difference in the amount of vegetation screening.
- In ongoing studies of oil and gas activities on mule deer in southwestern Wyoming, Sawyer et al. (2004, 2005) documented decreasing use beginning at Year 1 of drilling and continuing to decline through Year 4 (the most recent report reviewed). During the first three years, deer gradually increased their zone of reduced use to distances of 2.1, 3.1, and 3.7 kilometers (1.3, 1.9, and 2.3 miles), respectively. In Year 4, habitat selection did not seem to be affected by the distance from a pad. The authors attributed this to severe winter conditions (heavy and protracted snow cover), which may have forced deer to revert to their pre-development habitat use despite the presence of drilling operations. The 2004 report (presenting findings for Year 3) included the following statement: "While results from our analyses suggest that natural gas development…has affected mule deer habitat use, no statistically significant changes in survival or reproduction have been detected." However, the 2005 report noted a 46-percent reduction in deer abundance in the area of oil and gas development as of Year 4. Whether this was related to lower survival or reproduction due to the severe winter conditions, lower survival or reproduction due to deer being "forced" to use areas where they were more subject to disturbance effects (with associated increased stress), or dispersal to other winter ranges (as evidenced by one radio-collared animal)—or some combination of these—is not known. However, the authors noted that no similar decline was detected in the offsite ("control") population.

Some researchers have described road effects in terms of road density (length of roads per unit area). For example:

- Lyon (1983) stated that use by elk is reduced 25 percent at a road density of 1 mile per square mile, and 50 percent at 2 miles per square mile. Baker and Cai (1992) reported that a road density of 1.7 miles per square mile caused an 80-percent reduction in elk use and total avoidance by mountain lions, and that a density greater than 4.2 miles per square mile also eliminated elk use.

- Thomas (1979) used data of Perry and Overly (1976) to plot use of summer range by deer and elk in response to different types of roads and differing road densities. At a density of 2 miles of road per square mile of habitat, use by elk decreased only 3 percent for primitive (narrow, unimproved) roads but 40 percent and 54 percent for secondary and primary roads, respectively. Main roads were 1.5 or more lanes wide, improved, regularly maintained, and regularly traveled. In comparison, use by mule deer at the same road density decreased by 6 percent, 8 percent, and 16 percent for primitive, secondary, and primary roads. At densities of 3 miles per square mile, decreases in use by elk were 4, 52, and 65 percent for these road categories, while deer decreased 14, 16, and 31 percent, respectively.

The current "road" density on BLM land within the Planning Area is approximately 2.3 miles per square mile, based on 259 miles of mapped motorized routes. However, this represents the baseline (pre-development) condition in much of the area. Furthermore, it is not known precisely where increased traffic volumes associated with oil and gas development would occur, and what percentage of existing roads would be subject to increased traffic sufficient for the effects summarized above. For example, the Proposed Plan is assumed to result in 16 miles of new or upgraded access roads atop the plateau in 20 years (Table 4-2), which would increase the effective road density by only a factor of 0.3. Therefore, calculating decreases in use by deer and elk using the density method is not practicable.

Other Sources of Disturbance — Roads, timber clearcuts, and oil and gas developments are not the only reported sources of disturbance that can affect wildlife use:

- Gutzwiller et al. (1998) experimentally subjected forest birds to increased human activity, which consisted of walking through breeding territories. Effects included nest abandonment and reduced nest attentiveness leading to nest failure. However, Riffell et al. (1996) noted that this impact is not cumulative—i.e., does not carry across years if the disturbance ceases. Friesen et al. (1995) discussed the exacerbating effect of disturbance on habitat fragmentation due to decreased seclusion in the interiors of smaller patches. They found that 10-acre woodlots not located near human habitations supported more species and individuals of neotropical migrant songbirds than did 62.5-acre urban woodlots.
- Freddy et al. (1986) reported that deer would move away in response to pedestrian traffic as close as 200 meters (660 feet), similar to the distance reported by Ward et al. (1980) who also reported a "locomotor response" distance for elk of only 86 meters (about 200 feet). Parker et al. (1984) emphasized the importance of avoiding situations in which wintering deer would be forced to move to avoid human activity, owing to decreased energy stores in winter and greater effort in moving through snow. Ward (1986) reported that elk were disturbed by firewood gathering closer than 800 meters (0.5 mile), with a similar buffer requirement from logging operations (Ward 1976).
- Williams and Lester (1996) compiled an annotated bibliography of OHV and other recreational impacts on wildlife. Joslin and Youmans (1999) provide in-depth information on the effects of recreation on Rocky Mountain wildlife in Montana. Their compendium includes a listing by Knight and Cole (1995) of specific effects of recreational activities on wildlife (excerpted below):
    - Viewing (close encounters) – Altered behavior, unnecessary energy expenditure during flight, altered nest placement, and reduced survivorship of young due to abandonment or predation.
    - Backpacking/hiking/riding/cross-country skiing – Flight, displacement, or elevated heart rate.
    - Rock climbing – Disturbance of preferred raptor perching and nesting sites.
    - Spelunking (caving) – Disturbance or abandonment of bat roosting and maternity sites.
    - Pets (dogs) – Stronger predator-alarm response than a person without a dog; increased stress and energy expenditure while fleeing, risk of injury or mortality.

  - OHVs – Potential disturbance (flight and stress) and redistribution.
  - Snowmobiles – Same as OHVs.

- Boyle and Samson (1985) also discussed recreation effects on wildlife and found that many more species were adversely affected by hiking and camping, boating, wildlife viewing/ photography, OHV use, snowmobiles, caving, swimming, and rock climbing than were either unaffected or benefited.

Interference with Movement Patterns — Habitat loss or modification, habitat fragmentation, and disturbance 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, steep roadcuts). 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 birds that easily avoid them. Even without the need for these regular movements, most mammals 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 facilitate gene exchange between distinct populations. This is also seen in snakes and other reptiles. Barriers that prevent snakes from accessing winter dens or that isolate amphibian breeding pools from feeding areas can also affect or even eliminate a population.

For large mammals such as deer and elk, changes in the landscape can profoundly affect their ability to meet daily and annual requirements. For example, these large species must drink water regularly (daily during warm weather, even during winter), and home ranges must include sources of water. Blockage of a route between foraging or bedding areas and watering areas can cause the animals to abandon the larger area altogether. Seasonal movements between summer and winter range are also important for these species. In the Planning Area, for example, movement through the cliffs is limited to a few areas, many of which are included in the security areas described previously. Any human activity or landscape modification that prevents the use of one or more of these limited migration routes could effectively reduce the use of habitat either above or below the constrictions ("bottlenecks").

Harassment and Impacts from Dogs — Harassment is an extreme type of disturbance and involves intentional actions to frighten or chase a species. Because wildlife react more severely to directed movements by people rather than incidental movements, the magnitude and duration of the displacement is generally greater. This increases the risk of injury to the fleeing animal, placing greater stress on the animal by increasing metabolic rates and creating more prolonged disruption in behavior and habitat use.

One potentially important source of harassment results when wildlife is chased by dogs. See Sime and Schmidt (1999) for a treatise on the topic. In some cases, this can result in direct mortality if the dogs either kill or mortally wound an animal. Less obvious, but potentially as serious, is the increase in stress that occurs when wildlife are forced to flee or are simply displaced from an area. As noted above, this can be of particular importance during winter, when animals have low energy reserves and are more vulnerable to stress because of low temperatures and, depending on conditions, movement through snow. Dogs can also cause especially severe disturbance during the fawning and calving seasons, when young or pregnant females are highly susceptible to stress and less able to flee. Young are especially vulnerable to stress and more likely to be directly attacked.

Direct Mortality — In addition to attacks by dogs, direct mortality can result in areas of increasing human use due to collisions with (or being run over by) vehicles, electrocution of raptors on utility lines, increased likelihood of illegal hunting, or inadvertent trampling of nests. In the case of oil and gas development, wildlife mortality associated with petroleum pollution has also been reported. The USFWS (1991) and Esmoil and Anderson (1995) described wildlife mortality associated with oil pits in Wyoming. Affected species included waterbirds as well as large mammals, raptors, and songbirds. Additional moralities of birds and mammals were attributable to hydrogen sulfide gas being stripped from the petroleum. Since these studies were in an area of oil (rather than predominantly gas) production, the

number and toxicity of the oil pits would be expected to be greater than analogous situations associated with predominantly natural gas production such as the Planning Area.

Impact Analysis Methodology

Impact Estimation — Impacts on wildlife from habitat loss, habitat fragmentation, and increased human disturbance are difficult to quantify. Among the reasons are the following:

- Species differ in their tolerance of disturbance.
- Species differ in their ability to utilize less desirable habitats if displaced from more desirable habitats, or to otherwise adapt to changing conditions.
- Habitats differ in their ability to screen wildlife from areas of disturbance.
- Habitats differ in their importance to wildlife.
- Areas differ in their existing (baseline) quality.
- Areas differ in the existing level of human activity to which wildlife may have already adjusted their use patterns.
- All of the above may differ by season or other variables, both within and among years and within and among areas.

Added to these inherent variables are the realities of the RMPA/EIS process. Despite efforts to predict future conditions to a reasonably realistic level, unavoidable uncertainty remains. These uncertainties include factors such as (1) specific locations of well pads, access roads, or other types of surface disturbance; (2) specific rates at which changes in existing land uses occur, and how those rates may differ through time; and (3) specific degrees and rates of success in areas undergoing reclamation or habitat improvement programs.

Recognizing this difficulty, the Draft RMPA/EIS used an impact estimation tool for wildlife that attempted to "flatten out" the unavoidable uncertainties. This was intended to base the analysis on total changes across 20 years, since it was not possible to predict exactly where drill rig operation, road construction, and completed oil and gas production facilities would be located in any given year. Therefore, the analysis applied an estimate of reduced habitat effectiveness to all habitat losses that would occur over the 20-year period of analysis. The "multiplier" used was 3.5, which was derived from a study by Reed et al. (1996) indicating that the cumulative area affected by timber clearcuts and logging roads in forest habitat was up to 3.5 times the actual area of direct habitat loss, using a road-effect zone extending 100 meters from the disturbance. Assuming that this equates to total wildlife avoidance would compute to habitat loss of 3.5 acres for each acre of area impact (e.g., well pad) and 80 acres for each mile of road (assuming a straight road).

During the Consultation and Coordination process following publication of the Draft, CDOW stated that they did not agree with the use of this methodology and instead would prefer application of findings by Sawyer et al. (2004) and other authors who attempted to quantify effective habitat loss for deer and elk due to reduced use of areas around roads, drill rigs, or similar disturbances. Applying this approach would mean assuming, for example, an area of reduced use within some "buffer" zone. While the reported road-effect widths vary (see discussion earlier in this section), an average width at which reduced use is documented would be approximately 250 meters (820 feet). Because of the more intensive and continuous disturbance associated with a drill rig, it would seem reasonable to use a wider impact zone, such as 400 meters (1,320 feet or 0.25 mile), also borrowing from the studies cited above. Assuming approximately 50-percent avoidance within these distance zones, which are at the upper end of the typical ranges in the literature, computes to 63 acres of effective habitat loss around an operating drill rig and 99 acres of effective loss per mile of road length (assuming a straight road). Note that a very sinuous road has less total impact area per mile of length because the impact areas for individual points along the road

may be "stacked" or overlap. For example, a 250-meter buffer along a 1-mile section of road with a sinuosity of 0.7 (typical of winding roads in the Planning Area) would include 82 acres, as opposed to 99 acres for a straight road of the same length.

A shortcoming of the distance (instead of area) method is that it does not provide a basis for estimating a reduced zone of use around a production facility or access road once it has entered the long-term stage of occasional and lower intensity human. Furthermore, it is unlikely that many of the species present within the Planning Area would be subject to the same level of sensitivity to human disturbance as reported by some authors for hunted populations of deer and elk (unhunted populations being much more tolerant of human activity). Other furtive species include carnivores (black bears, mountain lions, and bobcats) and some raptors. Zones of effective habitat loss for smaller mammals and most birds would be much narrower.

As throughout this RMPA/EIS, the impacts resulting from quantitative and qualitative analyses are expressed in general terms for comparison among alternatives and resources. As pertains to fish and wildlife, adverse impacts are defined as follows:

- **None** – No changes in species occurrence, distribution, or abundance are expected.
- **Negligible** – Changes in distribution or abundance of some species may occur, but at levels that may not be discernible or demonstrable except at specific impact sites.
- **Minor** – Changes in distribution or abundance of some species would be discernible and demonstrable at a localized level, but current types and patterns of use and species occurrence would continue.
- **Moderate** – Changes in distribution or abundance would be readily discernible and demonstrable, and some species may occur in markedly lower numbers or be exterminated from localized parts of the Planning Area.
- **Major** – Similar to moderate, except that several species may occur at markedly lower numbers, and some species are likely to be extirpated from large portions of the Planning Area.

The same terms are applied in a more relative sense to describe beneficial impacts.

Oil and Gas Development — The following subsections describe fish and wildlife impacts associated with future management actions and land uses contained within the Proposed Plan. Selected comparisons are also made to one or more of the five alternatives analyzed in the Draft RMPA/EIS. Some impacts are direct, while others are indirect and affect wildlife through a change in another resource. Also, some of the most ecologically sensitive species such as raptors, and most socially and recreationally important species such as big game, are highly mobile and require large areas to meet their annual requirements. Thus, onsite impacts could also result in offsite and cumulative impacts.

Although fish and wildlife would be affected to some degree by all of the future land uses and management actions associated with implementation of the final Plan arising from this RMPA/EIS process, impacts resulting from development of oil and gas on both Federal and private lands are likely to be the most important (i.e., detectable, demonstrable, and deleterious). This conclusion is based on the increasing amount of habitat loss, habitat fragmentation, and disturbance from human activity associated with increasing levels of development. Therefore, the analyses below emphasize this land use.

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 – The initial phase of development typically lasts for 25 to 40 days, depending on depth, and is very equipment-intensive. Associated activities include blading an access road and pad (with an average combined area of 3.4 acres per well) and nearly continuous operation of a drill rig and other specialized heavy equipment. On average, 580 round trips by heavy trucks and

pickups are associated with each new well. Resultant impacts are likely greatest when the first well is drilled in an area, because wildlife would not have had an opportunity to habituate to low-level disturbance or adjust their movement patterns to avoid high-level disturbance.

- 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 to 5 years after disturbance; however, restoration to productive wildlife habitat could take up to 20 years. The remainder of the disturbed area is occupied by surface facilities and ongoing human activity throughout the life of the well.
- Abandonment – The final phase of an oil or gas well occurs at the end of its productive life, typically ranging from 20 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 vehicles in the project areas. Abandonment and reclamation activities require approximately 3 days per well and 4 days per mile of access road, for a crew of four people.
- Reclamation – Restoration of temporarily disturbed areas at the well pad and along the access road begins upon completion of construction. Attaining reclamation standards in terms of erosion control, weed control, and establishment of vegetation cover typically requires at least 3 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.

Impact Mitigation

Direct and indirect impacts of oil and gas development and other land uses or activities are generally best mitigated by avoiding or minimizing the impact to the degree practicable, given other management considerations. The various surface use restrictions outlined in Table 4-1 and described in Section 4.1 emphasize this approach for protecting fish and wildlife resources. Impacts that cannot be avoided would be minimized by a variety of BMPs, examples of which are provided in the following subsections.

Besides avoidance or minimization, some impacts can be mitigated by measures that improve the quality of habitats not directly affected. These measures may be implemented in portions of the Planning Area not affected or only minimally affected by development (e.g., the various NGD/NSO areas) or, potentially, in offsite areas. Habitat enhancement may include measures to improve shrub stands that are approaching decadence due to long-term fire suppression, restoring areas of degraded rangeland through reseeding and fertilization, use of fencing to exclude livestock from important wildlife habitats (e.g., riparian areas), and development of water sources.

Habitat restoration and enhancement measures could also be implemented on lands outside the Planning Area. A recent example of offsite mitigation occurred in GMU 42, in which an oil and gas operator purchased 320 acres of deer and elk winter range and implemented habitat improvements such as vegetation treatments (including prescribed fires and mechanical manipulation), construction of fences to protect riparian areas, and development of upland water sources (BLM 2002a). A variant on the concept of offsite mitigation is that of "habitat banking." Under this concept—analogous to the widely used practice of wetland banking—relatively large and unfragmented blocks of habitat would be improved and/or preserved in perpetuity for the purpose of supporting a specific wildlife use. The bank would then be used to offset unavoidable impacts in the project area. When applied correctly, an offsite bank or other mitigation area may be of more benefit to wildlife than attempting to minimize or offset impacts in multiple smaller (fragmented) areas subject to ongoing disturbance by human activity.

During the Consultation and Coordination process, CDOW noted that abandonment of active agriculture (irrigated hay production) along some portions of Parachute Creek have reduced the value of these lands, which provided a source of forage from fall through spring and helped offset impacts to native winter range. Reestablishment of irrigated hay production specifically as wildlife mitigation could benefit deer and elk as well as a variety of other species. While BLM does not believe that it can require offsite mitigation, the agency has agreed to consult with CDOW in identifying potential offsite mitigation programs for the Planning Area and to work with oil and gas operators to encourage such measures when deemed appropriate.

The levels of impact ascribed to the Proposed Plan in the following analyses assume that all applicable stipulations and other management actions constituting an element of the Plan and would be applied and enforced. Management prescriptions specific to oil and gas development and common to both the Proposed Plan and Alternatives I through V include the following:

1. Where feasible and deemed appropriate by BLM, use clustering, collocation, or consolidation of facilities to reduce habitat loss, habitat fragmentation, and vehicular activity (this is a key component of the Proposed Plan).
2. Place locked gates across well access roads to prevent unauthorized motorized use.
3. Require that development be "contained" so that produced waters and other drilling products are hauled offsite and disposed safely rather than retained onsite where they could pose a potential risk of toxicity to wildlife or pollution of surface waters.
4. Require that water used in drilling operations, dust suppression, pad revegetation, or other consumptive uses be hauled or piped from offsite areas so that natural watering sources for wildlife are not depleted or unnecessarily disturbed.
5. Require that new oil and gas drill pads and access roads be located to avoid or minimize new drainage crossings, unless avoiding a drainage would cause greater impacts from increased road length, cut-and-fill, etc.
6. Where practicable, use radiotelemetry to monitor oil and gas production facilities as a means of reducing vehicular traffic, especially in sensitive habitats or seasons of sensitive wildlife use.
7. Construct watering sources (e.g., "guzzlers") in areas not subject to oil and gas development to reduce the need for movement from secluded areas to watering areas along drainages, some of which may necessitate crossing through areas of increased human activity or new roads.
8. Prohibit oil and gas crews from bringing dogs onto BLM lands during the course of their work.
9. Develop cooperative programs among the oil and gas lessees, BLM, and CDOW to fund and implement onsite or offsite habitat enhancement measures to offset unavoidable onsite impacts and reduce regional habitat loss.

While these measures would not prevent direct or indirect impacts to fish and wildlife, they would help reduce the severity of these impacts or slow the rate at which they accumulate.

4.3.2.2 Impacts of Proposed Plan

The analysis of impacts of oil and gas development on fish and wildlife resources under the Proposed Plan is based on the protective stipulations, assumed numbers of pads and wells, assumed miles of new or upgraded access roads, and acres of short-term and long-term surface disturbance presented in Tables 4-1 and 4-2. For BLM lands within the Planning Area, the Proposed Plan represents a substantially different ratio between the number of well and the amount of surface disturbance associated with pads and access roads than Alternatives I through V. This is the result of the requirement for phased and clustered development with a focus on ridgetop development on top of the plateau, and management toward

clustering and collocation of facilities below the rim. Cumulative impacts of oil and gas development result from existing and anticipated drilling on private lands in the Planning Area and on both Federal and private lands in adjacent areas of the GSRA.

Although generally less important as a source of adverse impacts to fish and wildlife than oil and gas development, other land uses and activities—such as recreation and grazing and, to a lesser extent, range management and travel management—are also addressed below for the Proposed Plan, with selected reference to one or more of Alternatives I through V.

Direct and Indirect Onsite Impacts

Vegetation and Range Management — Vegetation goals would focus on improving the diversity, production, and native species composition of upland and riparian/wetland areas. Livestock grazing would be managed to conform to BLM grazing regulations and meet Land Health Standards as well as vegetation community objectives. Because the Proposed Plan makes greater use of active management than Alternatives I and II, which rely primarily on natural processes, the rate of improvement over existing vegetation and range conditions is expected to be more rapid. Over time, the Proposed Plan is expected to have moderate to major positive benefits on vegetation condition, which in turn would benefit wildlife.

Travel Management — Limiting travel to designated routes throughout the Planning Area (except for over-snow travel by snowmobile and 2,640 acres of open travel in the Hubbard Mesa OHV Riding Area), closing/rehabilitating 28 miles of existing routes, and limiting 68 miles of existing routes to administrative use would increase solitude for wildlife and reduce the area of habitat loss associated with existing road-effect zones along these routes. Of the total of 96 miles of existing routes to be closed or limited to administrative use, all but 78 miles would be above the rim in areas that include crucial elk calving habitats, fawning habitats for deer, summer range for mountain lions and black bears, and nesting habitat for a host of small birds and raptors. The associated gain in effective habitat above the rim would be substantial, assuming an existing zone of reduced use along these routes (see discussion on impact estimation).

Oil and Gas Development — Protection of terrestrial and aquatic wildlife resources under the Proposed Plan include application to oil and gas development of NGD/NSO, SSR/CSU, and TL restrictions for a variety of related resources. These include:

- **NGD/NSO** – Colorado River corridor, high-value (including both "high-risk" and "moderate-risk") habitat for the Colorado River cutthroat trout, riparian and wetland areas, wildlife security areas below the rim, bald eagle nesting and winter roosting areas, mapped nests of other raptors, and the Anvil Points claystone cave (bat habitat).
- **SSR/CSU** – Parachute Creek WMA (atop the plateau), wildlife security areas atop the plateau, big game migration routes, and the peregrine falcon cliff-nesting complex.
- **TL** – Big game winter range, bald eagle nesting and winter roosting areas, raptor nesting and brood-rearing areas, peregrine falcon cliff-nesting complex, and waterfowl/shorebird nesting and brood-rearing areas (Fravert Reservoir).

Approximately 52 percent of habitats on the top of the plateau and along or below the cliffs would be protected with NGD/NSO restrictions under the Proposed Plan. An additional 33 percent would be in areas of SSR/CSU restrictions. The NGD/NSO restriction for wildlife security areas along and below the cliffs, and the SSR/CSU restriction for security areas along some stream valleys atop the plateau, are considered by CDOW to be particularly important. So too are the six "passages" (migration routes) used by deer and elk during seasonal movements through the otherwise impassable Roan Cliffs. These areas would be protected with SSR/CSU restrictions. Neither the wildlife security areas nor the migration routes were provided special protection under the Preferred Alternative of the Draft.

Of the 15 percent of BLM lands to be managed under standard lease terms for oil and gas, or similar measures for other land uses, almost 55 percent would have TL restrictions to protect seasonally sensitive wildlife uses and areas. The most extensive TL (34,668 acres) prohibits oil and gas drilling, roadbuilding, and other construction projects during the most crucial period of winter range use (December through April). Other TLs include seasonally crucial uses such as raptor and waterfowl nesting and brood rearing.

This alternative would result in approximately 210 wells on 13 pads above the rim and 1,360 wells on 180 pads below the rim. The wells on top (in deer and elk summer range, also supporting dispersed calving and fawning) would result in direct, long-term loss of 32 acres associated with the pads and 43 acres along 16 miles of existing or new roads needed for access across the top of the plateau (from the point at which the Cow Creek Road enters the Planning Area). The wells below (in deer and elk winter range) would result in direct, long-term loss of 450 acres associated with the pads and 287 acres along 108 miles of existing or new roads needed for access. Although this discussion emphasizes deer and elk due to their recreational and economic importance and generally high level of public interest, the same losses would apply to other wildlife using the habitats of the Planning Area.

As described previously in this section, impacts associated with disturbance from human activity would add effective habitat losses to the areas of direct habitat loss. Also as described previously, quantifying this effective loss is difficult. Two methods for doing so are to (1) multiply the area of direct impacts by a factor of 3.5, referred to here as the "area" method, based on the work of Reed et al. [1996] regarding habitat fragmentation (and used in the Draft RMPA/EIS); and (2) calculate a zone of reduced use around drill rigs and roads based on distances and percent reductions reported for deer and elk in the scientific literature, referred to here as the "distance" method. Because reported distances and percent reductions vary, the following analysis uses a combination of assumptions. For roads, the impact zone is assumed to extend 250 meters on either side of a major (regularly traveled) access route for oil and gas activities. For drill rigs, the impact zone is assumed to extend a distance of 500 meters. For both types of disturbance, the reduction in use is assumed to be 50 percent. Both the 500-meter and 50-percent values are at the upper end of the typically reported range.

Impacts below the Rim

Under the Proposed Plan, winter range on BLM lands would be protected by a 5-month TL that restricts drilling, road construction, and other major sources of disturbance from December through April. The protected winter range on BLM lands is in close contact with winter range on private lands for which no seasonal restriction applies. The assumed seven drill rigs operating on BLM lands below the cliffs would probably shift their operations to these private lands during the winter. The impact analysis shown below using the distance method assumes that half of the seven drill rigs assumed to be operating on BLM lands below the cliffs would shift to private lands but would be located on the edge of BLM lands. Therefore, while avoidance by big game would still extend into the BLM lands from the adjacent private lands for half of the operating drill rigs and access roads, and the percentage of habitat loss during winter would also be reduced by one-half compared to a scenario with no TL. This assumption probably overstates the amount of effective habitat loss in BLM lands below the cliffs during winter, because few if any of the drill rigs would actually be on the very edge of the TL area.

Table 4-11 compares the results of applying the two methods for estimating effective habitat loss of deer and elk and winter range below the cliffs, as well as summer range atop the plateau, under the Proposed Plan and Preferred Alternative. For both methods, the estimates for the Proposed Plan reflect phased and clustered development throughout the area above the rim and management toward greater clustering below the rim, instead of concurrent drilling at more numerous and widespread locations.

As shown in Table 4-11, the distance method and assumptions described above yields long-term habitat loss of approximately 6,496 acres below the rim under the Proposed Plan during the 20-year period of analysis. This is equivalent to approximately 18.7 percent of total winter range on BLM lands below the rim (34,668 acres), a somewhat smaller impact than under the Preferred Alternative. Thus, the Proposed

Plan would result in slightly less loss of winter range while accommodating somewhat more oil and gas development.

Table 4-11. Comparison of Habitat Impacts Using Different Methods to Estimate Effective Loss

Component [1]		*Proposed Plan* [2]		*Preferred Alternative* [2]	
		Area Method	*Distance Method*	*Area Method*	*Distance Method*
Summer Range	Drill Rigs and Pads	112 ac	534 ac	364 ac	606 ac
	Roads	204 ac	1,648 ac	217 ac	2,348 ac
	Combined	**316 ac (0.9%)**	**2,182 ac (6.3%)**	**581 ac (1.7%)**	**2,954 ac (8.5%)**
Winter Range	Drill Rigs and Pads	1,575 ac	824 ac	2,940 ac	1,280 ac
	Roads	1,372 ac	5,645 ac	2,642 ac	5,417 ac
	Combined	**2,947 ac (8.5%)**	**6,469 ac (18.7%)**	**5,582 ac (16.1%)**	**6,697 ac (19.3%)**

[1] *Summer range = atop the plateau; winter range = area below the rim within the winter range TL.*

[2] *Based on data in Table 4-2 and 34,668 acres of mapped winter range. Values shown include areas of direct habitat loss and surrounding areas of effective habitat loss due to disturbance.*

As discussed previously, the reduction in winter range reported for the Preferred Alternative in the Draft RMPA/EIS was 22.3 percent (very close to the 19.3-percent reduction shown in Table 4-11) but was erroneously described as 33 percent in a summary statement that was meant to refer to the combined area of private and Federal lands.

In comparison to the distance method, the area method yields a lower impact estimate for both the Proposed Plan and the Preferred Alternative (Table 4-11). To ensure that the Proposed Plan/Final EIS does not underestimate impacts to big game winter range, the impact analyses presented in this section use the distance method, based on avoidance zones cited in scientific literature sources recommended by CDOW.

If a reduction in effective habitat were equivalent to direct habitat loss and proportional to a reduction in deer carrying capacity, the data in Table 4-11 would indicate approximately an 18.7 percent decrease in the sustainable deer population of BLM lands in the Planning Area. The assumption of a one-to-one relationship was used in the Draft RMPA/EIS. Sawyer et al. (2004), one of the references favored by CDOW, included the following statement in their study of impacts of oil and gas development on deer in Wyoming:

> "There are several potential concerns with the apparent avoidance of roads and well pads by mule deer. [This] avoidance results in indirect habitat loss that can be substantially greater than the direct habitat loss to road and pad construction. This reduction in winter range size and quality of available habitat may decrease the carrying capacity of the winter range. [However], changes in habitat use or distribution do not necessarily translate into lower survival or reproduction. Assuming some energetic cost associated with the change in distribution or habitat use and that alternate winter range is not available, the potential for negative effects on mule deer survival and reproduction exists. Initial changes…would most likely be evident in the fawn segment because of their high susceptibility to over-winter survival."

If effective habitat loss does not result in a one-to-one reduction in carrying capacity, or if the current population is below the carrying capacity for one or more reasons (see Section 33.2.3), the calculated estimate of an 18.7 percent reduction in winter range would be an overestimate.

In terms of the effectiveness of the TL restriction for big game winter range, the estimate of impacts to deer carrying capacity on BLM lands would be at least twice as great without the TL. This is because the calculations used for Table 4-11 assume that the amount of effective habitat loss on BLM lands due to avoidance of drill rigs, pads, and roads by deer would be reduced by half as a result of shifting operations to private lands in winter. However, when looking beyond the BLM lands, benefits of the TL are potentially less significant than suggested by Table 4-11. Precluding drilling operations on BLM lands during the winter would probably shift a substantial portion of the drilling to privately owned winter range. The proportion of winter range on private lands below the rim is actually greater than that on BLM lands (approximately 63 percent versus 47 percent)(Table 3-13).

While this discussion has focused on impacts to big game winter range, oil and gas activities below the rim would also affect other wildlife using the mostly pinyon/juniper and semi-desert shrub habitats subject to development. The TL stipulation for winter range would benefit species using these habitats during winter but would not benefit species such as carnivores, small mammals, raptors, and songbirds that use the habitats for feeding and breeding in spring and summer. However, these species would likely be less sensitive than deer to oil and gas drilling activities, road construction, and vehicular travel (i.e., would have a narrower impact zone).

A commonly reported zone of reduced use for other species is 100 meters (328 feet) instead of the assumed distances for deer of 250 meters (820 feet) along roads and 500 meters (1,640 feet) around well pads. Using these narrower impact zones would result in proportionately lower impact estimates for the distance method in Table 4-11.

Impacts atop the Plateau

In the higher elevation areas, implementation of the Proposed Plan would result in 63 acres of direct habitat loss over 20 years, compared to 166 acres under the Preferred Alternative. Applying the distance method, and using the assumptions of a 250-meter zone of reduced use by deer and elk along roads and a 500-meter zone around drill rigs, yields the following estimates of loss of summer range: (1) Proposed Plan – 534 acres of total (direct and effective) habitat loss for wells and pads and 1,648 acres for roads; and (2) Preferred Alternative – 606 acres for wells and pads and 2,348 acres for roads. The combined impacts are therefore 2,182 acres for the Proposed Plan, representing 6.3 percent of the area, compared to 2,954 acres for the Preferred Action, representing 8.5 percent of the area.

As with the analysis above for winter range, this loss of available habitat may not translate to an equivalent loss of wildlife populations. Such a direct relationship would be more likely for elk than deer, since summer range and calving habitats may be a limiting factor for elk in the Planning Area.

Similar or larger avoidance zones than the assumed 250 meters could apply to carnivores (e.g., mountain lions, bobcats, black bears) and some raptors (e.g., northern goshawks) due to their furtiveness. However, as discussed for the area below the rim, narrow impact zones around drill rigs, production facilities, and roads would be expected for most species, including some carnivores as well as most small mammals and birds. For these species, using a 100-meter impact zone but assuming total avoidance results in an estimated 1,331 acres of habitat loss associated with the assumed two drill rigs and 16 miles of new or upgraded and actively used access roads. This represents 3.7 percent of the area on top of the plateau. In comparison, the estimated habitat loss for these species under the Preferred Action is 1,913 acres (5.5 percent of the top of the plateau).

Another benefit of phased and clustered development atop the plateau is the restriction of well pads to ridgetops with slopes of 20 percent or less. Ridgetop development preserves a large percentage of the higher quality riparian, mountain shrub, aspen, and spruce/fir habitats along the drainages and sideslopes. The various drainage-oriented NGD/NSO and SSR/CSU restrictions described above provide additional protection for these sensitive habitats.

A third benefit of the phased and clustered development of the Proposed Plan for habitats atop the plateau is the decrease in the amount of habitat fragmentation compared to Alternatives II through V. While staged development under the Federal Unit would specify that only one portion of the plateau could be drilled at any one time, this would not apply under Alternatives I through V. Therefore, the other alternatives could include multiple drill rigs working simultaneously in different parts of the summer range. Besides the multiple drilling areas, this would result in drilling-related vehicle traffic on multiple travel routes.

Finally, the Proposed Plan would have a relatively low level of development throughout the 20-year life of the Plan, resulting in an assumed 210 wells on 13 pads atop the plateau. In contrast, the Preferred Alternative would have had fewer wells (51) but more pads (39), all of which would occur within a period of a few years at the end of the deferral period—i.e., within a span of about 4 years. Thus, deferred development under the Preferred Alternative would delay the onset, but not the magnitude, of disturbance-related impacts on wildlife.

Special Management Designations and Restrictions — Atop the plateau, the Proposed Plan would include the designation of two ACECs along the East Fork Parachute Creek and Trapper/Northwater Creek valleys and a WMA encompassing all of the Parachute Creek tributaries within BLM lands. The ACECs focus on protection of sensitive aquatic and terrestrial species and habitats and the watershed processes that affect them. The WMA includes an emphasis on protection of water quality for human uses but also provides protection of aquatic habitat and watershed processes, including the streams themselves as well as minor tributaries and slopes that contribute runoff to them.

Most of the drainages and lower sideslopes atop the plateau would be designated as NGD/NSO for the protection of riparian/wetland areas and the Colorado River cutthroat trout (Sections 3.3.1 and 3.3.4). The balance of the Parachute Creek WMA and two drainage-based ACECs would be designated as SSR/CSU. Also atop the plateau, streams found to be eligible for possible designation as WSRs would be managed to protect and preserve that eligibility until a determination regarding suitability has been made.

Special management to protect water quality, riparian and wetland vegetation, and watershed processes would benefit a wide variety of wildlife, and not only aquatic species. Throughout the region, areas providing a combination of reliable surface moisture, lush forage, and structural complexity (different strata and types of vegetation) consistently support disproportionately high species density and diversity, including use by "special status" species (Section 4.3.4).

Management emphasis on preserving ecological values in the ACECs, WMA, and WSR areas atop the plateau includes the application of BMPs (Appendix I) and reclamation standards (Appendix J) for areas subject to ground-disturbing activities.

Some of the deeper valleys atop the plateau are also identified as wildlife security (seclusion) areas (Map 19). These areas provide hiding cover for big game and other wildlife and serve as movement corridors. The mapped security areas atop the plateau, totaling 11,404 acres, would be protected with SSR/CSU restrictions to provide tools for minimizing habitat loss and wildlife disturbance. These areas were identified in the 1999 FSEIS but were not given special protection under Alternatives II through V of the Draft (Alternative I did not include oil and gas leasing in this area).

Below the rim, special designations include the Anvil Points and Magpie Gulch ACECs. These two areas would be managed to protect and preserve wildlife resources identified as relevant and important criteria. The Anvil Points ACEC includes the claystone cave that provides roosting and nursery habitat for sensitive bat species. The Magpie Gulch ACEC contains areas of mature (loosely termed "old growth") Douglas-fir forest that supports a variety of species and uses not found elsewhere below the rim or, in some cases, within the Planning Area.

Mapped security areas below the rim are more extensive than those atop the plateau and include a total of 11,481 acres (Map 19). These consist of rugged or broken terrain, dense conifers, and/or dense brush that

provide important hiding cover for big game. In addition to diurnal shelter for species such as deer and elk that may move into more open habitats at night to feed, the security areas also provide places to which furtive species can escape during periods of intensive human activity. The security areas also include all cliff passages that accommodate movement of big game between lower and higher elevations. The Proposed Plan would protect these security areas with NGD/NSO restrictions. Although they were incorporated into the 1999 FSEIS and Alternatives I and II of the Draft RMPA/EIS, the security areas were not given special protection under the Preferred Alternative. However, during the Consultation and Coordination process (Chapter 6) CDOW reiterated the importance of including the security areas in the Proposed Plan. While identified largely on the basis of security for big game, these areas also include some of the most important habitats for other wildlife, including carnivores, birds of prey, small birds, and other wildlife sustained by the rugged and mostly heavily wooded terrain.

Offsite and Cumulative Impacts

As shown by Table 4-3, cumulative impacts in terms of long-term ground-disturbing activities would be less under the Proposed Plan than the five previous alternatives except for No Action (Alternative I). This underscores the significance of phased and clustered oil and gas development atop the plateau and management toward greater clustering below the rim. However, in comparing assumed cumulative impacts to those for Federal lands (Tables 4-2 and 4-3), it is obvious that the offsite impacts (i.e., on private lands within the Planning Area) are proportionately greater than for the Federal lands. This reflects the greater proportion of available surface on private lands, where only areas steeper than 50 percent are assumed to be unavailable (versus other NGD/NSO restrictions on Federal lands). In addition, a higher proportion of private lands within the Planning Area are in lower elevation habitats (i.e., big game winter range).

Based on assumptions used in the RFD (Appendix H), approximately 3,691 wells would be developed on Federal and private lands in 20 years, using comparable development rates in proportion to the acres available for drilling operations (Table 4-3). This estimate includes the assumed 1,570 wells on Federal lands. Because more of the private lands are located below the rim than are Federal lands—64 percent versus 53 percent—the relative impacts on winter range of development on private lands would be greater. This is compounded by the lack of a seasonal restriction (TL stipulation) for oil and gas drilling and associated activities on private lands and an assumed lesser emphasis on clustering than to be encouraged by BLM on Federal lands.

Comparing the cumulative impact of long-term ground-disturbing activities on winter range below the rim (2,447 acres) to the data presented in Table 3-13 indicates that this direct loss would represent less than 4 percent of the total of 68,225 acres of total winter range in the Planning Area (34,668 acres BLM and 33,557 private). If the same ratio of effective habitat loss to direct habitat loss were to apply to the total area as on BLM lands (approximately 8:1), this would yield a total loss (effective-plus-direct) of approximately 22,000 acres, representing 32 percent of the winter range in the Planning Area, 11 percent of the winter range in GMU 32, and 3 percent of the winter range in DAU 41 (GMU 31 + 32). These losses would be cumulative to the losses resulting from oil and gas development in lands outside the Planning Area. For example, COGCC data indicate a total of 2,265 wells in GMU 32 as of late 2005, of which only 780 were in the Planning Area. Thus, the winter range in GMU 32 has already been subject to loss of winter range and would probably continue to be subject to such losses at levels comparable to, or greater than, those on BLM lands in the Planning Area.

Summary of Impacts to Fish and Wildlife

The requirement of phased and clustered development across the top of the plateau would substantially limit impacts compared to any of the five alternatives analyzed in the Draft RMPA/EIS (except for Alternative I, No Action, which did not include leasing of that area).

The sensitive and important stream corridors atop the plateau would be protected by NGD/NSO restrictions, with SSR/CSU restrictions on adjacent sideslopes and the headwaters of smaller streams. These streams would also be managed to protect current WSR eligibility. Lesser streams below the rim would have an NGD/NSO stipulation for riparian and wetland areas. The NGD/NSO for high-value fish habitat under this alternative (Section 4.3.4) would also benefit other wildlife. Similar NGD/NSO protection would also apply to the bat habitat of the Anvil Points claystone cave and, along with TLs, to raptor and waterbird nesting areas. Most of the old-growth Douglas-fir remnant communities would also be protected by an NGD/NSO associated with wildlife security areas in the Magpie Gulch ACEC, preserving unfragmented habitat for forest-interior small birds.

Another important component of the Proposed Plan is the application of NGD/NSO restrictions to the 11,481 acres of wildlife security areas below the rim and SSR/CSU restrictions to 11,404 acres atop the plateau. These areas are important as hiding cover for big game, contain the six passages through the Roan Cliffs barrier, and provided rugged, wooded terrain that benefits a variety of other wildlife.

The 5-month winter TL for construction activities in the winter range would minimize disturbance-related impacts to use of this crucial habitat by deer and elk. However, some impacts would result from ongoing operations and maintenance activities during the 5-month season (e.g., vehicular traffic and some monitoring and repairs), as well as from the gradual accumulation of habitat loss associated with construction of pads and of new or upgraded roads. Probably the greatest impact under this alternative would be related to loss or fragmentation of portions of big game winter range, despite the TL restrictions. However, this impact would be less than for the Preferred Alternative due to a management goal of greater clustering of well pads on Federal lands below the rim.

Compared to current management (Alternative I), the restriction of motorized and mechanized travel to designated routes (except in the Hubbard Mesa OHV Riding Area) would reduce the potential for disturbance-related impacts to wildlife, as would the closure of 28 miles of roads and the restriction to administrative use of an additional 68 miles of existing routes. These actions would reduce the impacts associated with new roads for oil and gas access.

Additional benefits to wildlife under the Proposed Plan, compared to Alternatives I and Alternative II, is the more intensive and comprehensive vegetation management, including weed control, and the implementation of active as well as administrative measures for range improvement.

Notwithstanding the special designations, resource management actions, and other wildlife-related measures described above, oil and gas development on Federal lands within the Planning Area would result in direct loss of approximately 75 acres of habitat above the rim and 737 acres below the rim in 20 years. Including effective habitat loss due to reduced wildlife use in areas of human activity would increase these losses to approximately 2,182 acres and 6,469 acres above and below the rim, respectively, using the distance method (see discussion in Section 4.3.2.1). These numbers represent approximately 6.3 percent and 18.7 percent of the upper and lower areas of BLM lands (Table 4-11), respectively, and approximately 9.1 percent of all BLM lands in the Planning Area.

Table 4-12 summarizes direct and indirect impacts to major groups of terrestrial and aquatic wildlife under the Proposed Plan. Overall, the Proposed Plan would have minor adverse impacts on wildlife. More severe (moderate) temporary impacts would occur in areas of active road, pad, or well construction—particularly the operation of drill rigs—as well as other ground-disturbing activities. For impacts to special status species, see Section 4.3.4.

Table 4-13 compares the impacts of the Proposed Plan to those for the alternatives analyzed in the Draft RMPA/EIS. Due to the major improvement on Federal lands atop the plateau and, to a lesser extent, below the rim as a result of the phased and clustered development, impacts to wildlife under the Proposed Plan would be similar to or less than Alternatives I through V, including the most environmentally protective alternative (Alternative II)(Table 4-2 and 4-3).

Table 4-12. Summary of Impacts of Proposed Plan to Terrestrial and Aquatic Wildlife [1, 2]

Taxonomic or Trophic Group	*Vegetation and Range Management*	*Recreation and Travel Management*	*Oil and Gas Development*	*Special Management Designations*
Large Carnivores, Deer/Elk Summer Range	Minor (+)	Moderate (+)	Minor (-)	Moderate (+)
Big Game Winter Range	Minor to Moderate (+)	Minor (+)	Moderate (-)	Minor (+)
Medium-size Predators and Small Mammals	Minor (+)	Moderate (+)	Minor (-)	Moderate (+)
Raptors	Negligible (+)	Moderate (+)	Minor (-)	Moderate (+)
Waterbirds	Negligible (+)	Minor (+)	Negligible (-)	Minor (+)
Small Birds	Minor (+)	Moderate (+)	Minor (-)	Moderate (+)
Reptiles and Amphibians	Negligible to Minor (+)	Moderate (+)	Minor (-)	Moderate (+)
Aquatic Species	Moderate (+)	Moderate (+)	Minor (-)	Moderate to localized Major (+)

[1] *Overall impact level after combining adverse (-) and beneficial (+) effects of land uses and management actions and after incorporating BMPs described in text and Appendix I.*

[2] *Does not include special status (threatened, endangered, proposed, candidate, or sensitive) species; see Section 4.3.4 and Table 4-15.*

Table 4-13. Overall Summary of Impacts to Fish and Wildlife [1, 2]

Taxonomic or Trophic Group	*Alt. I No Action*	*Alt. II*	*Alt. III Preferred*	*Alt. IV*	*Alt. V*	*Proposed Plan*
Large Carnivores, Deer/Elk Summer Range	Negligible to Minor (-)	Negligible to Minor (-)	Negligible to Moderate (-)	Moderate (-)	Moderate to Major (-)	Negligible to Minor (-)
Big Game Winter Range	Minor to Moderate (-)	Minor to Moderate (-)	Moderate (-)	Moderate to Major (-)	Major (-)	Moderate (-)
Medium-sized Predators and Small Mammals	Negligible to Minor (-)	Negligible to Minor (-)	Minor to Moderate (-)	Minor to Moderate (-)	Moderate (-)	Negligible to Moderate (-)
Raptors	Negligible to Minor (-)	Minor (-)	Moderate (-)	Moderate (-)	Moderate to Major (-)	Minor to Moderate (-)
Waterbirds	Negligible (-)	Negligible (-)	Negligible (-)	Negligible (-)	Minor (-)	Negligible (-)
Small Birds	Negligible to Minor (-)	Minor (-)	Minor to Moderate (-)	Moderate (-)	Moderate to Major (-)	Minor (-)
Reptiles and Amphibians	Negligible to Minor (-)	Minor (-)	Minor (-)	Minor (-)	Moderate (-)	Minor (-)
Aquatic Species	Negligible to Minor (-)	Minor (-)	Minor to Moderate (-)	Minor to Moderate (-)	Moderate (-)	Minor (-)

[1] *Overall impact level after combining adverse (-) and beneficial (+) effects of land uses and management actions and after incorporating BMPs described in text and Appendix I.*

[2] *Does not include special status species; see Section 4.3.4 and Table 4-15.*

Note in Table 4-13 that that the overall impact levels for big game summer range under Alternatives IV and V and for winter range under Alternatives I, II, and IV have been raised compared to the Draft

RMPA/EIS table. This reflects the greater estimate of effective habitat loss using the distance method than with the area method of the Draft. The same type of adjustment was not necessary for other habitats, species, or seasons that are less susceptible to disturbance or are dispersed more widely throughout the Planning Area (and thus less vulnerable to localized impacts).

In considering the impact levels for big game winter range, it should be remembered that deer and elk are the focus of hunting throughout the region. In this regard, they and other game species are fundamentally different from the special status species discussed in Section 4.3.4. Much of the concern regarding game species involves the maintenance of populations that can support the desired level of consumptive recreational use, with its associated local economic benefits, whereas the primary concern for special status species is the potential for local or regional extirpation. However, very large reductions in deer, elk, or other game species—besides affecting hunting—would also adversely affect the quality of the recreational experience for visitors who enjoy observing wildlife as the purpose for, or a desirable outcome of, their outdoor activity.

Some of the impacts to wildlife described above, including reductions in big game winter range and carrying capacity, could represent an irreversible and irretrievable commitment of natural resources (Section 4.6).

4.3.3 Special Status Plants and Significant Plant Communities

4.3.3.1 Introduction

The special status plant species and significant plant communities addressed in this section are defined and listed in Section 3.3.3. A number of management actions proposed for incorporation into the RMPA have the potential to impact these species and communities. These fall into two categories. The first is management actions directed specifically at these resources. The second is all other proposed management actions that may affect these resources including special management designations and restrictions, vegetation, grazing and rangeland, public travel/access and recreation management, and oil and gas development.

For the purposes of this analysis, direct impacts to these plant resources include the physical disruption or removal of rooted vegetation or disruption of habitat in the immediate vicinity of rooted plants; disruption to a plant community that results in the reduction of total numbers of plant species (species richness) within an area; and/or reduction or loss of total area, diversity, structure, and/or function of a community.

Potential indirect impacts include disruption or reduction of pollinator populations; disruption of hydrological processes (particularly in relation to wetlands and riparian habitat); loss of habitat suitable for colonization due to surface disturbance; introduction of noxious weeds by various vectors or conditions that enhance the spread of weeds; and general loss of habitat due to surface occupancy, surface compaction, or trampling. Upgradient physical disruption can result in sedimentation into occupied habitat and/or potential habitat. Failed reclamation or mitigation may also cause indirect impacts to these resources. Most indirect impacts are assumed to result from direct impacts in proportion to the relative amount of surface disturbance that occurs.

For the impact analysis of oil and gas development, the following measures are assumed:

- BLM would determine whether potential habitat for these resources occurs in a lease area during pre-drill review.
- All potential habitat for a specific species or community would be surveyed during the appropriate season, prior to disturbance.

- If a resource is found in areas with SSR/CSU restrictions, the proposed disturbance would be moved up to 400 meters from the outer resource perimeter, as well as its local habitat, to prevent direct negative impacts.
- In areas of standard lease terms, the proposed disturbance would be moved up to 200 meters to avoid these impacts.
- If potential disturbance sites are moved to avoid direct impacts to sensitive plant resources and their habitat but are still in their vicinity, a fence would be constructed around the resource and its local habitat to protect it from inadvertent trampling or other disturbance and to alert people to the presence of the plant resource, unless it is determined that this would create additional unacceptable impacts.

This protocol is also assumed for the analysis of other activities that result in localized ground disturbance. It is also assumed that any additional special status plant species or new locations of known species found on the Planning Area subsequent to the implementation of the RMPA would be entered into the BLM location database and managed in the same way described for currently known locations.

Standardized definitions were used to categorize impacts of specific management actions on special status plant species and significant plant communities. Categories are based upon the potential physical impacts to this resource in terms of the special status species policy (BLM 2001b) and Colorado Land Health Standard #4: these species and their habitats are maintained or enhanced by sustaining healthy, native plant communities. As an indicator, stable and increasing populations of endemic and protected species must occur in suitable habitat and suitable habitat must be available for recovery of endemic and protected species.

The following categories were used to define levels of adverse impacts to special status plants and significant plant communities:

- **None –** No physical disruption of the resource. Effects are unlikely to be detectable. No impairment of the resource value in terms of Land Health Standards.
- **Negligible –** Physical disruption to less than 5 percent of the resource. Effects may be detectable but of short duration (would last no more than one growing season) and not of concern to the general public. Unlikely to impair the resource value in terms of Land Health Standards.
- **Minor –** Physical disruption to less than 5 percent of the resource. Effects would be detectable but temporary (would last no more than 2 years) and unlikely to be of concern to the general public. Likely to cause some impairment of the resource value in terms of Land Health Standards.
- **Moderate –** Physical disruption to 6 to 15 percent of the resource. Effects would be readily visible and maybe of concern to the general public. Effects may increase over time or be long-term to permanent. May cause substantial impairment of the resource value in terms of Land Health Standards.
- **Major –** Physical disruption to more than 15 percent of the resource. Effects would be highly visible and of concern to the general public. Effects likely to increase over time and be long-term or permanent. Likely to cause substantial impairment of the resource value in terms of Land Health Standards.

Note that the same terms are applied in a more relative sense to describe beneficial impacts.

4.3.3.2 Impacts of Proposed Plan

BLM Manual 6840 (IM No. 97-118)(BLM 2001b) directs that the "conservation of special status species means the use of all methods and procedures which are necessary to improve the condition of special status species and their habitats to a point where their special status recognition is no longer warranted." Under the Proposed Plan, the general management goal for these resources is to ensure that no actions

contribute to the need to add candidate or sensitive species to the Federal list of threatened or endangered species. Toward this end, specific management of special status plants and significant plant communities focuses on protection of occupied habitat through special management designations and restrictions. These resources would also be impacted by general vegetation, grazing and rangeland, travel and recreation management as well as oil and gas development.

Potential beneficial and adverse impacts to special status plant species and significant plant communities are summarized in Table 4-14, and discussed by alternative and management action below.

Table 4-14. Summary of Impacts to Special Status Plants and Significant Plant Communities [1]

Land Use or Management Action	*Alt I No Action*	*Alt. II*	*Alt. III Preferred*	*Alt. IV*	*Alt. V*	*Proposed Plan*
Resource-specific Surface Management Restrictions	Minor (+)	Minor to Moderate (+)	Minor (+)	Minor (+)	Minor (+)	Minor (+)
Management of Proposed ACECs	NA	Minor to Moderate (+)	Minor (+)	Minor (+)	NA	Minor (+)
Parachute Creek Watershed Management Area	NA	Minor to Moderate (+)	Minor to Moderate (+)	Minor (+)	NA	Minor to Moderate (+)
Management of WSR-eligible Streams	NA	Minor to Moderate (+)	Minor to Moderate (+)	Minor to Moderate (+)	NA	Minor to Moderate (+)
Management for Wilderness Values	NA	Minor to Moderate (+)	Minor (+)	NA	NA	NA
Vegetation Management	Minor to Moderate (-)	Minor to Moderate (+)	Minor to Moderate (-)	Minor to Moderate (-)	Minor to Moderate (-)	Minor to Moderate (+)
Grazing and Rangeland Management	Localized Moderate to Major (-)	Moderate (+)	Minor to Moderate (+)	Minor to Moderate (+)	Minor to Moderate (-)	Minor to Moderate (+)
Travel and Recreation Management [2]	Localized Moderate to Major (-)	Minor to Moderate (+)	Minor to Moderate (+)	Minor to Moderate (+)	Minor (-)	Minor to Moderate (+)
Oil and Gas Development [3]	Localized Minor (-)	Negligible to Minor (-)	Localized Minor (-)	Localized Minor (-)	Minor to Moderate (-)	Negligible to Minor (-)

[1] Overall impact level after combining adverse (-) and beneficial (+) effects of land uses and management actions and after incorporating BMPs described in text and Appendix I.

[2] Minor to Moderate (-) for Great Basin grassland under Alternative I.

[3] Oil and gas impacts for Alternative I almost entirely below cliffs due to no-lease of NOSR 1.

Direct and Indirect Onsite Impacts

The Proposed Plan comprises a number of protective surface-use restrictions specific to special status plants and significant plant communities. These restrictions are listed in Table 2-1 and detailed in Table C-1. These include an NGD/NSO for known occupied habitat of the two candidate species, DeBeque phacelia and Parachute penstemon. This is in contrast to the Preferred Alternative which includes similar restrictions for all special status plants and significant plant communities. Therefore, most of these species and communities and their habitat would be at greater risk of direct negative impacts of surface disturbance under the Proposed Plan should NGD/NSO and SSR/CSU restrictions for other resources be in conflict with relocation of activities for special status plants and significant plant communities.

A large area of SSR/CSU restrictions for other special status plants and significant plant communities would apply in areas below the rim. A separate SSR/CSU would apply to protect the habitat for hanging garden special status species along the East Fork Parachute Creek and Trapper/Northwater Creek watersheds above the rim (Map 22). Four populations of Utah fescue atop the plateau occur outside any special restriction areas for special status plants and so would not be protected from potential ground-disturbing activities.

These and other surface-use restrictions that are specific to other resources (e.g. riparian/wetland areas, wildlife security areas, etc.) could also result in indirect benefits to many of the special status species as they result in future physical conditions in these areas determined largely by natural processes. This is especially pertinent to management of the several sensitive plants that are early succession species. These require ongoing natural disturbances for maintenance of potential habitat. The overall impact of these restrictions would result in minor positive impacts to these resources.

Special management areas under the Proposed Plan include four ACECs, the Parachute Creek WMA, and WSR-eligible stream corridors. Sensitive plant species within the four ACECs that would be designated under the Proposed Plan are considered relevant and important values and as such would be the focus of some special management prescriptions, resulting in potential minor positive impacts (Table 2-2). Likewise, management actions that support goals and objectives for the proposed WMA include specific prescriptions for protection of these resources that would result in minor to moderate positive impacts to these resources. Prohibitions on long-term ground-disturbing activities within WSR-eligible stream corridors would indirectly provide minor to moderate potential positive impacts in terms additional protection to these resources, their habitat, and supporting ecological processes.

Vegetation resources would be managed for their intrinsic ecological value under the Proposed Plan, guided by specific objectives for the major natural plant communities in the Planning Area. Accomplishing these objectives would be supported by the establishment of reference sites to provide a context for long-term monitoring and management decisions regarding vegetation treatments, attainment of reclamation success criteria, and siting and mitigation requirements for project approvals and permits.

The Proposed Plan incorporates the Alternative II emphasis on noxious weed inventory, detection, and monitoring. These management actions would allow for a far more focused and effective application of the current weed management program by providing data and information upon which to base a number of important decisions such as: incipient population locations, priority-to-control strategies, and the efficacy of different integrated methods for particular species and locations. These actions would indirectly provide minor to moderate positive impacts to special status plant species and significant plant communities as general vegetation habitat quality is expected to exhibit a general improving trend.

Livestock grazing would be managed to conform to BLM grazing regulations and meet Land Health Standards as well as vegetation community objectives. Allotment management plans, to be developed and reviewed in collaboration with grazing permittees on a regular schedule, would provide a basis for monitoring of rangeland health and making grazing management decisions. A combination of administrative solutions, range improvement projects, and application of reclamation guidelines and

BMPs would be applied to meet resource objectives and standards. These actions would indirectly provide minor to moderate positive impacts to special status plant species and significant plant communities as general vegetation habitat quality is expected to exhibit a general improving trend.

Management under the Proposed Plan would limit OHV use by restricting motorized and mechanized travel to designated routes, except for the Hubbard Mesa OHV Riding Area and over-snow travel by snowmobiles in areas with at least 12 inches of snow cover. This would reduce the expansion of travel routes throughout the Planning Area that have the potential to introduce physical disturbance and noxious weeds in the vicinity of special status plant species and significant plant communities. Combined with the closure and revegetation of existing routes such as the Anvil Points Mine Road and those that currently bisect significant plant communities, these proposed management actions would result in minor to moderate positive impacts to special status plant species and significant plant communities.

All restrictions specific to the protection of special status plant species and significant plant communities are applicable to oil and gas development activities and structures in the form of stipulations. In addition, a number of BMPs discussed above are assumed for potential impacts to these resources from oil and gas development activities.

Under the Proposed Plan, oil and gas development is assumed to result in negligible to minor negative impacts to special status plant species and significant plant communities. This conclusion is based on the protective stipulations, other restrictions on surface use, and the BMPs described above.

Offsite and Cumulative Impacts

Of some special concern under the Proposed Plan is the population of Parachute penstemon near the Anvil Points Mine. This population is located near the interface of BLM and private lands in the south-central part of the Planning Area. A number of individual plants grow near the Anvil Points Mine portals and along roadcut slopes. For the purpose of this analysis, it is assumed that the specific NGD/NSO restriction for this species would be applied rigorously to prevent negative impacts from any ground-disturbing actions, including possible remediation of this site. However, additional mitigation measures such as boundary fences and signage may be required to protect this unique and rare resource from negative offsite impacts.

A positive impact to offsite areas could occur should any of the existing populations of special status plant species expand, or new populations be recruited, as a result of management actions that protect the populations themselves as well as habitat and supporting ecological processes. Larger or new populations could serve as larger sources for propagating these species into new offsite areas. In addition, information collected from monitoring these species may be useful in managing them on other sites.

The CNHP reports that some sensitive plants are being heavily impacted by road construction and both residential and commercial development accompanying rapid human population growth and recreational use throughout the region (CNHP 2001). Threatened or endangered plant species that occur on private lands are not specifically protected under the ESA. Likewise, the State of Colorado provides no legal protection for any plant species other than the State flower, the blue columbine. Neither special status plant species nor significant plant communities are necessarily inventoried on private lands. Therefore, monitoring and protection of these species occurs on a voluntary basis on private lands. If negative impacts to these resources continue to increase as expected, the occurrences on public lands become even more important to their survival and continuation.

Any potential negative impacts to significant riparian communities would be cumulative to some past and some ongoing degradation of surrounding riparian areas due to livestock grazing, unregulated stream crossings, noxious weed proliferation, and current drought effects (Section 3.3.1). Localized negative impacts would result from oil and gas development. A number of positive impacts to special status plant species and significant plant communities would be anticipated to occur under the Proposed Plan. These would result from the special management for these resources, as well as positive impacts as a result of

travel and rangeland management actions. These positive impacts would be offset by widespread minor to moderate negative impacts that may result from noxious weed management actions.

Cumulative to these impacts would be an inevitable reduction of potential habitat and ecological processes due to a large portion of these areas being under SSR/CSU restrictions that would protect actual occurrences and occupied habitat, but not necessarily prevent all indirect impacts. Cumulative impacts would therefore include widespread positive impacts to sensitive plants and significant plant communities combined with some general negative impacts from increasing noxious weed infestations and localized minor to moderate impacts from ground-disturbing activities.

4.3.4 Special Status Fish and Wildlife

4.3.4.1 Introduction

Special status fish and wildlife species discussed in this section are defined and discussed in Section 3.3.4 and listed in Table 3-16. A number of management actions already established for currently leased areas are proposed for the Planning Area, as a whole, under some of the alternatives analyzed in this RMPA/EIS. These include actions focused on different resources (e.g., vegetation, visual resources, or recreational travel) but that could affect fish and wildlife either positively or negatively. The alternatives represent different combinations of management actions and land uses, with differing types and levels of impacts.

Under all alternatives, the general management goal is to ensure against actions that would jeopardize the continued existence or recovery of currently listed, proposed, or candidate threatened or endangered species or contribute to the need to list additional species as threatened or endangered. Further management objectives specific to the Proposed Plan, with selected reference to one or more of the five alternatives analyzed in the Draft RMPA/EIS, are described below.

Potential impacts to special status fish and wildlife fall into one or a combination of the categories described in Section 4.3.2 and include habitat loss or modification, habitat fragmentation, disturbance, interference with movement patterns, and direct mortality. These impacts can reduce numbers of one or more species, potentially to the point of local extirpation; disrupt community composition and function through changes in the distribution, relative abundance, and habitat use of various species (e.g., reduced prey abundance affects predator abundance); and make populations and communities hypersensitive to other perturbations. For example, increased habitat fragmentation can make forest-interior species more vulnerable to disturbance by reducing patch size, increasing the amount of edge, and increasing accessibility to predators or (in the case of songbirds) nest parasitism by brown-headed cowbirds.

As described in Section 4.3.2 for non-special-status wildlife, impacts associated with changes in management, human use, and resource development can have direct and indirect impacts on these species. For wide-ranging or migratory species, onsite impacts can also affect community composition and function in offsite areas, and project impacts can combine with non-project impacts to cause cumulative impacts.

For the impact analysis of oil and gas development, it is assumed that BLM would evaluate whether habitat for special status species is present in a specific area during the review of an APD. If the area is covered by a SSR/CSU restriction, BLM may cause the proposed activity to be shifted by more than 200 meters to avoid or minimize the impact.

As pertains to special status fish and wildlife, the analysis of the Proposed Plan uses the following general terms to describe impact levels:

- **None** – Changes in species occurrence, distribution, or abundance are not expected.

- **Negligible** – Changes in distribution or abundance of some species may occur, but at levels that may not be discernible or demonstrable except at specific impact sites.
- **Minor** – Changes in distribution or abundance of some species would be discernible and demonstrable at a localized level, but current types and patterns of use and species occurrence would continue.
- **Moderate** – Changes in distribution or abundance would be readily discernible and demonstrable, and some species may occur in markedly lower numbers or be extirpated from localized parts of the Planning Area.
- **Major** – Similar to moderate, except that several species may occur in markedly lower numbers, and some species are likely to be exterminated from large portions of the Planning Area

Note that the same terms are applied in a more relative sense to describe beneficial impacts.

While these impact categories are applied in all special status species in this RMPA/EIS, some of the species are also being addressed in a biological assessment (BA) being prepared separately by BLM for submittal to USFWS pursuant to Section 7 of the ESA. The BA will address Federally listed, proposed, or candidate threatened or endangered species, state-listed threatened or endangered species, state-listed species of special concern, and selected additional special status species. For each species addressed, the BA will determine whether implementation of the Proposed Plan would be likely to adversely affect, not likely to adversely affect, or likely to benefit the species. For all species with a "likely to adversely affect" determination, USFWS will issue a biological opinion (BO) determining whether the Proposed Plan would jeopardize the maintenance or recovery of the species. In such a case, BLM would develop, in consultation with USFWS and CDOW, additional conservation measures to avoid jeopardy.

The following analysis considers both short-term and long-term impacts to special status fish and wildlife resources. For the purpose of this analysis, short-term or temporary impacts are those most often associated with a period of initial habitat loss or modification and intensive human activity. In the context of future management and development scenarios for the Planning Area, short-term impacts are mostly associated with oil and gas development, during which activity at a specific well may last for several weeks or months but then is reduced in severity as that part of the field enters the production phase. This already occurs to some extent in currently leased BLM lands and nearby private areas. Short-term impacts also currently occur during the hunting season, during which time the number of visitors atop the plateau is much higher than in the remaining seasons, and the activity is coupled with noise, harassment, and pursuit, injury, or mortality of wildlife.

Long-term impacts are those that last more than 2 years, and most of these would extend throughout or potentially beyond the period of the management action or development activity. Examples include impacts associated with the continued presence of elevated levels of human activity throughout the life of the oil and gas field (40 years or longer) and the protracted period needed for final reclamation of disturbed areas. Permanent impacts are those with a likely duration of more than 50 years.

4.3.4.2 Impacts of Proposed Plan

The 1984 GSRA RMP had no specific objective for managing special status species but identified monitoring, maintaining, or improving habitat for threatened or endangered species as a priority for implementation. For the production area of NOSR 3 below the rim, the 1999 FSEIS and ROD established a number of stipulations to reduce or avoid potential impacts from the oil and gas development on special status species and their habitats. The Proposed Plan would also apply these existing stipulations and extend them to activities in addition to oil and gas development. The existing stipulations to be applied under the Proposed Plan include:

- NGD/NSO for Colorado River corridor would prohibit long-term ground-disturbing activities within a 0.5-mile buffer on either side of the Colorado River.
- NGD/NSO and TL for raptor nest sites would prohibit long-term ground-disturbing activities within a 0.125-mile buffer around raptor nests year-round and establish a 0.25-mile buffer from February 1 through April 15.
- NGD/NSO and TLs for bald eagle nesting and winter roosting sites would prohibit long-term ground-disturbing activities within a 0.25-mile buffer around a nest or roost site year-round, a 0.5-mile buffer around nest sites from December 15 to June 15, and a 0.5-mile buffer around roost sites from November 15 to April 15.
- SSR/CSU and TL for the peregrine falcon cliff-nesting complex would require special design and/or relocation of projects by more than 200 meters to protect the complex and surrounding 0.25-mile buffer year-round and prohibit ground-disturbing activities or other major disturbance within a 0.5-mile buffer around the cliff-nesting complex from March 15 to July 31.
- NGD/NSO for threatened or endangered species would prohibit ground-disturbing activities within occupied habitat or any other habitat required for the maintenance or recovery of the specific species.
- NGD/NSO for the Anvil Points Cave would prohibit long-term ground-disturbing activities in the area encompassing the cave opening, subsurface features, and watersheds overlying the cave.
- TL for waterfowl and shorebird nesting would prohibit long-term ground-disturbing activities within a 0.25-mile buffer around the nesting and brood-rearing habitat of Fravert Reservoir.
- SSR/CSU for BLM sensitive species would require special design and/or relocation of projects by more than 200 meters may be required to protect the resource.

The Proposed Plan would also include two new restrictions specific to fish and wildlife and relevant to special status species:

- NGD/NSO for high-value habitat for special status fish species would minimize direct loss or degradation of habitat for the Colorado River cutthroat trout by prohibiting long-term ground-disturbing activities along occupied or other high-quality stream reaches.
- SSR/CSU for the Parachute Creek WMA would minimize indirect loss or degradation of Colorado River cutthroat trout habitat by requiring that proposed ground-disturbing activities be relocated by more than 200 meters if necessary to protect areas identified as having a high value for watershed processes (i.e., upslope or upstream from areas of high-value trout habitat).

In addition, some protective stipulations not aimed specifically at special status fish and wildlife would also benefit them. These include an NGD/NSO and SSR/CSU for riparian and wetland zones, an NGD/NSO and a SSR/CSU for wildlife security areas, an NGD/NSO for areas with slopes steeper than 50 percent, an SSR/CSU for the Parachute Creek WMA, and a TL for big game winter range during the 5-month period December through April.

While these restrictions are specific to the GSRA portion of the Planning Area, the 1997 WRRA RMP lists additional stipulations for special status species that apply within the small part of the Planning Area in Rio Blanco County.

Importantly for sensitive species associated with habitats atop the plateau, the staged development component of the Proposed Plan would also be a major benefit. Specifically, as described in Chapter 2 and the introduction to Chapter 4, this would limit oil and gas development to only one of six phased development areas at a time (Figure 2-1). Assuming relatively uniform sizes of these areas, no more than one-fifth (20 percent) of the upper area would be subject to development during any given year. Furthermore, with an assumed average of two drill rigs operating at the higher elevations, the portion

actually subject to disturbance at any one time would be much smaller. Finally, the requirement that development cannot result in more than 350 acres of active (unreclaimed) disturbance at any one time further reduces both the direct and effective habitat loss in the ecologically sensitive upper plateau.

Another important component of the Proposed Plan (compared to Alternative I, No Action) is that travel management would prohibit motorized or mechanized cross-country travel, except for over-snow travel by snowmobile with a minimum of 12 inches of snow cover and OHV travel in the Hubbard Mesa area. Permanently closing and rehabilitating 28 miles of existing routes and limiting 68 miles of existing routes to administrative travel would also benefit special status wildlife.

Direct and Indirect Onsite Impacts

A total of 210 wells on 13 pads above the rim and 1,360 wells on 180 pads are assumed under the Proposed Plan (Table 4-2). Direct habitat loss from long-term ground-disturbing activities during the 20-year period of analysis is estimated to be 75 acres and 737 acres in the upper and lower areas, respectively. Using the distance method to estimate reduced wildlife use near areas of oil and gas activity (discussed in Section 4.3.2.2) yields effective habitat losses of 2,182 acres (6.3 percent) of the area atop the plateau and 6,469 acres (18.7 percent) of the area below the rim (see Table 4-11). However, this estimate should be applied only to furtive species such as the lynx, which is not known to occur onsite. For most species, the area method described in Section 4.3.2.2 (and used in the Draft RMPA/EIS) probably provides a more realistic estimate. This method, which differs by not assuming such large zones of reduced use along roads and around drill pads, yields effective habitat losses of 316 acres (0.9 percent) and 2,947 acres (7.6 percent) for the upper and lower portions of the Planning Area, respectively. Regardless of which method is used, the emphasis on clustered development under the Proposed Plan—with a minimum of 2,640 feet between pads (one pad per 160 acres) atop the plateau and a management goal of one pad per 80 acres below the rim—would reduce habitat losses compared to the previous other alternatives, including No Action (see Table 4-2).

While the NGD/NSO and SSR/CSU restrictions on the mapped wildlife security areas would be established primarily for big game, the restrictions would also benefit special status species associated with these areas of steep, rugged, and/or heavily wooded terrain. The security areas include some of the best developed pinyon/juniper, Douglas-fir, and spruce/fir habitats in the Planning Area. These restrictions would help preserve the seclusion provided by this terrain and prevent or minimize any fragmentation of the relatively contiguous habitats.

Benefits to special status fish and wildlife under the Proposed Plan would also result from the restriction of motorized or mechanized travel to designated routes (except over-snow travel by snowmobiles and cross-country travel by OHVs in the Hubbard Mesa Area) and from the closure and restoration of 26 miles of existing routes atop the plateau. Limiting an additional 68 miles of existing routes to administrative travel would also help offset the increased traffic associated with oil and gas activity.

Finally, the more active management of vegetation and range resources under the Proposed Plan than under Alternatives I or II is expected to more effectively control weed infestations, hasten recovery of degraded rangeland areas, and provide more intensive monitoring of reclamation success. Riparian areas and river corridors are a focus of vegetation protection and management under this alternative and will be managed to achieve a minimum condition rating of PFC and late-seral stage plant community development. This includes a specific objective for maintaining proper hydrologic function in areas along and adjacent to streams. Due to these protections and specific management actions, it is expected that many riparian reaches would return to PFC and late-seral stage community development over time, resulting in positive impacts to riparian habitats, riparian wildlife communities, and aquatic species.

Potential impacts to special status species under the Proposed Plan are described below. These descriptions exclude species not expected to occur in the Planning Area and vicinity. See Section 3.3.4

(Table 3-16) for a listing and synopsis of the habitat requirements and range limitations of special status fish and wildlife in the Planning Area and vicinity.

Federally Listed or Candidate Threatened or Endangered Species

Colorado River Fishes — USFWS has designated critical habitat for two endangered big-river fishes—the razorback sucker and Colorado pikeminnow—as including the Colorado River and 100-year floodplain along the southern boundary of the Planning Area as far upstream as the town of Rifle. In addition, critical habitat for two other endangered fishes, the bonytail and humpback chubs, has been designated for the Black Rocks area near the Colorado-Utah border approximately 80 miles downstream from the Planning Area. Factors affecting the decline of these species include lower water temperatures and altered flow regimes associated with reservoirs, depletion in flows due to diversion for agricultural and other consumptive uses, evaporative losses from reservoir surfaces, and predation on eggs and larvae by introduced non-native game (predatory) fishes.

Impacts from Decreases in Water Quantity

The primary impact under the Proposed Plan is the depletion of water in the Colorado River Basin. Adequate flows are necessary to provide for the various life-stage requirements of these native fishes. Most important are the spawning and backwater habitats identified in and downstream of the "15 Mile Reach" located in Grand Junction, Colorado. This segment of river is important for spawning and the rearing and development of young. Adequate flows are needed to maintain the integrity of these important habitats during critical periods. Reduced water flows can reduce spawning habitat use, dewater backwaters, and result in lowered productivity and recruitment.

In May 1994, BLM prepared a Programmatic Biological Assessment (PBA) that addressed water-depleting activities in the Colorado River Basin. In response to the PBA, the USFWS issued a BO on June 13, 1994 (USFWS 1994), which determined that water depletions from the Colorado River Basin would jeopardize the continued existence of the Colorado pikeminnow, humpback chub, bonytail, and razorback sucker and result in the destruction or adverse modification of their critical habitat. The BO included reasonable and prudent alternatives developed by USFWS to allow BLM to authorize projects with resultant water depletions of less than 125 acre-feet. Projects or actions resulting in depletions of greater than 125 acre-feet per year fall outside the PBA and require individual consultation with USFWS.

The PBA and BO were written to remain in effect until a total depletion threshold of 2,900 acre-feet per year is reached. An amendment to that BO in 2000 (USFWS 2000) stated that the threshold would be 3,000 acre-feet per year. BLM has estimated future depletions from oil and gas drilling activities on BLM lands under the Proposed Plan at 43 acre-feet per year (see Section 4.2.4). This is well below the remaining allowable amount under the amended BO. Put in perspective, this depletion is equivalent to an average of 0.06 cfs, or less than 0.002 percent of the average flow in the Colorado River near the Planning Area.

Additional depletions could result from use of Colorado River Basin waters in dust suppression of roadways used for oil and gas access. Because dust suppression would be required only on roadways actively used for oil and gas access, and only during portions of the year, the exact number of miles or acres of roads requiring dust suppression per year is not known. Methods to reduce depletions related to dust suppression include surface treatments such as magnesium chloride or gravel. Surface treatments would not be allowed in areas where they could adversely affect surface waters. Other water conservation measures could include onsite treatment and reuse of imported or produced waters.

Other water-depleting activities under the Proposed Plan and other alternatives include use in dust suppression, evaporative loss from stockponds and spring developments, and evapotranspiration from irrigation during reclamation. Because several stockponds and spring developments are already in place in the Planning Area, it is anticipated that no more than ten new water developments would be constructed during the life of the plan. Stockponds and spring developments are generally 0.1 acre in size

or less and deplete an annual average of 0.425 acre-feet of water. Given this amount of depletion per development, average annual depletions from ten typical stockponds would equal 4.25 acre-feet.

Additionally, as described in Section 4.2.4.2, successful enhancement of areas not meeting Land Health Standards due to livestock use could decrease runoff due to increased vegetation cover. However, the result of this impact is generally beneficial, because contributions to runoff as shallow subsurface flow following infiltration into a vegetated hillside are less "flashy" and more protracted than in poorly vegetated situations, even if actual flow to the stream is reduced. The 1984 GSRA RMP allows for enhancing water yield by vegetation manipulation, which alters the timing, duration, and intensity of runoff. Treatments could include thinning of brush, prescribed fires, and timber harvests.

If it were to become apparent that the combination of oil and gas drilling, dust suppression, and other sources of depletion were to exceed the threshold amount established by USFWS, BLM would be required to implement one or more measures to avoid jeopardizing the existence or recovery of the fishes. Such measures could include limits on drilling but, more realistically, would include requirements for conservation.

Impacts from Decreases in Water Quality

Another potential threat to the endangered fishes is decreased water quality related to industrial and other developments on private lands along the Colorado River, including oil and gas. Impacts could result from direct discharge of pollutants or by transport of pollutants in sheet runoff or tributary drainages. While most of the tributaries to the Colorado River (except Government Creek and Parachute Creek) are ephemeral, episodic runoff associated with rainstorm or snowmelt events could transport any pollutants that have accumulated in the sediments since the previous runoff event. This potential is reduced by protective restrictions and limitations contained within standard oil and gas leases and aimed at capturing spills and releases before they can be transported to receiving waters. The NGD/NSO for protection of the Colorado River corridor would help reduce the potential for direct impacts on water quality from oil and gas or other industrial activities along the corridor.

For tributary streams, the NGD/NSO protections for riparian/wetland vegetation and Colorado River cutthroat trout habitat and the SSR/CSU protections for riparian/wetland buffers and the entire Parachute Creek WMA atop the plateau would further reduce of indirect impacts on water quality in potential habitats for the endangered fishes.

Potential pollution risks associated with generally highly saline produced water from drilling operations would be minimized by trucking the excess waters offsite for disposal at an approved location or, where risk of flow to surface water is not present, discharged into lined evaporation ponds. The potential also exists for onsite treatment of produced water and subsequent use to water livestock, but this is not a requirement under the Proposed Plan. Regardless of the method for disposing of produced water, BLM requirements would prohibit direct discharge into surface water, including ephemeral or more persistent tributaries of the Colorado River and other perennial streams.

An existing potential threat to these species is the risk of transport of contaminants to the Colorado River from the spent oil shale pile located on BLM land north of I-70 and within the Planning Area. Remediation of the pile, for which BLM has selected a remedy, would reduce or eliminate this potential threat.

Bald Eagle — The bald eagle occurs in the Planning Area but is not documented to nest within or near the area in recent years. Mature trees of riparian habitats at lower elevations of the site (e.g., the Colorado River, Parachute Creek, and to a lesser extent Government Creek) provide perching and roosting habitat as well as potential nesting habitat. The Colorado River and Parachute Creek provide suitable year-round hunting habitat for favored prey (fish and waterfowl), while nearby areas of open terrain (e.g., semi-desert shrublands) provide suitable habitat for other prey. The latter includes rabbits and carrion, which may be particularly important during winter and migration seasons. No significant impacts to the bald eagle

would be expected under the Proposed Plan, based on NGD/NSO protection of the Colorado River corridor and other riparian areas, and NGD/NSO and TL restrictions for nests and winter roosts. Any loss of hunting habitat from oil and gas development would represent a small portion of the suitable habitat in the area.

Mexican Spotted Owl — Although this species has not been observed in the Planning Area, potentially suitable habitat occurs in tributary gulches of the Parachute Creek drainage. NGD/NSO restrictions on riparian/wetland areas and wildlife security areas under the Proposed Plan would reduce the potential for impacts to this species. If the species were found to be present, any nest, brood-rearing habitat, or other critical habitat would be protected by the NGD/NSO for Federally listed species. However, the extent to which the Proposed Plan could affect potential hunting habitat is unknown, since that would depend on the location of any active nest or roost.

Lynx — This species of subalpine forests has not been documented in the Planning Area, although no comprehensive surveys have been conducted. However, as discussed in Section 3.3.4, the 2,600 acres of mixed aspen/conifer habitat atop the plateau is potentially suitable in terms of plant species composition and community structure. Additionally, the Planning Area is known to support a population of the favorite prey of the lynx, the snowshoe hare, as well as other suitable prey (blue grouse, mountain cottontail, and the young of deer and elk). Reintroduced lynx have begun to reproduce in Colorado and are gradually moving into areas where not released. The potential for dispersal of lynx into the Planning Area is reduced by the limited amount and patchiness of the suitable habitat and its isolation from more extensive habitat in the White River National Forest.

BLM and USFS Sensitive Species, USFWS Birds of Conservation Concern, and State-listed Species

Native Non-game Fishes — The roundtail chub, flannelmouth sucker, and bluehead sucker are found in the mainstem of the Colorado River in the Planning Area vicinity and may occur in lower reaches of Parachute Creek. The Colorado River and general riparian area NGD/NSO restrictions afford protection to these species except for any degradation of riparian habitat due to livestock grazing and cross-country OHV travel, and sediment transport from oil and gas development below the rim. Even these impacts probably would not affect either species because of their tolerance for turbid streams. Loss of vegetation along the streams could affect water temperature but would be unlikely to significantly raise the temperatures of the large streams above the ranges tolerated by these species. Substantial depletions would not be expected (see discussion for endangered fishes, above). The existing spent oil shale pile located north of I-70 within the Planning Area may pose an ongoing risk of contaminant transport to the Colorado River, but this area would be remedied (removed or capped) under any of the alternatives. Transport of chemical pollutants, including dissolved salts, as runoff or discharges from oil and gas activities on private and public lands below the rim would also be minimized by BMPs (Appendix I). Based on the discussion above, potential impacts to these species are expected to be none to negligible.

Colorado River Cutthroat Trout — Only negligible to minor impacts would be expected, based on the phased and clustered oil and gas development and the special management designations and NGD/NSO and SSR/CSU restrictions described above. These include protection of occupied stream reaches, as well as upslope and upstream areas affecting water quality and other watershed processes. The suggested BMPs to protect stream quality (Appendix I) would further benefit the Colorado River cutthroat trout. Examples of these include a requirement that new road crossings of streams use culverts or bridges where feasible, to reduce impacts to streams and direct mortality of fish or eggs.

Restricting cross-country travel and closing 26 miles of routes above the rim would further reduce stream impacts—in terms of both limiting direct physical disturbance to specific crossing points and reducing the amount of fishing pressure in remote areas. Beneficial impacts to riparian habitats from active vegetation management and changes in grazing would also benefit the trout by reducing bank erosion and sediment inflow and by increasing vegetation canopy cover for shade and as a source of allochthanous ("from outside the stream") insect prey or other food items.

Amphibians — The boreal toad, a BLM sensitive species and State-listed endangered species, is not known to occur in the Planning Area. Although no comprehensive surveys have been conducted, the area is near the lower elevational limits of the species, and potentially suitable habitats within the Planning Area are both limited and isolated.

The occurrence of the Great Basin spadefoot and the northern leopard frog (both BLM sensitive species and Colorado special-concern species) is limited by the availability of suitable habitats, i.e., seasonal ponds or pools for the toad and perennial ponds or slow-flowing streams for the frog. Impacts to these species would be negligible to minor, depending on whether drainages crossed by new roads support these species. In general, the phased and clustered development and protective measures cited above for streams, riparian/wetland areas, and watershed functions would benefit all three of the potentially present special status amphibians. Limiting motorized mechanized travel to designate routes would be beneficial by limiting stream crossings. BMPs such as requiring that stream crossing culverts or bridges where feasible would reduce potential impacts (see Appendix I). Changes in grazing management to improve stream corridors would also benefit the amphibians. The Proposed Plan is therefore expected to have negligible impacts to both of these potentially present species.

Reptiles — The Utah milk snake and midget faded rattlesnake (both BLM sensitive species, and the midget faded rattlesnake also a Colorado special-concern species) are expected or known to occur in the Planning Area. The NGD/NSO for steep slopes would preserve much of the potential denning habitat for the rattlesnake. The milk snake occurs in riparian habitats and moist gulches and would be generally protected by the NGD/NSO for riparian/wetland vegetation and other stream-oriented designations or stipulations. Restrictions on motorized and mechanized travel and more active management to improve condition of upland and riparian/wetland vegetation would also benefit the rattlesnake and milk snake, respectively.

Waterbirds — Barrow's goldeneye and the white-faced ibis (BLM sensitive species) are known to occur as migrants in the Planning Area or vicinity. The Colorado River corridor provides the most suitable habitat, although the goldeneye and ibis also occur at Fravert Reservoir. The TL for waterbird nesting at Fravert Reservoir provides seasonal protection for these and other waterbird species that may nest there, but the Colorado River NGD/NSO is probably the most important habitat protection within the Planning Area. The TL stipulation for bald eagle winter roosting extends into part of the spring migration season for Barrow's goldeneye and the white-faced ibis and therefore also benefits these species. The Proposed Plan is therefore expected to have negligible impacts to either species.

Raptors — The peregrine falcon, prairie falcon, ferruginous hawk, Swainson's hawk, golden eagle, northern goshawk, northern harrier, boreal owl, flammulated owl, and burrowing owl could be affected under the Proposed Plan due to some loss of hunting habitat. Of these species, the burrowing owl is State-listed as threatened, while the others are some combination of BLM sensitive species, Colorado special-concern species, or BCC species (Table 3-16). All of these and, except for cliff-nesters such as the peregrine falcon and golden eagle, face potential loss of nesting habitat. Direct long-term loss of 812 acres of habitat due to oil and gas development under the Proposed Plan would represent 1.1 percent of the BLM lands in the Planning Area. Applying the larger amount of effective habitat loss calculated previously for deer and elk under the Proposed Plan (Table 4-11) is not appropriate for estimating impacts to breeding raptors, because of the NGD/NSO and TL restrictions for active nests. However, if effective habitat loss were assumed, such as by limiting the amount of habitat available for searching for prey, the amount of such loss would be less under the Proposed Plan than any other alternative, due to the smaller number of pads and fewer miles of new or upgraded access roads

Cliff-nesting areas for peregrine and prairie falcons and the golden eagle are especially important because these species depend on high cliffs for nesting. For the peregrine falcon, proximity to a large body of water (the Colorado River) is also important because it supports the falcon's favorite prey—waterfowl. The other two cliff-nesters hunt in open terrain, potentially including sparsely vegetated habitats below

the rim and sagebrush shrublands atop the plateau. The cliff-nesting area would continue to be protected by an SSR/CSU under the Proposed Plan, and active nests would be protected by NGD/NSO and TL restrictions.

For the northern goshawk and boreal owl, aspen and conifer forests at higher elevations of the Planning Area and some areas of mature Douglas-fir below the rim provide suitable hunting and nesting sites. The flammulated owl could occur in any of these habitats as well as denser stands of pinyon/juniper. The NGD/NSO restrictions for steep slopes and the wildlife security areas below the rim would benefit these species, as would NGD/NSO and TL restrictions for mapped or other active nests and the restriction on motorized and mechanized travel. Furthermore, the phased and clustered development atop the plateau would reduce impacts by limiting oil and gas drilling to only one development area at a time (Figure 2-1), leaving other areas relatively undisturbed.

Another special status raptor, the northern harrier, nests and hunts in more open habitats dominated by grasses, forbs, and low shrubs, while the Swainson's hawk hunts in open habitats but nests in trees. Either species could occur in any part of the Planning Area that provides suitable habitat. Impacts to these species would be in proportion to the direct loss of habitat—again, a relatively minor area under the Proposed Plan. The NGD/NSO and TL restrictions for raptor nests would also apply to these species.

Based on the protective measures summarized above, impacts to raptors under the Proposed Plan are expected to range from negligible (atop the plateau) to minor (below the rim).

Neotropical Migrants and Other Native Birds — Not all neotropical migrants are designated as sensitive, nor are all of them forest species. However, many of these species, including several species on the USFWS list of BCC, either occur or could occur in habitats of the Planning Area (see Section 3.3.4). Lower elevation sensitive species or BCC species, such as Lewis's woodpecker, loggerhead shrike, gray vireo, Virginia's warbler, black-throated gray warbler, and sage sparrow (as well as many other, unlisted species), would lose approximately 737 acres (1.9 percent) of the habitat below the rim. If effective habitat loss from reduced use by birds near areas of human activity were considered, the loss below the rim would be 2,947 acres (7.6 percent of the lower elevation habitats). This is based on the smaller zone of avoidance represented by the area method, discussed in Section 4.3.2 and shown in Table 4-11.

For neotropical migrants nesting atop the plateau, including sensitive and/or BCC species such as the northern three-toed woodpecker, Williamson's sapsucker, and olive-sided flycatcher, the amount of direct long-term habitat loss would be only 75 acres (0.2 percent of the area), while effective habitat loss would be 316 acres (0.8 percent of the BLM lands atop the plateau).

Another BCC species that could occur onsite is the black swift, which often nests on cliffs behind or adjacent to waterfalls. If this species is present, it would be most likely to occur in the vicinity of the East Fork Falls, which would be protected by an NGD/NSO restriction.

BLM has not yet developed conservation strategies for species on the BCC list. However, NGD/NSO and SSR/CSU restrictions aimed at reducing impacts to high-quality habitats—including riparian habitats, major portions of the Douglas-fir and spruce/fir forests, and much of the aspen forest and mature pinyon/juniper—would benefit these species. Many of these species would benefit from other NGD/NSO restrictions and the raptor nesting and waterbird nesting TL restrictions. Additionally, the restrictions on motorized and mechanized travel, closure of some existing routes, and vegetation and range management measures aimed at improving both upland and riparian/wetland communities would tend to offset a portion of the adverse impacts from oil and gas activity.

The conclusions regarding BCC species also applies to all of the native birds protected by the MBTA (i.e., excluding upland gamebirds). In considering projects and management activities that could affect native birds, BLM would consider the species and habitats to be affected and the type, intensity, timing, and duration of the impact in evaluating the overall population effect. Where an adverse population impact could result, BLM could require that the project or activity be relocated, postponed, or mitigated.

Where these measures would not be effective in avoiding or minimizing the adverse population effect, BLM could deny the request. In general, negative impacts to neotropical migrants and other birds are expected to be negligible both above and below the rim.

Bats — The combination of NGD/NSO restrictions for the Anvil Points Cave, most cliff areas, and most areas of mature forest and the limited amount of direct long-term habitat loss (812 acres) is expected to result in impacts to bats of none to negligible under the Proposed Plan.

Carnivores — In the event that the lynx, wolverine, or American marten occurs in the Planning Area, any of these would be most likely in subalpine forest habitats atop the plateau. As described above, the Proposed Plan would result in an assumed 75 acres of direct long-term habitat loss in these habitats, representing 0.2 percent of the upper area. Using the wide buffers from human activity assumed earlier for deer and elk (Section 4.3.2), the effective habitat loss would be only 6.3 percent of the upper area (Table 4-11). Additionally, the phased and clustered development, with oil and gas drilling limited to a single area at any one time, would reduce the disturbance-avoidance impacts by leaving most of the upper plateau in a relatively undisturbed condition.

Other relevant components of the Proposed Plan include the NGD/NSO protections for most of the higher quality forest habitats along drainages or along the cliffs. The combination of these considerations, the restrictions on motorized and mechanized travel, and implementation of measures to improve upland and riparian/wetland vegetation supports the conclusion that impacts to these special status carnivores would be none or negligible.

Another USFS sensitive species and State-listed endangered species potentially present in the Planning Area is the river otter. If this aquatic carnivore were to disperse into or through the Planning Area from future release sites or by natural dispersion from occupied habitat, movement would most likely be limited to the Colorado River or Parachute Creek. Because of the various NGD/NSO restrictions associated with other riverine resources (special status fishes, bald eagle, Colorado River corridor, riparian vegetation, etc.), impacts to potential future use by this species would be none or negligible.

Offsite and Cumulative Impacts

One of the principal cumulative impacts under the Proposed Plan would include the combination of oil and gas development on BLM lands with that on private lands within the Planning Area, and with both Federal and private lands in nearby areas. Because of assumed higher well densities and lower levels of ecological protection on private lands, the combined result would be direct long-term habitat loss of 2,791 acres, or 2.2 percent of the total Planning Area, compared to 1.1 percent for the BLM lands alone. Using effective habitat loss—i.e., accounting for reduced use near areas of human activity—as the indicator of cumulative impacts, the relative amounts are estimated at approximately 7.7 percent of the entire Planning Area, compared to 2.9 percent of the BLM lands. These estimates are derived from the information presented in Table 4-3 and the area-method calculations of effective habitat loss in Table 4-11 (most species are not subject to the wider disturbance-avoidance zones of the distance method). In comparison, effective habitat loss on private and Federal lands combined under the Preferred Alternative is estimated at 8.5 percent of the Planning Area.

About 88 percent of the cumulative (private plus Federal) habitat loss within the Planning Area would be in areas below the rim. Combined effective loss of the private and Federal lands at these lower elevations would be approximately 11.7 percent under the Proposed Plan, compared to 12.7 percent under the Preferred Alternative (again using the area method). For the 12 percent of cumulative impact area atop the plateau, the comparison of effective habitat loss for the Proposed Plan and Preferred Alternative is 2.2 percent versus 2.8 percent.

For large, wide-ranging species such as raptors and carnivores with home ranges that include nearby offsite lands, the estimated cumulative impacts of habitat loss and disturbance avoidance due to oil and

gas development within the Planning Area would be cumulative to losses from the same type of development in nearby lands.

Quantifying cumulative impacts that incorporate offsite lands is more difficult, due to uncertainties about the location, scale, and rate of oil and gas development on BLM lands, private lands, and other lands both inside and outside the Planning Area, as well as uncertainties about the application and effectiveness of environmental protections on these non-BLM lands. However, the long-term surface disturbance from new wells on BLM lands in 20 years (812 acres) represents 29 percent of the cumulative total for private plus Federal, existing plus projected development (Tables 4-2 and 4-3). Also, the total number of BLM and private wells projected for the Planning Area at the end of 20 years (approximately 3,700) is in comparison to a project total of 10,000 to 20,000 in Garfield County for the same time-frame (Section 3.4.3).

Finally, it should be noted that habitat losses from oil and gas development are in addition to the direct and effective losses resulting from the ongoing human population growth in the region, with an annual increase of approximately 4.5 percent in western Garfield County. While some portion of this growth is related to oil and gas development in the Planning Area (Section 4.4.3), most of the growth is unrelated to either the Planning Area or the oil and gas sector of the local economy.

Summary of Impacts to Special Status Fish and Wildlife

Impacts to special status species under the alternatives analyzed are summarized in Table 4-15. Some impacts may represent an irreversible and irretrievable commitment of natural resources (Section 4.6).

Table 4-15. Summary of Impacts of Proposed Plan to Special Status Fish and Wildlife [1, 2]

Management Action	*Alt. I No Action*	*Alt. II*	*Alt. III Preferred*	*Alt. IV*	*Alt. V*	*Proposed Plan*
Special Stipulations for ACECs	NA	Major (+)	Moderate to Major (+)	NA	NA	Moderate to Major (+)
Protection of WSR-eligible Streams	NA	Moderate to Major (+)	Moderate to Major (+)	Moderate to Major (+)	NA	Moderate to Major (+)
Watershed Management Areas	NA	Moderate to Major (+)	Major (+)	NA	NA	Major (+)
Management for Wilderness Values [3]	NA	Moderate to Major (+)	Moderate (+)	NA	NA	NA
Vegetation/Weed Management	Minor to Moderate (-)	Minor to Moderate (+)	Minor to Moderate (+)	Minor to Moderate (-)	Minor to Moderate (-)	Moderate to localized Major (+)
Recreation/Travel Management	Moderate (-)	Moderate to Major (+)	Moderate to Major (+)	Moderate to Major (+)	Moderate (+)	Moderate (+)
Range Management	Moderate (-)	Moderate (+)	Moderate (+)	Moderate (+)	Minor (-)	Moderate to localized Major (+)
Oil and Gas Development [4,5]	Negligible to Minor (-)	Minor to Moderate (-)	Negligible to localized Major (-)	Moderate to localized Major (-)	Moderate to Major (-)	Negligible to localized Major (-)

[1] *Overall beneficial (+) or negative (-) impacts after balancing positives and negatives for resource components and assuming implementation of BMPs described in text and Appendix I..*

[2] *For Federally listed, proposed, or candidate threatened or endangered species, USFWS would issue a BO addressing potential effects and required conservation measures.*

[3] *Limited to roadlessness and naturalness under Alternative III.*

[4] *Under Alternative I, oil and gas impacts for Alternative I almost entirely below cliffs due to no-lease of NOSR 1.*

[5] *Under Alternative III, development above the rim would be deferred until 80% of anticipated total wells below the rim during 20-year period of analysis have been drilled.*

4.3.5 Wild Horses and Burros

No managed populations of wild horses or wild burros occur in the Planning Area or GSRA, and these non-native ungulates are therefore not discussed in this RMPA/EIS.

4.4 HUMAN ENVIRONMENT

4.4.1 Visual Resources

4.4.1.1 Introduction

As outlined in Section 3.4.1, VRM classes are assigned to the various parts of the landscape based on visual characteristics or to meet management objectives. These range from preserving a natural landscape and existing characteristics (Class I) to providing for management activities that allow major modification of the landscape (Class IV). While numerous management activities can impact visual values, the most significant impacts are large-scale or cumulative ground-disturbing activities that alter the existing form, line, color, and texture that characterize the existing landscape.

Impacts to visual resources are considered major if they substantially change or degrade the character of the landscape as seen from sensitive viewsheds or if the allowable modifications exceed VRM classifications. While topography can allow for some landscape modifications, many types of disturbance, such as roads and artificial structures, can dominate the landscape depending on their size, distance, topographic position, presence/absence of screening, and contrast with surrounding conditions.

All BLM resource uses, management activities, and implementation decisions will be designed to meet VRM objectives established in this Proposed Plan. Visual resource design techniques and BMPs will be utilized to mitigate potential short-term and long-term impacts. Visual contrast ratings will be required for all projects proposed on public lands that fall within VRM Class I, II, and III areas with high value or high visual sensitivity. This will allow BLM to reduce impacts on a site-specific basis to ensure compliance with the assigned VRM Classes. Viewsheds deemed to be of high value are those that have high scenic quality, such as East Fork Canyon, or high visual sensitivity due to the large amount of public interest and viewing.

A viewshed analysis was performed for each of the alternatives assessed as part of this RMPA/EIS process. Although the alternatives include various resource management actions and land uses, increased levels of oil and gas development would be the dominant long-term landscape-altering activity. Visible changes associated with oil and gas exploration and production include not only physical structures, but also altered topography, exposed soils, and construction of roads (often with significant cut-and-fill) and pipelines. All of these activities require the removal of vegetation. While some temporary disturbances are reclaimed within 2 years, most pads and roads remain as long-term areas of physical and biological, and hence visual modification.

4.4.1.2 Methods

The viewshed analysis was performed using ESRI ArcScene software and a USGS DEM. The DEM used for this project was based on USGS 7.5-minute topographic quadrangles with a cell size of 28.5 meters. The viewshed analysis process used the DEM to identify all areas in which well pad locations would be visible from I-70, SH 13, or the Rim Road. As described in Section 2.3.1, GIS was used to place hypothetical well pad locations on top of the plateau (Rim Road viewshed) under the Proposed Plan, with the first 13 pads assumed to be in the southeastern-most development area (see Figure 2-1) due to its horizontal proximity to existing production areas below the rim. For the I-70 and SH 13 viewsheds, the greater flexibility in pad locations (see Section 2.3.1 and the introduction to Chapter 4) required a different approach. For analysis of these viewsheds, the estimated 180 pads to be completed in 20 years

were assumed to be distributed randomly and proportionately (based on relative areal extent) in terms of visible versus non-visible locations, I-70 versus SH 13 corridors, and SSR/CSU versus standard stipulations and restrictions.

Maps 24 through 26 show the viewsheds for I-70, SH 13, and the Rim Road. The colored area of each map depicts the portion of the landscape visible from that roadway. Note that the Rim Road viewshed (Map 26) differs from the version in the Draft RMPA/EIS by not indicating any visible areas below the rim. This reflects the actual situation, because at no point is the Rim Road close enough to the edge for an occupant of a vehicle to be able to look downward onto the lower plateau. In contrast, the Draft RMPA/EIS erroneously indicated a large area below the rim as being visible. This resulted from a GIS artifact related to the size of pixels compared to the distance from the Rim Road to the actual rim.

Also note the wide overlap between the I-70 and SH 13 viewsheds (Maps 24 and 25). In the Draft RMPA/EIS, this resulted in a number of wells being double-counted and hence overestimating the impacts. To address this situation, the Proposed Plan/Final EIS treats these two viewsheds as separate, with well pad locations in the zone of overlap assigned to the road from which primarily visible (typically, the nearer road, since visual impact is at least partially related to viewing distance). Visibility characteristics for the I-70 and SH 13 viewsheds under the Proposed Plan are summarized in Table 4-16.

Table 4-16. Visibility Characteristics for Area below the Rim under the Proposed Plan [1]

Component	*Total Area*	*Private Lands*	*BLM Lands [1]*			
			NGD/NSO	*SSR/CSU*	*Standard Restrictions*	*Total BLM*
Below the Rim	73,209 ac	34,365 ac	22,590 ac	11,896 ac	4,358 ac	38,844 ac
Visible Primarily from I-70	21,234 ac	9,108 ac	9,244 ac	2,244 ac	638 ac	12,126 ac
Visible Primarily from SH 13	12,574 ac	4,531 ac	4,682 ac	2,422 ac	939 ac	8,043 ac
Not Visible from I-70 or SH 13	39,401 ac	20,726 ac	8,664 ac	7,230 ac	2,781 ac	18,675 ac

[1] *Includes BLM surface and/or mineral estates.*

As shown by Table 4-16, slightly more than half (52 percent) of the total BLM lands below the rim and less than half (40 percent) of private lands below the rim are visible from I-70 or SH 13. The remaining (non-visible) portions are either located along CR 215 north of Parachute or are hidden by rugged topography in some of the lower areas bordering I-70 and SH 13 (Maps 24 and 25).

GIS analysis was also used to calculate the amount of visible terrain within specific distance zones as measured from I-70, SH 13, and the Rim Road. The distance zones are as follows:

- Close Range – Less than 0.25 mile
- Near Foreground – 0.25 to 1 mile
- Foreground – 1 to 3 miles
- Midground – 3 to 5 miles
- Background – Greater than 5 miles

As described in Section 3.4.1, landscape features generally are more visible at distances closer to the observer due to the increase in visual size and greater ability to discern the details of form, color, texture,

and line. Objects viewed at a distance of less than 0.25 mile generally have the highest degree of visual sensitivity, with decreasing importance at increasing distances. However, generalizations about the importance of distance do not necessarily hold in the case of landscape features or modifications that are large, located in a topographically prominent area, or have a high degree of contrast with their surroundings. Table 4-17 presents information on the distance zones for the three viewsheds under the Proposed Plan.

Table 4-17. Distance Zone Information for Roadway Viewsheds under the Proposed Plan [1]

Roadway Viewshed	*Visible Area*	*Close Range <0.25 mile*	*Near Foreground 0.25 – 1 mile*	*Foreground 1 – 3 miles*	*Midground 3 – 5 miles*	*Background >5 miles*
I-70	12,126 ac	137 ac	1,439 ac	7,698 ac	2,838 ac	14 ac
SH 13	8,043 ac	540 ac	2,308 ac	4,153 ac	1,042 ac	0 ac
Rim Road	11,566 ac	2,682 ac	1,962 ac	2,136 ac	575 ac	63 ac

[1] *Limited BLM lands visible from the three roadway-based viewsheds analyzed. Rim Road analysis also limited to areas atop the plateau (i.e., excludes distant vistas). For all three viewsheds, "visible area" does not assume vegetational screening.*

Table 4-18 presents the results of the analysis of the number of well pads visible in the three roadway viewsheds, by alternative and distance zone. As described previously, the analysis assumes that the distribution of pads below the rim would be in proportion to the area of each viewshed and each distance zone, and independent of whether an area is protected by an SSR/CSU or standard restrictions. In reality, the greater protection of visual resources in areas with the SSR/CSU restrictions would reduce the number of visible pads compared to the number predicted solely on the basis of relative area. Not assuming reduced visibility in SSR/CSU areas—even though that is the purpose of the restriction—is intended to ensure that visual impacts of well pads are not underestimated.

Table 4-18. Number of Well Pads Estimated to be Visible from Road Corridors in 20 Years [1]

Viewshed	*Distance Zone*	*Alt. I No Action*	*Alt. II*	*Alt. III Preferred*	*Alt. IV*	*Alt. V*	*Proposed Plan*
I-70 [2]	< 0.25 mi	0	0	0	0	0	1
	0.25 – 1 mi	7	16	17	15	20	11
	1 – 3 mi	15	27	35	31	63	19
	3 – 5 mi	1	1	7	6	16	1
	> 5 mi	0	0	0	0	0	0
	Total	**23**	**44**	**59**	**52**	**99**	**32**
SH 13 [2]	< 0.25 mi	8	9	9	8	8	6
	0.25 – 1 mi	23	22	31	28	28	17
	1 – 3 mi	12	12	42	37	40	12
	3 – 5 mi	1	1	8	7	11	3
	> 5 mi	0	0	0	0	0	0
	Total	**44**	**44**	**90**	**80**	**87**	**38**
Rim Road [3,4]	< 0.25 mi	2	7	3	10	16	5
	0.25 – 1 mi	1	7	4	11	18	3
	1 – 3 mi	1	5	5	17	22	4

Table 4-18. Number of Well Pads Estimated to be Visible from Road Corridors in 20 Years [1]

Viewshed	Distance Zone	Alt. I No Action	Alt. II	Alt. III Preferred	Alt. IV	Alt. V	Proposed Plan
	3 – 5 mi	0	3	1	4	5	1
	> 5 mi	0	0	0	0	0	0
	Total	**4**	**22**	**13**	**42**	**61**	**13**

[1] *Numbers may differ slightly from Draft RMPA/EIS due to refinement in method but retain same assumptions.*

[2] *Analyses for I-70 and SH 13 assume 40-acre surface density for Alternatives I through V and average of 80-acre surface density for Proposed Plan. Number of visible pads in I-70 and SH 13 viewsheds under Proposed Plan with 40-acre surface density used for other alternatives can be estimated by doubling the numbers shown.*

[3] *Analysis for Rim Road incorporates the effective 160-acre surface density to be required atop the plateau.*

[4] *Analysis for Rim Road differs from Draft RMPA/EIS by not including areas below the rim. As indicated in text of report, wells below the rim indicated in Draft as visible from Rim Road were an artifact of computer analysis. These wells can actually be seen only by exiting vehicle and walking to top of cliffs.*

The viewshed analysis did not include potential new roads or improvements to existing roads to provide access to new oil and gas facilities. Estimates of new or upgraded access roads needed to service oil and gas activities on BLM portions of the Planning Area range from an estimated 124 miles for the Proposed Plan to 350 miles for Alternative V. Access roads represent additional impacts to visual resources, especially where they must cross a visible slope or require removal of vegetation.

Some of the impacts may represent an irreversible and irretrievable commitment of visual resources (Section 4.6). Development on private lands within the Planning Area is discussed in the cumulative impact analysis portion. VRM classes under the Proposed Plan and Preferred Alternative are shown on Map 23; and the potential changes to visual resources resulting from prescribed VRM classes are shown in Table 4-19.

Table 4-19. Acres of VRM Classes by Alternative

VRM Class	Alt. I No Action	Alt. II	Alt. III Preferred	Alt. IV	Alt. V	Proposed Plan
Class I	0	37,205	925	925	0	1,612
Class II	24,039	13,428	48,752	48,752	0	30,168
Class III	37,115	14,607	15,563	15,563	63,022	33,536
Class IV	10,340	8,350	8,350	8,350	10,568	8,274
Class V	2,096	0	0	0	0	0
Urban	12	12	12	12	12	12

4.4.1.3 Impacts of the Proposed Plan

Direct and Indirect Onsite Impacts

Oil and Gas Development — While many management activities can have direct impacts on visual values and adversely alter the landscape, oil and gas development is the activity with the greatest anticipated level of visual change during the 20-year life of the Plan. Although all activities will be managed to meet the assigned VRM Class objectives, unavoidable long-term ground-disturbing activities associated with the oil and gas development represents an irretrievable commitment of visual resources. Therefore, oil and gas development is the focus of this analysis. The allowable level of change in the landscape will depend on the VRM Class designation for that particular area.

Under the Proposed Plan, a total of 1,570 wells on 193 pads are anticipated in BLM portions of the Planning Area. The long-term surface disturbance associated with this level of development would be approximately 812 acres. The development assumptions described in Section 2.4 yield approximately 180 well pads below the rim and 13 above the rim on BLM lands.

Both above and below the rim, oil and gas development would create direct impacts to the existing landscape by introducing new contrasts in form, line, color, and texture. Temporary impacts to visual resources would result from the increased presence of drill rigs, construction vehicles, artificial lights, dust, and other associated uses during construction and drilling phases. Long-term impacts to the landscape would result from the presence of well pads, tanks, compressors, dehydration units, roads, pipelines, power lines, and other features associated with the oil and gas operations.

I-70 Viewshed

As shown in Table 4-18, approximately 32 well pads on BLM lands may be visible from I-70. This number is smaller than any of the previous alternatives except No Action, reflecting a combination of the NGD/NSO restrictions on surface facilities to protect highly sensitivity VRM Class II areas of the I-70 viewshed with the smaller number of pads associated with management toward greater clustering of wells. As a result of NGD/NSO restrictions to protect both the visual and ecological quality, and steeper terrain along the cliffs, 94 percent of the visible pads (30 of 32) would be in the near foreground (0.25- to 1-mile) and foreground (1- to 3-mile) distance zones. The concentration of pads in these distance zones means that the farther but visually conspicuous areas along the cliffs are estimated to have no visible pads.

With the diverse and varied landscape characteristics in the foreground distance zone, opportunities exist to locate roads and pads in areas that would reduce visual impacts. For example, 72 percent of the pads visible from I-70 would be on lands with SSR/CSU restrictions, giving BLM the ability to require relocation by more than 200 meters to reduce visual impact. With standard stipulations, BLM can require that pads be relocated by up to 200 meters. Even with the ability to adjust the location of pads and to require facility colors that reduce visual impact, the removal of vegetation would amplify visual contrasts in line, color, form, and texture. Since much of the foreground distance zone, and especially the distal portion, is pinyon/juniper, increases in contrast created by removing vegetation may be especially visible.

In the near foreground, and especially the proximal portion, vegetation of the Planning Area is dominated by semi-desert shrubs and sparse grasses. As a result, ground disturbance creates less contrast from removal of plant cover. On the other hand, the fewer opportunities to screen a pad behind woody vegetation and irregular terrain, and the fact that viewed objects appear larger because they are closer, offset some of the beneficial impacts of the more arid vegetation.

Indirect impacts under the Proposed Plan would be a more industrialized setting adjacent to I-70. However, with the VRM Class II and the sensitive I-70 viewshed stipulations, most of the existing visual quality in the midground and background distance zones of the I-70 viewshed would be maintained.

SH 13 Viewshed

Approximately 38 well pads on BLM lands are estimated to be visible from SH 13 under the Proposed Plan (Table 4-18). This is the smallest number for any alternative, including No Action. The area nearest the highway, including the close range and near foreground distance zones (i.e., less than 1 mile), would be managed as VRM Class IV, which allows major modifications and direct impacts to the existing landscape. VRM Class IV reflects the present condition of the landscape which includes the existing electric transmission corridors and the Hubbard Mesa OHV Riding Area which has resulted in impacts to visual quality. About 60 percent of the visible pads (23 of 38) would be in the two closest distance zones.

The cliff areas to the west would be managed as VRM Class II, which allows for only minor modifications to the landscape, and protected with SSR/CSU restrictions for visual resources. In, addition

much of the rugged backdrop of the SH 13 viewshed would be protected by NGD/NSO restrictions associated with steep slopes and wildlife security areas. For the estimated 15 pads to be visible at distances greater than 1 mile from SH 13, the contrast of linear access roads, areas cleared of trees, and freshly disturbed soil within pinyon/juniper woodlands could exacerbate visual contrasts compared to those normally expected at such distances. However, the diverse topography, varied landscape characteristics, and woodland habitats also provide opportunities for screening to reduce impacts. The more distant areas, including slopes below the cliffs that support Douglas-fir and are more conspicuous due to higher elevations, are estimated to have only three well pads.

Indirect impacts under the Proposed Plan would be a more industrialized setting adjacent to the SH 13 viewshed. However, with the VRM Class II and the sensitive I-70 viewshed stipulations (which overlap broadly with the SH 13 viewshed), most of the existing visual quality in the midground and background distance zones would be maintained. Maintenance of the scenic cliffs was identified as an important issue to residents, adjacent communities, and travelers along SH 13.

Rim Road Viewshed

The estimated number visible well pads on BLM lands atop the plateau (13) is the same number as the total number of well pads in that portion of the Planning Area during the 20-year planning period. On one hand, this number is smaller than for any alternative except No Action (with the upper area mostly closed to oil and gas development) and the Preferred Alternative of the Draft RMPA/EIS (with deferral of oil and gas development for approximately 16 years). On the other hand, it represents the entirety of well pads estimated to be constructed atop the plateau in 20 years. This is because one component of the Proposed Plan is the emphasis of oil and gas development along ridgetops. While ridgetop development would protect visual and other qualities associated with the relatively undisturbed stream valleys, it would increase visual impacts along ridgetop roadways in areas of oil and gas development.

The assumption that all 13 pads atop the plateau would be visible from the Rim Road reflects the assumption that development would occur first in the southeastern portion of the upper area due to its closer horizontal proximity to existing oil and gas development in the lower area. This happens to be the area accessed along the Rim Road. If some other portion of the upper plateau is developed first, the number of wells visible from the Rim Road during the 20-year period would be smaller, and potentially none.

The pads visible from the Rim Road would mostly be in the close range (< 0.25 mile) and near foreground (0.25 to 1 mile) distance zones because of the emphasis on development along existing roads (including the Rim Road) and the greater screening due to topography and wooded vegetation farther from the road. The decision by BLM to accept greater visual impacts as a consequence of managing primarily to protect the visually, ecologically, and hydrologically sensitive stream valleys resulted from Consultation and Coordination (Chapter 6).

At a localized scale, some opportunities for screening using existing woodland vegetation or topographic features may exist at specific sites where pads or other surface facilities would be located. The SSR/CSU restriction across the entire top of the plateau would allow BLM to manage visual quality consistently with the VRM Class III designation. While the East Fork Falls and the box canyon below it are not visible from the Rim Road, the NGD/NSO for the associated VRM Class I area of the falls and box canyon would preserve the existing scenic quality. The SSR/CSU associated with VRM Class III across the balance of the upper plateau gives BLM the ability to require that proposed facilities be relocated by more than 200 meters and/or that specific mitigation be incorporated to minimize visual impacts.

Direct visual impacts would be temporary (drill rigs, vehicular traffic, dust generation, etc.) in areas of active drilling and long-term (well pads, well facilities, roads, compressors, etc.) in areas that have moved into the production phase.

Indirect impacts would be a more industrial setting within development areas visible from the Rim Road. Potentially, the southeastern portions of the upper plateau, which includes the Rim Road, would support initial exploration and drilling activities atop the plateau. This is because closest (horizontally) to existing production areas below the cliffs may be developed first. Development along the Rim Road, which provides access to the Anvil Points overlook and other scenic vistas, could in turn have an adverse impact on the attractiveness of the area for tourism and recreation. However, the portion of the top of the plateau to be affected visually during the 20-year period represents only a small percentage of the total Planning Area, leaving the remainder available for the same types of recreational travel and scenic viewing as at present.

Special Management Designations and Restrictions — Special management designations under the Proposed Plan include designating two ACECs on top of the plateau, designating two ACECs along the east-facing and south-facing cliff areas, identifying a WMA for the Parachute Creek drainage basin, and managing WSR-eligible streams atop the plateau to retain that condition until a determination of suitability has been made. While all of these area designations would involve some management components that would benefit visual quality, only the four ACECs specifically include visuals as one of the resources being protected.

Management to protect sensitive resources in the two ACECs atop the plateau (East Fork Parachute Creek and Trapper/Northwater Creek) would provide some protection of highly scenic areas along stream valleys and canyons that currently show little influence of human activity. While the component of the Proposed Plan that focuses oil and gas development on ridgetops in the area above the rim would add to this protection of the scenic valleys and canyons, it would increase visual impacts to travelers along roadways through the area(s) of development.

The East Fork Falls viewshed would be managed as VRM Class I under the Proposed Plan to protect its high scenic quality (Map 23). The goal for VRM Class I areas—i.e., to preserve the existing character of the landscape, would be achieved with an NGD/NSO restriction. The remainder of the top of the plateau would be managed as VRM Class III, for which the goal is to partially retain the existing character of the landscape while allowing a moderate level of change. This level of protection and development would be achieved through SSR/CSU restrictions. As described elsewhere, these allow BLM to require that a proposed activity be relocated by more than 200 meters if necessary to protect a resource.

Below the rim, the Magpie Gulch and Anvil Points ACECs provide a basis for management of resources in ways that would benefit visual qualities. These two ACECs include most of the high cliffs, rock outcrops, and other rugged terrain features that provide the highly scenic backdrop for travelers on I-70 and SH 13 and residents of nearby communities.

Most of the lands below the rim would be managed as VRM Class II, for which the goal is to retain the existing landscape character while allowing low levels of change. Portions of the Class II lands on slopes steeper than 30 percent and visible from I-70 would be protected with NGD/NSO restrictions, while the balance would have SSR/CSU restrictions. Some areas along SH 13, including the existing electrical transmission corridor, would be managed as VRM Class IV, which allows for actions and land uses that cause major modifications to the existing character of the landscape.

Areas previously designated as VRM Class V are located in the vicinity of the Anvil Points Mine and along the upper part of the JQS road switchbacks. This designation would no longer be applied, and areas mapped as such under Alternative I (No Action) would be managed under the VRM class of adjacent areas (mostly VRM Class II)(Map 23).

Offsite and Cumulative Impacts

Until relatively recently, modifications of the natural landscape in the Planning Area have mostly been characteristic of agricultural and ranching lands, with localized industrial impacts associated with the railroad and I-70 highway corridors on private lands and the Anvil Points Mine. More recently, these

changes are cumulative to growth of residential and commercial uses, utility corridors, oil and gas development, and other rural industrial uses. Changes in the overall landscape specifically resulting from oil and gas development under any of the alternatives, including the Proposed Plan, are likely to be disproportionately greater on private lands. This is because private lands include much of the area along I-70 and SH 13 and adjacent to the towns of Rifle and Parachute. Additionally, development on private lands is relatively free of the requirements associated with management of Federal lands as VRM Class II (i.e., management to retain the existing character of the landscape while allowing low levels of change).

In addition to impacts being more noticeable and accumulating more quickly on private lands along I-70, the same will be true for Federal lands managed as VRM Class IV along SH 13. A substantial portion of these impacts would be concentrated in the close range and near foreground distance zones (i.e., less than 1 mile). Also, because VRM Class IV allows major changes in the existing character of the landscape, the magnitude of the potential changes would also be greater.

With the lower levels of visual protection on commingled private lands along I-70 and Class IV designations along SH 13, combined with the past, current, and foreseeable accumulation of landscape modifications, it is expected that the landscape most commonly viewed from major transportation corridors will experience a more developed and industrialized setting through time. While the most visually sensitive lands such as the scenic backdrop of the Roan Cliffs and East Fork Canyon will be preserved, impacts within the foreground zones will change visitors and residents expectations and experiences. Offsite impacts may be realized through a greater appreciation of remaining visual open space throughout the region.

Summary of Impacts to Visual Resources

Long-term, large-scale, and cumulative landscape modifications associated primarily, but not solely, to oil and gas development would contribute to a change in overall landscape character particularly along I-70 and SH 13. Mitigation and reclamation efforts for long-term ground-disturbing activities on Federal lands would reduce visual impacts on Federal lands. Cumulative impacts could degrade overall visual quality on private lands due to their proximity to major highways and population centers. Private lands compose 43 percent of the landscape in the Planning Area, and approximately 67 percent of the developable land below the rim.

All Federal lands within the Planning Area would be managed to meet assigned VRM objectives (see map 23 and Table 4-19). Federal lands within the I-70 viewshed on slopes over 30 percent and East Fork Canyon would retain their natural-appearing landscape character. Lands within the I-70 viewshed with less than 30-percent slopes (VRM Class II lands) would experience a low change to their natural appearance.

Visual quality atop the plateau (except for East Fork Canyon) would experience conditions in which development could be readily observable from some ridgetop roads but does not dominate the landscape. Lands near SH 13 would experience high levels of landscape modification which could dominate the landscape.

Areas previously designated as VRM Class V are located in the vicinity of the Anvil Points Mine and along the upper part of the JQS Road switchbacks. This designation would no longer be applied, and those areas would be managed under the VRM class of adjacent areas (mostly VRM Class II)(Map 23).

4.4.2 Cultural Resources

4.4.2.1 Introduction

Cultural resources, in the broadest terms, are the products of human presence and actions. Cultural resources range from a prehistoric arrowhead to a historic building or a landscape held sacred by a group of people who live on or work the land.

Consideration of cultural resources by Federal agencies is mandated by a number of Federal statutes. The NHPA of 1966 as amended (16 United States Code [USC] 470a-x6), particularly Section 106 (16 USC 470f) and Section 110 (16 USC 470h-2(a), requires Federal agencies to "take into account the effects of Federal actions on historic properties" and outlines Federal agency responsibilities for the management, protection, preservation, and use of historic properties. The principal Federal regulations that guide implementation of this statute are found at 36 CFR 800 (Protection of Historic Properties) and 36 CFR 60 (National Register of Historic Places). The National SHPO Programmatic Agreement/Colorado Protocol provides alternative procedures for implementing 36 CFR 800 between the BLM, Advisory Council for Historic Preservation, and the National Conference of State Historic Preservation Officers. BLM Manual 8100 details the alternative procedures implemented by BLM, supplemented by WO-IB-2002-101 (BLM 2002g). Other Federal statutes that may affect the management of historic properties include the ARPA of 1979 (16 USC 470aa-mm), the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (25 USC 3001-3013), Executive Order 13007 Sacred Sites, and the American Indian Religious Freedom Act (AIRFA) of 1978 (42 USC 1996).

Not all sites are considered significant and qualified for protection under the NHPA. Significant sites are designated as "historic properties" and defined in 36 CFR 800.16(l) as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in the National Register of Historic Places (NRHP)." Eligibility criteria for listing in the NRHP are presented in 36 CFR 60.4. Under 36 CFR 60.4, sites can be evaluated as:

- eligible for nomination to the NRHP
- potentially eligible for nomination to the NRHP
- not eligible for nomination to the NRHP

Traditional cultural properties are sites, locations, areas, and landscapes that may be important to certain groups. Although traditional properties are eligible for nomination, no traditional cultural properties have been identified in the Planning Area.

Cultural sites are nonrenewable resources that can be irretrievably lost if subject to certain actions. In general, any activity that destroys or irreversibly alters a historic property is an "adverse effect." Adverse effects can be mitigated by a variety of methods. The type of site and Proposed Plan affects the chosen method(s) and is determined by consultations between the Federal agency, SHPO, and the Advisory Council on Historic Preservation (ACHP). Applicable Native American tribes and the public are included in these consultations as necessary. Native American consultation requirements are outlined in BLM Manual 8160 and H-8160-1 (BLM 1990).

4.4.2.2 Methods

The analysis of impacts to cultural resources included the assumptions that (1) ground-disturbing activities associated with additional oil and gas exploration and development will be the primary impact agent, and (2) any new or upgraded roads will increase the probability that cultural resources are adversely affected, either directly and indirectly.

As described for the five alternatives analyzed in the Draft RMPA/EIS, the effects or potential effects were estimated by analyzing the number, type, significance, and density of cultural resources in comparison to the relative areas subject to ground-disturbing activities. Since 58 percent of the Planning Area has been surveyed for cultural resources and 429 resources recorded, reasonable estimates of the impact of each alternative can be determined. Data used for the analysis were derived from the GIS database compiled for the *Roan Plateau Class I Cultural Resources Overview* (Hoefer et al. 2002). Data used to compile the overview were obtained from files and GIS data generated by the GSFO, the Colorado Historical Society Office of Archaeology and Historic Preservation, and existing reports on archaeological investigations in the Planning Area.

The analysis began by subdividing each alternative into areas open to mineral leasing, areas closed to mineral leasing, and the utility corridor. The number and types of documented cultural resources in each of these areas was tabulated, along with the NRHP status of each resource. These numbers were used to compare the numbers of known cultural resources in each alternative. The density of cultural resources under each alternative was calculated by dividing the number of acres inventoried for cultural resources by the number of known cultural resources. The density is expressed as one resource per number of acres (e.g., one site per 100 acres).

The potential number of cultural resources that may be affected under each alternative was estimated by dividing the potential number of acres disturbed in each alternative by the site density. The number of significant sites (historic properties) was estimated by multiplying the potential number of sites by 0.18. This number was derived from the Class I Overview (Hoefer et al. 2002), in which 18 percent of the documented cultural resources in the Planning Area were evaluated as eligible or potentially eligible to the NRHP.

The impact analysis considered three types of impacts:

- **Direct –** Direct impacts are caused by ground-disturbing activities that immediately alter cultural resources in a physical manner (e.g., construction of roads, wells, pipelines, and stockponds).
- **Indirect –** Indirect impacts result from activities that may cause degradation to cultural resources as an unintended consequence of the activity. Examples include livestock grazing, cross-country vehicular travel, construction that leads to erosion in areas outside the construction zone, recreation, and increased artifact collection and vandalism.
- **Cumulative –** Cumulative impacts represent the loss of cultural resources over the long term due to the incremental impact of past, present, and reasonably foreseeable future actions. Over time, certain types of cultural resources (e.g., prehistoric campsites or historic homesteads) may be lost if development is concentrated in areas containing these resources.

Impacts to cultural resources in the Planning Area under the Proposed Plan are described below, including selected comparison to one or more of Alternatives I through V. Some impacts may represent an irreversible and irretrievable commitment of cultural resources (Section 4.6).

4.4.2.3 Impacts of the Proposed Plan

The Proposed Plan would allow oil and gas leasing atop the plateau, but large areas would be protected from most potential ground-disturbing activities by various NGD/NSO restrictions for specific ecological and sensitive visual resources. Additionally, the phased and clustered development under the Proposed Plan would reduce the number and total acres of surface disturbances. Below the rim, clustering at levels greater than currently used in the Planning Area would be a management goal for new leases as well as for future development on existing leases but would not be a specific requirement. Nonetheless, the combined result of these measures would be less surface disturbance than under Alternatives I through V, including Alternative I (Table 4-2). Total (long-term plus temporary) surface disturbance of approximately 1,130 acres (1.5 percent of BLM lands in the Planning Area) would result from a total of 193 well pads and 124 miles of new or upgraded access roads. In comparison, Alternative I would result in 1,901 acres of surface disturbance, 254 well pads, and 152 miles of new or upgraded access roads—despite almost the entire upper plateau being unavailable for oil and gas leasing.

All of the alternatives include a utility corridor near the eastern side of the Planning Area. The utility corridor covers 6,827 acres of Federal and private lands. Grazing, range management, and recreation (including hunting) could also impact cultural resources. Travel would be restricted to designated corridors throughout the Planning Area, except for over-snow travel by snowmobile with a minimum of 12 inches of snow cover and open (off-route) travel in the Hubbard Mesa OHV Riding Area. Vegetation and range management would use a combination of administrative and physical measures (e.g., additional

fencing, stock watering ponds, and weed management) to improve currently degraded areas. Coal or oil shale development would be permitted, subject to the NGD/NSO restrictions, but neither is anticipated during the 20-year life of the Plan.

Direct and Indirect Onsite Impacts

A cultural resources inventory has been conducted on 66.5 percent of the lease acreage (48,950 acres) and on 16.3 percent (1,116 acres) of the utility corridor. Within the proposed lease area are 316 known cultural resources, of which 51 are eligible or potentially eligible for nomination to the NRHP. It is likely that the portion of the lease area above the rim contains additional cultural resources that are obscured by the denser vegetation in this area (Hoefer et al. 2002). The utility corridor contains 43 known cultural resources, of which six are eligible or potentially eligible for nomination to the NRHP. Table 4-20 lists the types and NRHP eligibility classification for BLM lands in the Planning Area. See Table 4-21 regarding sites in the utility corridor.

Table 4-20. Cultural Resources in Areas Subject to Oil and Gas Leases, Proposed Plan

Component Type	Resource Type	NRHP Eligibility			Total
		Eligible	Potentially Eligible	Not Eligible	
Prehistoric	Isolated Find	0	0	117	**117**
	Lithic Scatter	4	7	37	**48**
	Open Camp	19	11	52	**82**
	Other Prehistoric	1	1	5	**7**
Historic	Isolated Find	0	0	2	**2**
	Habitation	0	2	18	**20**
	Aspen Art	0	0	21	**21**
	Ditch/Water Control	2	0	2	**4**
	Road	1	1	0	**2**
	Mine	1	0	2	**3**
	Artifact Scatter	0	0	4	**4**
	Other Historic	0	1	5	**6**
Total		**28**	**23**	**265**	**316**

Table 4-21. Cultural Resources in the Utility Corridor

Component Type	Resource Type	NRHP Eligibility			Total
		Eligible	Potentially Eligible	Not Eligible	
Prehistoric	Isolated Find	0	0	21	**21**
	Lithic Scatter	0	0	3	**3**
	Open Camp	0	1	7	**8**
	Other Prehistoric	0	1	1	**2**
Historic	Isolated Find	0	0	1	**1**
	Habitation	0	0	3	**3**
	Aspen Art	0	0	0	**0**
	Ditch/Water Control	1	0	0	**1**
	Road	1	1	0	**2**
	Mine	0	0	0	**0**
	Artifact Scatter	0	0	1	**1**
	Other Historic	0	1	0	**1**
Total		**2**	**4**	**37**	**43**

Combined cultural resource density in the utility corridor and the area to be available for oil and gas leasing under the Proposed Plan is one resource per 155 acres. The potential surface disturbance of 1,130 acres from oil and gas development activities indicates that approximately 7.3 cultural resources could be impacted under this alternative. Using the figure that 18 percent of the sites in the Planning Area are eligible or potentially eligible to the NRHP (Hoefer et al. 2002), an estimated 1.3 eligible or potentially eligible site (0.18 x 7.3 = 1.3) would be affected. Of course, the actual number could be higher or lower (zero), depending on the exact location of ground-disturbing activities. In comparison, the combined 1,901 acres of surface disturbance under Alternative I (No Action) and 2,948 acres under Alternative III (Preferred) would impact approximately 12 and 19 cultural resources, respectively.

Erosion caused by oil and gas development may increase the potential for indirect impacts on cultural resources outside the direct impact areas. Again, however, the number and acres of well pads and the miles and acres of new or upgraded access roads would be less under the Proposed Plan than any of the alternatives analyzed in the Draft RMPA/EIS.

Offsite and Cumulative Impacts

Any direct or indirect impacts on cultural resources on Federal lands would be in addition to impacts associated with increased development and travel on private lands within the Planning Area, and on both Federal and private offsite lands. Furthermore, siting of roads and pipelines on Federal lands may influence the route these developments take across private lands.

Summary of Impacts to Cultural Resources

All of the alternatives considered in this RMPA/EIS have the potential to impact cultural resources. The magnitude of potential impacts is directly related to the amount of oil and gas development activities and other ongoing resource uses that involve ground-disturbing activities or increased human access into currently little-used areas. The potential for direct impacts to significant cultural resources increases slightly from Alternative I through Alternative IV of the Draft RMPA/EIS due to relatively modest

increases in the amount of new development assumed to occur. Impacts under Alternative V could be substantially greater due to the large number of well pads and miles of new or upgraded roads needed to support the assumed level of development.

In contrast to the five previous alternatives, potential impacts would be substantially less under the Proposed Plan. This would result from the smaller number of well pads and miles of new or upgraded roads associated with the requirement for phased and clustered development atop the plateau and BLM management emphasis toward clustered development below the rim.

Tables 4-22 and 4-23 compare the number of cultural resources by NRHP eligibility category and potential numbers of affected resources. The following subsection addresses mitigation measures, management actions, and policy considerations—including legal mandates—that would avoid or minimize these impacts.

Table 4-22. Number of Known Cultural Resources and NRHP Eligibility by Alternative

Alternative and Area		*NRHP Eligibility*			*Total Cultural Resources*
		Eligible	*Potentially Eligible*	*Not Eligible*	
Alternative I	Lease Area	9	10	116	**135**
	No-Lease Area	19	13	149	**181**
Alternative II	Lease Area	19	20	218	**257**
	No-Lease Area	9	3	47	**59**
Alternatives III, IV, and V (All Leased)		28	23	265	**316**
Utility Corridor (Alternatives II – V)		2	4	37	**43**

Table 4-23 Number of Potentially Affected Cultural Resources by Alternative

Alternative	*Area of Long-term and Short-term Surface Disturbance*	*Average Cultural Resource Density in Areas of Oil and Gas Leasing*	*Potentially Affected Cultural Resources*	*Potentially Affected Significant Cultural Resources*
I (No Action)	1,901 acres	1 per 99 acres	19	3.5
II	2,262 acres	1 per 123 acres	18	3.3
III (Preferred)	3,269 acres	1 per 155 acres	21	3.8
IV	3,269 acres	1 per 155 acres	21	3.8
V	4,211 acres	1 per 155 acres	27	4.9
Proposed	1,130 acres	1 per 155 acres	7.3	1.3

4.4.2.4 Mitigation, Management, and Policy Considerations under All Alternatives

Mitigation Measures

Impacts to significant cultural resources (historic properties) can be mitigated with a variety of strategies. To conform to the requirements of Section 106 of the NHPA, cultural resource inventory and evaluation projects are conducted prior to development activities. If significant cultural resources are encountered, it is BLM policy to avoid them whenever possible. If a resource cannot be avoided, BLM, SHPO, and the ACHP consult to determine the appropriate mitigation measures, according to the terms of the BLM National Programmatic Agreement (PA). Native American groups and the public are consulted as necessary.

To integrate further the BLM cultural resource policy with the goals and policies for other resources, BLM issued agency-wide Information Bulletin (IB) 2002-101 in May 2002. This IB has two goals. Goal 1 is to preserve and protect significant cultural resources and ensure they are available for appropriate uses by present and future generations. Goal 2 is to identify priority geographic areas based on probability of unrecorded significant resources.

Goal 1 is met by the inventory and evaluation of cultural resources and classification of resources into six use categories:

- scientific use
- conservation for future use
- traditional use
- public use
- experimental use
- discharged from management

Classified cultural resources in the first five categories are subject to management actions that preserve and protect the resource. Those discharged from management have all protective measures removed.

To meet Goal 2, sensitivity areas were developed for the Planning Area to inform future management decisions (Hoefer et al. 2002). High sensitivity areas are those parts of the Planning Area where the density of cultural resources is one per 118 acres. Moderate sensitivity areas have a density of one cultural resource per 234 acres, and low sensitivity areas have a density of one resource per 538 acres.

Management Actions

Management actions for each use allocation and sensitivity area are discussed below. Sensitivity area recommendations are summarized in Table 4-24, followed by recommendations for data collection, monitoring, geoarchaeological investigations, site evaluation policies, and impacts to private lands.

Table 4-24. Recommended Cultural Resource Management Actions

Sensitivity Zone	*Recommended Action*				
	Project Location	*Areas Not Yet Inventoried*	*Areas Inventoried – No resources*	*Potentially Eligible Resources*	*Eligible Resources*
High	Atop the Plateau	Conduct Class III inventory	Monitor	Avoid or test excavate	Avoid or implement data recovery plan
	Below the Rim	Conduct Class III inventory	Monitor	Avoid or test excavate	Avoid or implement data recovery plan
Moderate	Atop the Plateau	Conduct Class III inventory	Monitor	Avoid or test excavate	Avoid or implement data recovery plan
	Below the Rim	Conduct Class III inventory	No further work	Avoid or test excavate	Avoid or implement data recovery plan
Low	Atop the Plateau	Conduct Class I inventory	No further work	Avoid or test excavate	Avoid or implement data recovery plan
	Below the Rim	Conduct Class I inventory	No further work	Avoid or test excavate	Avoid or implement data recovery plan

Use Allocations

Scientific — Sites in this category need to be preserved and protected from all potentially damaging actions until the research potential is fulfilled. Once the research potential is fulfilled through excavations, surface collections, or any other appropriate method, further conservation is unnecessary.

Conservation for Further Use — Sites in this category should be segregated from all other land or resources uses, including cultural resource uses, which would threaten the maintenance of their present condition or setting. Protective measures and designations should be developed and implemented for these sites.

Traditional — Cultural properties in this category are to be managed in ways that recognize the importance ascribed to them and seek to accommodate their continued traditional use. Tribes should be consulted to determine how traditional use allocations should be protected, managed, and used.

Public — Cultural properties assigned public uses should be managed in a way that makes them available for use by the public, but at the same time protects the historic value of the property. For each site in this category, permitted uses and limitations need to be determined. The public, especially historical societies and educational institutions, should be consulted on possible uses and management of such properties.

Experimental — Should any sites be placed in this category in the future, the type(s) of experimentation allowed should be specified. It is further recommended that BLM develop a protocol to use for experimental sites including proposal review, monitoring implementation, and reporting requirements.

Discharged from Management — Properties discharged from management remain in the inventory, but are removed from further management consideration and do not constrain other land uses. No protective measures would be instituted for sites in this category. It is recommended that BLM develop specific criteria to determine when and how sites should be placed in this category. At a minimum these criteria should consider the physical condition, information potential, and public use potential of the site.

High-Sensitivity Zones

Areas Not Inventoried — Class III inventories should be conducted in both the upland and lowland areas where no inventories have occurred. Limited auger or shovel testing should be conducted at all

newly discovered sites. Testing should be of sufficient scope to describe subsurface deposits and make reasonable estimates on the probability of the presence of subsurface deposits.

Inventoried Areas, No Resources — In the upland high sensitivity areas, where no surface resources have been encountered, any ground-disturbing activity should be monitored. Such monitoring is needed because much of the surface is obscured by vegetation. In the lowlands, monitoring should occur in areas with potentially intact Holocene or late Pleistocene deposits. Should monitoring encounter any surface or subsurface materials, sufficient testing should be conducted to determine the vertical and horizontal extent of the deposit, evaluate site geomorphology and stratigraphy, salvage any identified manifestations, and determine NRHP eligibility.

Potentially Eligible Sites — Sites evaluated as needing additional data and located within areas of potential effect that cannot be avoided would require testing to refine NRHP eligibility further.

Eligible Sites — NRHP-eligible sites within the area of potential effect that cannot be avoided would require a data recovery plan to be formulated and implemented.

Ineligible Sites — In upland areas, these sites should be monitored during ground-disturbing activities and reevaluated if subsurface remains are found. Although these sites have been field evaluated as ineligible, the vegetation obscuring the ground surface brings into question evaluations of these sites. Many site forms have poorly written evaluation statements and it is unclear whether or not the sites are significant. No further work is recommended for ineligible sites in lowland areas.

Moderate-Sensitivity Zones

Areas Not Inventoried — Class III inventories should be conducted in upland areas and Class II inventories in the lowland areas. In the uplands section, auger or shovel testing should be conducted at all newly discovered sites. This testing should be of sufficient scope to describe the subsurface deposits and make reasonable estimates as to the probability of the presence of subsurface deposits. The location and amount of Class II inventory in the lowland areas should be determined on a case-by-case basis.

Inventoried Areas, No Resources — In upland moderate-sensitivity areas, where no surface resources have been encountered, any ground-disturbing activity should be monitored. Such monitoring is needed because much of the surface is obscured by vegetation. Should monitoring encounter any surface or subsurface materials, sufficient testing should be conducted to determine the vertical and horizontal extent of the deposit, evaluate site geomorphology and stratigraphy, salvage any identified manifestations, and determine NRHP eligibility. In the lowlands, monitoring should occur only in known areas of intact Holocene or late Pleistocene deposits with a good probability of containing intact cultural deposits.

Potentially Eligible Sites — Sites evaluated as needing additional data, located within areas of potential effect that cannot be avoided, would require testing to refine NRHP eligibility further.

Eligible Sites — NRHP-eligible sites within the area of potential effect that cannot be avoided would require formulation and implementation of a data recovery plan.

Ineligible Sites — Upland area sites should be monitored during ground-disturbing activities and re-evaluated if subsurface remains are found. Although these sites have been field evaluated as ineligible, vegetation obscuring the ground surface brings into question evaluations of these sites. Many of site forms have poorly written evaluation statements and it is unclear whether or not the sites are significant. No further work is recommended for ineligible sites in lowland areas.

Low-Sensitivity Zones

Areas Not Inventoried — Conduct a Class I inventory to determine if known sites are in the area of potential effect. Special attention should be focused on possible early oil shale extraction and processing sites in the Roan Cliffs area. If the Class I study identifies areas where sites may occur, these areas should be subject to inventory.

Inventoried Areas, No Resources — No further work is recommended.

Potentially Eligible Sites — Sites evaluated as needing additional data, located within areas of potential effect that cannot be avoided, would require testing to refine NRHP eligibility further.

Eligible Sites — NRHP-eligible sites within the area of potential effect that cannot be avoided would require formulation and implementation of a data recovery plan.

Ineligible Sites — No further work is recommended.

Policy Recommendations

Data Collection Policy

Temporal information is not currently being collected in the study area and accurate temporal information is lacking for most prehistoric sites in the study area. Projectile point and ceramic chronologies have proven less than useful as an indicator of site age. To rectify this situation, different types of information need to be gathered. The best source of temporal information is material that can be dated by radiocarbon methods or ceramic shards that can be dated by thermoluminescence. It is recommended that BLM encourage the collection and analysis of datable materials and develop procedures for the controlled collection and analysis of such samples on all monitoring and testing projects. Any material that is collected for dating should, at a minimum, meet one of the following conditions: (1) the sample is in stratigraphic context, and/or (2) the sample is in good association with artifacts or features.

Monitoring Policy

The monitoring recommendation is presented to determine if cultural material is being obscured by vegetation in the highlands and to develop a better understanding of sediments correlated with cultural deposits. It is recommended that monitoring be conducted on all ground-disturbing activities in the areas outlined above until sufficient information is gathered to determine if (1) the vegetation is obscuring additional cultural remains in the uplands, and (2) certain sediments contain buried cultural components. The results of such monitoring should be reviewed annually to determine if this approach is reaching the stated objectives.

Geoarchaeological Policy

To ensure that the archaeologist conducting test excavations or monitoring activities is adequately informed, a geoarchaeological investigation of the study area is desirable (Waters 1992). A geoarchaeological investigation focusing on the formation of current and past landforms and sediments and the ages of sediments provides a context to evaluate subsurface cultural deposits discovered during testing or monitoring. A geoarchaeological evaluation can be done two ways. A geoarchaeological specialist can be required to be part of any investigation where ground disturbance is likely. Alternatively, a geoarchaeological overview of the study area would be initiated and the results made available to future archaeological investigations. It is recommended that BLM pursue funding for a geoarchaeological overview of the study area, or require a geoarchaeological specialist on all archaeological monitoring and testing/excavation projects. Such work is critical for proper NRHP evaluations to be conducted.

Site Evaluation Policy

It is recommended that a more rigorous methodology of NRHP site evaluations be required, particularly on sites that may contain historic archaeological remains or are representative of a single occupation. In formulating site recommendations, the research questions presented at the end of the Results Section should be used as a basis for the recommendations. Research questions presented in Reed and Metcalf (1999) can also be used if applicable to the study area, and research questions not identified in the Class I overview (Hoefer et al. 2002) can also be used if they identify an applicable research problem. Following a method such as that outlined below may remedy some of the evaluation bias problems discovered in the

site analysis. First and foremost, it is recommended that the method presented in Little et al. (2000) be used as a model for evaluation methodology. The method includes the following steps:

1. Identify the data set(s) or categories of archaeological, historical, or ecological information available for the property.
2. Identify the historic context(s), i.e., the appropriate historical and archaeological framework in which to evaluate the property.
3. Identify the important research question(s) that the data sets can be expected to address.
4. Taking archaeological integrity into consideration, evaluate the data sets in terms of their potential and known ability to answer research questions.
5. Identify the important information that an archaeological study of the property has yielded or is likely to yield.

Recommendations for Inventory of Private Lands in the Planning Area

To develop information on portions of the study area not under Federal jurisdiction, archaeological investigations on private lands are encouraged. Section 112 of the NHPA encourages Federal agencies to work with private landowners whose property contains historic resources. The types of sites on private lands and the information contained within them are needed to complete the picture of prehistoric and historic developments in the area. This may be a unique opportunity to develop a public-private partnership to explore the prehistory and history of the upper Grand Valley. It is recommended that BLM actively pursue partnerships with existing Federal, State, and non-profit programs to help inventory, evaluate, and protect cultural resources on private lands.

4.4.3 Socioeconomics

4.4.3.1 Introduction

A number of the management changes proposed by BLM have the potential to produce socioeconomic (sociological and economic) impacts. Proposed changes in the amount of Federal mineral estate available for oil and gas leasing could substantially increase the region's mineral fuel reserves and would extend the length of time that the region would continue to supply oil and gas. These changes would also increase Federal and local government revenues and local employment. Other management actions proposed under the various alternatives analyzed in this RMPA/EIS—e.g., to establish ACECs, close some of the roads in the Planning Area to public motorized or mechanized use, and prohibit cross-country travel in most of the Planning Area—could change the recreational experience in the area, which in turn could alter the pattern of local expenditures for recreation equipment and supplies.

Proposed management changes under the various alternatives would have the potential to alter the perceptions of area residents about their lifestyles and the quality of their lives. Impact assessment standards used in this analysis are described below. Because impact assessment involves professional judgment, often based on contradictory elements, the standards should be viewed as guidelines. Some proposals could have impacts that vary in degree depending on the scale of comparison. For example, changes in the grazing program could have a major impact on individual ranchers, a moderate impact on grazing in the region, and a negligible impact on the local economy. In general, adverse impacts are described in terms of the local economy or the local community of residents.

- **None –** The action is unlikely to result in any change in socioeconomic conditions.
- **Negligible –** The action may bring about temporary, short-term, or marginal changes that are unlikely to be of interest to the general public. If the impact indicator could be quantified, it would be less than 1 percent of the current or future condition.

- **Minor –** The action may bring about permanent or temporary changes that would not substantially alter socioeconomic conditions that could be of interest to some of the general public. If the impact indicator could be quantified, it would be 1 to 5 percent of the current or future level.
- **Moderate –** The action is likely to bring about permanent or long-term changes that alter socioeconomic conditions and would be of interest to the general public. If the impact indicator could be quantified, it would be 5 to 15 percent of the current or future level.
- **Major –** The action is likely to bring about permanent or long-term changes that substantially alter socioeconomic conditions and would be of significant interest to the general public. If the impact indicator could be quantified, it would be more than 15 percent of the current or future level.

Note that the same terms are applied in a more relative sense to describe beneficial impacts.

4.4.3.2 Impacts of Proposed Plan

The potential social and economic impacts of the Proposed Plan are considered in the context of the fast growing, dynamic environment of the region. The Planning Area is in Garfield County, one of the fastest growing counties in Colorado. Garfield County also hosts the fastest growing area of oil and gas development in Colorado. The socioeconomic analysis measures the potential direct, indirect, and cumulative impacts of the Proposed Plan on population, housing, cost of living, employment, personal income, and dependency on Federal lands. Environmental justice and transportation are considered in subsequent sections.

Socioeconomic Impacts of Oil and Gas Development

Table 4-25 compares the potential socioeconomic impacts and trends for Garfield County and the Planning Area under the Preferred Alternative and the Proposed Plan. These potential impacts are based on proposed oil and gas development for Garfield County as a whole and inside the Planning Area under the Preferred Alternative or Proposed Plan.

Estimates for drilling rigs in operation, wells drilled per year, oil and gas employment, total wells drilled, and natural gas production for Garfield County during the 20-year period of analysis are based on recent operation and drilling data as well as industry forecasts (*Post Independent* 2005, COGCC 2006). The estimates of the number of drill rigs, wells drilled per year, and total wells drilled for the Preferred Alternative and Proposed Plan were taken from Table 4-2. Annual oil and gas employment was estimated based on the number of drill rigs. Industry data reveal that about 30 to 45 jobs in Garfield County are associated with each operating drill rig (Barrett 2004, Post Independent 2006).

Indirect employment was estimated using a job multiplier of three from State data and recent research on oil and gas impacts for La Plata County, Colorado (CDLE 2004, Ft. Lewis College 2005). Indirect employment represents the jobs in support services that would be created by oil and gas employment.

Gas production for the 20-year planning period was estimated using an average annual production rate for a well with a 30- to- 40-year lifetime and production levels taken from the RFD (Appendix H). This assumption simplifies the actual production curve for an individual well. However, new wells would be drilled each year throughout the 20-year planning period, and wells drilled early in the period may be declining as new wells are added. Therefore, total production from all wells would level out to an overall production rate within the estimated range. The estimated production rate for Garfield County assumes continued increases in annual gas production. In 2005, about 237 BCF of natural gas was produced in Garfield County (COGCC 2006). At this annual rate, about 5,000 BCF would be produced over 20 years.

Table 4-25. Comparison of Potential Socioeconomic Impacts and Trends

Component Analyzed	*Garfield County*	*Increment on BLM Lands in Planning Area*	
		Alternative III (Preferred)	*Proposed Plan*
Drilling Rigs in Operation	60 – 90	6-8	9
Wells Drilled per Year	1,500 – 2,250	79	86
Annual Employment			
Oil and Gas Employment	1,800 – 4,000	234	270 – 400
Indirect Employment	3,600 – 8,000	700	540 – 800
Cumulative Gas Development over 20-Year Plan Period			
Total Wells Drilled	10,000 – 20,000	1,324	1,570
Natural Gas Production 20 Years (BCF)	6,000 – 12,000	781	700 – 900
Cumulative Fiscal Impact over 20-Year Plan Period			
Value of Gas Production [1]	$6 – $12 trillion	$7.8 billion	$7 – $9 billion
Property Tax Revenues [2] (to Garfield County)	$72 – $143 billion	$93 million	$84 – $108 million
Property Tax Revenues [3] (Total)	$300 – $600 billion	$390 million	$350 – $450 million
Federal Severance Taxes [4]	--	$1,200 million	$875 – $1,125 million
State Share of Federal Severance Taxes [5]	--	$600 million	$438 – $563 million

[1] Assumes long term gas price of $10 per thousand cubic feet (EIA 2005).

[2] Assumes a mill levy of 13.655 on 87.5% of production value. (Garfield County 2005).

[3] Assumes a mill levy of 50 (Garfield County 2004).

[4] Would be reduced by an estimated $40 million due to provisions of the Transfer Act regarding NOSRs 1 and 3.

[5] County totals depend on the amount of gas production on Federal lands.

Fiscal impacts of natural gas production were estimated using a long-term average gas price of $10 per MCF (EIA 2005). Property tax revenues to Garfield County were estimated using a mill levy of 13.655 on the assessed value of gas production (87.5 percent)(Garfield County 2005). Potential Federal royalties (12.5 percent of production value) and the share of these royalties that would go to Colorado (50 percent) are included to illustrate additional revenues from the Preferred Alternative and Proposed Plan.

Population and Housing

Potential impacts of the Proposed Plan on population and housing are minimal if considered in the context of growth rates and patterns for central Garfield County. Population for Garfield County is predicted to more than double over the next 20 years, from just over 50,000 in 2005 to between 105,000 and 115,000 in 2025. Given an average household size of 2.7, the direct employment associated with the Proposed Plan could increase population by 730 to 1,080 persons, assuming that an average-size household moves into the area with the job (DOLA 2005). This amounts to less than 2 percent of the expected population growth in Garfield County over the next 20 years.

Housing has been a critical issue in Garfield County for the past few years because of very low vacancy rates and relatively high prices. Between 1990 and 2000, municipalities in Garfield County experienced population growth rates significantly higher than rates at which housing was being built (USFS White

River FEIS, Volume 2002). For example, the population of Rifle grew by about 40 percent between 1990 and 2000, but housing stock increased only 25 percent. Between 2000 and 2004, the Rifle population grew by about 15 percent, and housing stock grew at about the same rate (DOLA 2005). However, housing stock would have to grow faster than population to fill the housing gap. The housing vacancy rate in Rifle was just under 3 percent in 2004. By comparison, in 2004, the housing vacancy rate in Garfield County was just over 6 percent, and the Colorado average was about 12 percent (DOLA 2005).

A moderate to severe impact on housing availability could occur if employees choose to live in municipalities such as Rifle, Silt (2004 housing vacancy rate 1.5 percent), or Parachute (4.5 percent vacancy rate). Currently, insufficient vacant housing exists in Rifle, Silt, and Parachute combined to accommodate the 270 to 400 potential households associated with direct oil and gas employment under the Proposed Plan. However, Garfield County as a whole currently has 1,200 vacant housing units or more. Also, employment practices in the oil and gas industry in Garfield County—such as use of temporary drill rig crews and subcontractors from outside the region—could reduce the need for permanent housing. Depending on access routes to oil and gas production in the Planning Area and resident housing needs, the Proposed Plan could exacerbate the local housing crunch. Mitigation measures could include applying federal royalty revenues to construction of temporary and permanent affordable housing in central Garfield County.

Employment and Personal Income

Total employment in Garfield County was just under 30,000 in 2005 (DOLA 2006a). It is expected to increase to between 45,000 and 60,000 during the next 20 years. In 2001, employment in mining and extractive industries (including oil and gas) represented less than 2 percent of total employment in Garfield County (DOLA 2003a). Therefore, the 270 to 400 jobs associated with oil and gas development under the Proposed Plan would be insignificant. The indirect employment (540 to 800) in goods and services jobs supported by the oil and gas industry would also be insignificant in the greater Garfield County employment picture. Total employment (direct and indirect) expected from the Proposed Plan (810 to 1,200) would constitute less than 5 percent of present employment in Garfield County. Therefore, significant employment impacts would be unlikely to result from the Proposed Plan.

Since oil and gas jobs have relatively high wages, they could have a larger impact on personal income than overall employment. Average wages for oil and gas jobs range from about $40,000 to $100,000 per year (Fort Lewis College 2005, DOLA 2006a, *Post Independent* 2006). This range is higher than average wages for jobs in the top five employment categories for Garfield County (construction, retail trade, real estate, hotel and food service, and government)(NWCOG 2005). Median household income in Garfield County was $48,018 in 2003 (BLS 2005). Almost three-fourths of all personal income in Garfield County is derived from wages or salaries (DOLA 2005). Therefore, the relatively high-paying oil and gas industry jobs resulting from the Proposed Plan could have a small positive (beneficial) impact on personal income levels in Garfield County.

Although oil and gas jobs pay relatively high wages, the cost of living in Garfield County is also higher than average. A recent study of the Rural Resort Region in Colorado that includes Garfield County found that a hypothetical family of four living on the median household income for the area would be facing 13 percent higher cost of living in Garfield County than a standard city (NWCOG 2004). The higher cost of living in Garfield County is due primarily to higher housing costs, which are almost double those of the standard city. It takes a household with more than double the median income to qualify to purchase a home of 1,800 to 3,000 square feet in Garfield County (NWCOG 2005). Therefore, the higher paying oil and gas jobs under the Proposed Plan (and Alternatives I through V) could have a small beneficial impact on the standard of living in Garfield County by enabling more households to meet the higher cost of living without lowering their living or housing standards.

Tax and Other Government Revenues

Taxes on revenues from oil and gas production in Garfield County contribute a significant and growing share of total government revenues. In 2004, taxes on oil and gas production were almost 18 percent of Garfield County's total revenue of $44 million (Garfield County 2005). Property taxes on oil and gas production represented almost half of total property taxes collected in Garfield County that year. The school districts in the vicinity of the Planning Area rely on property taxes from the oil and gas industry for more than three-fourths of their annual funding (*Post Independent* 2006). Another revenue source from oil and gas production in Garfield County consists of State and Federal severance tax distributions, including both direct distributions and grants. With natural gas production in Garfield County increasing and gas prices rising, tax revenues from this source would probably have an increasingly significant impact on government revenues.

Property taxes are paid to the cities and counties on the value of annual oil and gas production, as well as land and improvements owned and leased by the gas producers. In Garfield County, 87.5 percent of this total value is assessed with a tax rate of $0.013655 per dollar of property value. For the value of natural gas production estimated under the Proposed Plan, tax revenues to Garfield County would be about $4 to $5 million per year over the planning period. This would constitute about 10 percent of total annual revenues to Garfield County at current budget levels. In addition to county taxes, gas producers pay taxes to school districts and municipalities. These tax revenues are a large share of the budgets for the school districts (Garfield RE-2 and District 16) in proximity to the Planning Area. Therefore, the gas production estimated under the Proposed Plan could have a small beneficial impact on total county property tax revenues but a larger beneficial impact on revenues for school districts in Rifle and Parachute.

In addition to property and sales taxes, gas producers pay between 2 and 5 percent of gross income as State severance taxes on every cubic foot of gas produced inside Colorado. This tax revenue is distributed through the DOLA Affairs Energy and Mineral Impact Assistance fund. The State of Colorado uses a complex set of formulas and conditions for distributing State and Federal severance tax revenues (see Appendix M). About 7.5 percent of the State severance taxes are given back to the local governments, depending on the share of resident oil and gas employees living inside the county or municipality. Recently, Garfield County and the City of Rifle saw significant reductions in their severance tax distributions because the State changed how it determined "resident" employees (*Post Independent* 2006). According to press reports, Garfield County's portion of severance tax revenues decreased from $2.7 million in 2004 to $2.1 million in 2005 because the number of qualified resident employees dropped from 900 to 476, despite significant increases in overall gas production and employment in Garfield County during the same 2-year period. Because of Colorado's complex severance tax distribution system, it is difficult to estimate the amount of State severances taxes actually received by the counties and municipalities due to natural gas production under the Proposed Plan. The impact of these possible revenues is likely to be beneficial, and perhaps substantially so, to the City of Rifle and Town of Parachute.

Another source of tax revenues relevant to the Proposed Plan is Federal Mineral Severance Tax distribution. For natural gas production on Federal lands, 12.5 percent of the production value is collected as severance taxes. This revenue is divided evenly between the Federal and State governments. The Federal half of the revenues collected on BLM lands is used as follows: 20 percent to the general treasury and 80 percent to the Reclamation Fund for Bureau of Reclamation Projects. The other half of the collected revenues is returned to the State as compensation for mineral production impacts and to fund mitigation measures. Colorado distributes these funds according to a complex set of formulas and conditions. Appendix M provides more information on severance tax distribution and a worksheet for estimating distributions to local governments.

The severance tax revenues collected on oil and gas production on BLM lands inside the Planning Area is subject to an additional condition in the agreement that transferred the NOSR from DOE to BLM. This

condition requires that about $40 million spent on oil and gas development on the NOSRs must be repaid before severance tax funds would be dispersed to the State. Colorado's distribution system is too complicated to allow a reliable estimate of the Federal severance tax funds that would be distributed to the counties and municipalities under the Proposed Plan. Based on production and revenues estimated over the 20-year planning period, Colorado's share of the Federal Severance Tax would be about $22 to $28 million per year.

In 2003, Colorado's share of Federal Severance Tax revenues was about $63 million, with about $36 million coming from oil and gas production (DOLA 2005b). In that year, Garfield County received about $1.3 million in Federal Severance Tax distributions (Garfield County 2003). Since then, the value of oil and gas production has increased across Colorado, especially in Garfield County. Therefore, the impact of potential Federal Severance Tax revenues from oil and gas production under the Proposed Plan could have a substantial beneficial impact on revenues for Garfield County and the municipalities near the Planning Area. However, whether these funds would be sufficient to pay for mitigation measures to offset negative impacts would depend on how the funds are distributed. Significant effort by local governments may be required to secure these funds, especially grant funds for mitigation projects (Appendix M).

Environmental Justice

An environmental justice review requires that each Federal agency identify any "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." Under the Proposed Plan, it is very unlikely that minority or low-income populations would suffer a disproportionately severe effect.

The largest minority population in the Planning Area is the Hispanic community, representing about 17 percent of the Garfield County population in 2000 (Sonoran Institute 2003a). The Hispanic population in Garfield County has been growing at a fast pace. Between 1990 and 2000, this population segment increased from 1,673 to 7,300 (RRR 2005). In 2003, almost one-third of total school enrollment was Hispanic (RRR 2005). The Hispanic population appears to be dispersed throughout Garfield County, as demographics for Rifle and Parachute show similar results for percentage of Hispanic population (Sonoran Institute 2003 b,c).

Garfield County presents some challenges to low income families because of the relatively high cost of housing in the region. Median household income in Garfield County in 1999 was just over $47,000 and about one-fourth of all households earned less than $30,000 (Sonoran Institute 2003a). In 1999, a household earning median income could not afford the median priced house (Sonoran Institute 2003a). In 2003, just over 8 percent of children in Garfield County were living in poverty. Average wages for the top job categories were all below median household income, ranging from $13,624 annual wages for food and accommodation services up to $38,200 for construction jobs in 2002 (RRR 2005). This means that many households need two or more wage earners to live in Garfield County; more than two-thirds of all families in Garfield County contained at least two wage earners in 1999 (Sonoran Institute 2003a). Under the Proposed Plan, the direct jobs for oil and gas development generally have wages above the median household income (Denver Post 2005). This could result in a small beneficial impact on household economic conditions in the region.

Overall, no evidence suggests that the Hispanic community or low-income population segments would be affected by the Proposed Plan to a greater or lesser degree than any other population segment.

Cumulative Impacts

The proportion of cumulative socioeconomic impacts from the anticipated level of oil and gas development under the Proposed Plan is very minor. For example, the estimated 1,570 new wells on BLM lands in 20 years would be in comparison to the projection of 10,000 to 20,000 for the county during the same timeframe (Table 4-25). There could, however, be some significant socioeconomic

impacts to the Town of Silt, City of Rifle, and Town of Parachute, depending on employee housing requirements and the distribution of Federal Severance Tax revenues.

Moreover, while the contribution to impacts of the Proposed Plan are insignificant compared to the cumulative impacts from the county-wide oil and gas development and county-wide population growth, the impacts of the cumulative total could be significant, even under the No Action alternative. For example, while 300 to 400 new households under the Proposed Alternative is not significant in comparison to the large growth forecasted for Garfield County over 20 years, limited availability of housing in these municipalities could create some impacts over the mid-term. The rate at which housing is being built in these municipalities has not kept pace with past growth. If significant shares of the potential new households are located in Silt, Rifle, or Parachute, current housing would be insufficient.

To address the potential mid-term shortage in both temporary and permanent housing, it would seem appropriate to use Federal Severance Tax revenues to meet this need. However, Colorado's distribution system for these funds does not guarantee that they would be available to the affected municipalities. Therefore, the potential exists for some adverse impacts to housing availability in Silt, Rifle, and Parachute, and the means to mitigate these impacts may not be readily available.

Impacts on Hunting and Hunting-related Revenues

Tourism is an important economic force in Garfield County, supporting 18 percent of all jobs in the County in 2003 (DOLA 2006c). Tourists require lodging, restaurants, sporting goods stores, guide and outfitter services, food, fuel and other types of supplies. In addition to Ski Sunlight, the Hot Springs Pool, and the Glenwood Caverns Adventure Park in eastern Garfield County, the many types of outdoor recreation opportunities throughout the County attract tourists. Hunting, fishing, river rafting, and OHV use draw visitors from throughout the state and nation.

In central Garfield County, big game hunting in particular is viewed as critical to the economy. In addition to providing economic diversity, hunting gives a seasonal boost to many local businesses that could not otherwise survive. In addition to outfitters and sporting goods stores, restaurants, motels, gas stations, motor vehicle sale and repair shops, and grocery stores all rely to some extent on hunting-season sales. Interviews with business people in the Roan Plateau area frequently elicited a comment that the hunting season makes the difference between profit and loss for the year.

Big game hunting occurs primarily on public lands managed by BLM or USFS. The Planning Area is nearly coincident with CDOW GMU 32, which is a popular hunting destination that includes the top of the plateau. During the 1990s, the number of deer and elk hunters in GMU 32 usually exceeded 2,500. However, the number has declined in recent years due to decreased numbers of deer and resultant changes in hunting regulations. In 2002, the number of hunter recreation-days (5,800) was less than half the average for the previous 10 years. Table 4-26 provides hunting statistics.

Table 4-26. Big Game Hunting Effort and Impact on Local Economies in 2002 [1]

Game Management Unit(s)	*Hunters*	*Hunter-Days*	*Direct Dollars*	*Indirect Dollars*
Planning Area and Immediate Vicinity (GMU 32) [2]	1,273	5,842	$1,700,000	$1,400,000
All GMUs Located Entirely or Primarily in Garfield County (GMUs 30 – 34)	10,782	48,273	$16,100,000	$12,900,000

[1] *Source: CDOW (2004, 2005)*

[2] *Data for GMU 32 pro-rated from combined data for all GMUs.*

At least three outfitters hold permits to provide guide and outfitting services in the Planning Area. The one outfitter interviewed felt that hunting success was poor atop the plateau because the prevalence of motorized vehicle use quickly drove the game to less accessible locations including large tracts of private land to the west. The outfitters employ as many as 20 people for 3 to 4 months each. CDOW recently estimated the economic impacts of big game hunting in Garfield County at $14.4 million in 2002. Using total recreation-days to pro-rate total estimated expenditures, it is estimated that approximately $1.7 million were expended in Garfield County by deer and elk hunters using the Planning Area and immediate vicinity in 2002 (Table 4-26).

The Planning Area is mostly contained within GMU 32, while GMUs 30, 31, 33, and 34 include most of the remainder of Garfield County. In addition to the direct expenditures by hunters are associated indirect economic impacts. Using a multiplier of 1.8 from CDOW and Colorado Demography statistics, the total direct and indirect economic impacts of hunters in the Planning Area and immediate vicinity was just over $3 million in 2002 (CDOW 2004, DOLA 2004). Potential economic expenditures for fishing were not included as a potential economic impact because the Planning Area is not a significant fishing destination in comparison to other locations in Garfield County.

CDOW statistics indicate that big game hunting effort and harvest inside the Planning Area have been on a downward trend for the past 15 years. Early in this period, the declines were probably related to a combination of natural and human-caused factors. More recently, declines reflect more stringent restrictions on hunting levels permitted by CDOW in an attempt to facilitate recovery of the declining deer population. Due in part to these recent declines, hunting is a relatively small contributor to total tourism expenditures in Garfield County. Data for 2002 were not available, but in 2003, tourism expenditures (including tourist services, resorts, and second homes) amounted to over $90 million. However, big game hunting expenditures can be locally substantial and timely, especially for specific types of commercial enterprises (sporting goods suppliers, motels, restaurants, etc.).

The impact of natural gas drilling on deer and elk populations has recently been studied in Wyoming and is currently under study in Garfield County (Sawyer et al. 2005, Post Independent 2006)(see Section 4.3.2.2 of this RMPA/EIS). Results from these studies are somewhat inconclusive. For the Wyoming study of a migratory deer population, Sawyer et al. (2005) reported a 46-percent reduction in overall population 4 years after drilling began. While most of the decline followed a severe winter, no similar decline was observed in a "control" area without oil and gas activity. Even without the population decline, it was clear from earlier years of the study that deer were shifting their patterns of use away from the oil and gas activity. Preliminary results of the study in Garfield County indicate no significant impact of drilling activity on resident mule deer populations. Therefore, more analysis would be needed before a definitive estimate of impacts of oil and gas development on BLM lands under the Proposed Plan could be made.

As described in Section 4.3.2.2 of this RMPA/EIS, various assumptions regarding avoidance by deer and elk of active oil and gas development and the effectiveness of seasonal restrictions on development within winter range and year-round restrictions on use in wildlife security areas were used to estimate effective habitat loss. The result was an effective loss of 19.2-percent of the mapped winter range in the Planning Area. Even so, however, this does not necessarily mean that the populations of deer and elk in the Planning Area and adjacent GMUs would be affected sufficiently to alter current levels of hunter use.

Restrictions on cross-country travel atop the plateau under the Proposed Plan could also affect the experience of hunters by not allowing use of ATVs or other motorized or mechanized vehicles off designated routes. As with reductions in the amount of available winter range, however, it is not possible to estimate whether these restrictions would alter hunter use of the Planning Area to an extent that could be detected economically.

Impacts on Recreational Travel and Related Revenues

The Proposed Plan would designate all BLM lands in the Planning Area as the Roan Plateau ERMA, with custodial objectives and implementation actions intended to (1) retain some level of opportunity for participation in traditional recreation activities, (2) provide for visitor health and safety, (3) address use and user conflicts, and (4) protect resources.

Two significant changes from current travel and transportation management could have socioeconomic impacts related to changes in patterns of human use. The first is restricting or closing motorized travel on 26 miles of BLM routes atop the plateau and 2 miles below the rim. The second is managing the JQS Road for historical and public use but diverting industrial travel to Cow Creek Road for access to the top of the plateau. Access for oil and gas development through private land on the west (i.e., in the Parachute Creek valley) could also receive a substantial portion of oil and gas traffic. Although modifying public use patterns somewhat, the route closures and restrictions are unlikely to impact significantly the traditional uses in the Planning Area. Table 4-27 shows the travel management designations for BLM lands under the Proposed Plan, Preferred Alternative, and No Action Alternative.

Table 4-27. Comparison of Travel Management Designations

Category		*No Action*	*Preferred*	*Proposed Plan*
Travel Designation		**Acres**		
Open to Motorized and Mechanized Travel		66,934	0	2,640
Limited		0	66,934	64,474
Closed		0	0	0
Route Management		**Miles**		
Open to Motorized or Mechanized Use	Atop the Plateau	162	113	86.5
	Below the Rim	97	96	86.5
Limited to Administrative Access	Atop the Plateau	0	24	52
	Below the Rim	0	0	16
Closed to Motorized or Mechanized Use	Atop the Plateau	0	26	26
	Below the Rim	0	0	2

The Proposed Plan would designate Hubbard Mesa as open to OHV travel. Motorized and mechanized travel on all other BLM public lands in the Planning Area would be limited to designated routes except for over-snow travel by snowmobiles where snow cover is at least 12 inches of snow. These designations would not exclude vehicles used for emergency, official, or other authorized purposes. OHV travel and access may also be limited at certain times or seasons, in certain areas, or to certain vehicles types and numbers of vehicles. In Colorado, off-road driving is one of the fastest growing recreation activities (Colorado State Parks 2003). The economic impact of OHV use in Colorado is estimated between $200 million and $230 million per year (Colorado State Parks 2003). While current OHV and mountain bike use numbers for Hubbard Mesa are not available, designation as a free-ride area is likely to increase its use as a riding destination. This could result in a positive economic benefit to the community through increased tourism and demand for tourist services

Potential impacts of oil and gas development under the Proposed Plan on traditional recreation opportunities would vary depending on the type of recreation and experience being sought. Many recreation opportunities would be protected by NGD/NSO and SSR/CSU restrictions in areas of sensitive resources values—including an SSR/CSU in the Hubbard Mesa OHV Riding Area. As noted in the 1999 FSEIS, "Non-motorized recreation values in places outside these areas may be affected by road

construction and a change in the overall recreation setting if oil and gas development occurs within them. Construction of roads and well pads makes an area appear less natural and less remote and increases the likelihood that the visitor would encounter other visitors, most likely on motorized vehicles."

Depending on the pattern of oil and gas development inside the Planning Area, the character of some areas could change from a more primitive, remote experience to one with more human impacts and interactions with other people. These changes would be less noticeable in areas with existing roads that receive regular traffic. For visitors seeking a motorized recreation experience and expecting to encounter other visitors, these changes could be considered positive. Visitors who prefer more natural settings with fewer visitors and less obvious human-caused landscape modifications would likely view these changes as negative (BLM 1999a). While these changes may affect the types of visitor experiences being sought, the effect on tourism expenditures is expected to be negligible.

4.4.4 Transportation and Traffic

4.4.4.1 Introduction

Potential impacts on the Planning Area transportation system include changes in the amount and type of traffic and the construction of new roads or abandonment of existing roads. Changes in the level of traffic and the type of traffic inevitably have secondary impacts on the governmental entities that manage the road system and may have to deal with increased maintenance and other traffic management issues, like safety. Road construction and abandonment also have secondary effects, either increasing or decreasing the need for maintenance and system management.

Whatever impacts are brought about by changes in BLM management in the Planning Area, traffic levels near and into the Planning Area are expected to increase. Table 3-31 in Section 3.4.4 describes traffic levels that might occur in the year 2023. The relatively low levels of traffic occurring currently at critical Planning Area access points suggest the potential for changes in public land uses to have a major effect at those points. CR 242, the JQS Road, shows 84 average daily trips currently and a projected 113 in 2023. CR 244 at Fravert Reservoir shows 317 and 428 trips, respectively.

The change in BLM management with the greatest potential to affect traffic levels would be offering for lease the oil and gas mineral estate in the NOSRs. An assumed 210 wells would be drilled above the rim and 1,360 below the rim under the Proposed Plan. The lower drilling rate atop the plateau reflects a combination of a smaller area of available land, more difficult access, a thicker geologic section to penetrate, more stringent environmental constraints, and a reduced drilling season due to snow accumulation (an assumed 6-month season)(Appendix H).

The traffic generated by an average of approximately 78.5 wells per year during the 20-year period of analysis is shown in Table 4-28. The table includes the number of vehicle trips required to develop a single well, the number required for an assumed 78.5 wells per year, and the average daily traffic generated by 78.5 wells. These numbers are derived from data used previously by Notar (1998) in modeling air quality impacts from oil shale development on the NOSRs.

In addition to increases in traffic volume, oil and gas development has a substantial impact related to the construction of new roads or upgrading of existing routes for access to well pads. These newly constructed or improved roads are the source of much of the environmental impact of drilling due to removal of vegetation, disturbance of the soil, invasion of disturbed soil by noxious weeds and other undesirable plants, erosion of disturbed soil into streams, and airborne dispersal of disturbed soil particles as fugitive dust. Construction or upgrading of access roads can affect visual quality, impact surface water and aquatic habitat at stream crossings, and increase fugitive dust. Potentially, new or upgraded roads can also affect wildlife through increased disturbance (more noise and larger vehicles) and increased habitat fragmentation. Risks of damage to paleontological and cultural resources also increase in proportion to new or upgraded roads.

Table 4-28. Vehicular Traffic Expected for Oil and Gas Drilling on BLM Lands [1]

Vehicle Class	*Total Number of Trips for One Well[2]*	*Total Trips in One Year (78.5 Wells)[3]*	*Average Daily Trips for 78.5 Wells[4]*
16-wheel Tractor-Trailers	88	6,908	19
10-wheel Trucks	216	16,956	46
6-wheel Trucks	452	35,482	97
Pickup Trucks	404	31,714	87
Total	**1,160**	**91,060**	**249**

[1] Does not account for efficiencies associated with phased and clustered development under the Proposed Plan.

[2]Trips by different vehicle types are not necessarily distributed evenly during the drilling process.

[3]Number in one year based on 1,570 well in 20 years (avg. = 78.5 per year)(Table 4-2).

[4]Average daily trips based on 30 days to complete a well.

The most important impact on transportation is the addition to the existing network of roads in an area. When new oil and gas development roads are abandoned, BLM may elect to retain some of these roads and open them to public use. Some of the new access roads are likely to provide opportunities for recreational travel into otherwise remote, undisturbed locations. Whether this is viewed as a negative or beneficial impact depends on the perspective of the potential user. Any oil and gas roads that BLM deems inappropriate for retention following abandonment would be reclaimed.

BLM road construction standards are applied in the design of access roads for oil and gas development or other uses. These standards have proven effective in mitigating soil erosion problems related to disturbance from construction operations. Actions such as limiting road grades, providing proper water drainage including ditches and culverts, applying surface materials such as gravel, avoiding excessive earthwork and sidecast of materials, and implementing dust abatement techniques can effectively mitigate adverse impacts. BLM requires that the operator obtain all necessary local permits, including the hauling permits required by Garfield County.

Roads to producing wells are generally maintained periodically by the operator to provide year-round access. Maintenance activities such as surface blading, culvert and ditch cleaning, spot surfacing, and weed control are required to meet road standards and minimize resource impacts. When a well is plugged and abandoned, BLM usually requires the rehabilitation and closure of roads related to the site, unless overriding benefits to the public dictate that a road remain open for travel.

4.4.4.2 Impacts of Proposed Plan

Direct and Indirect Onsite Impacts

Management Actions — The Proposed Plan would designate the East Fork Parachute Creek and Trapper/Northwater Creek ACECs atop the plateau, the Magpie Gulch and Anvil Points ACECs below the rim, a WMA for the entire Parachute Creek drainage basin on BLM lands, and manage to maintain the WSR-eligible streams. BLM would close and rehabilitate 28 miles of existing roads, including 26 miles above and 2 miles below the rim. Below the rim, 86.5 miles of roads would remain open to motorized or mechanized use. Above the rim, a total of 86.5 miles of road above the rim would remain open to motorized or mechanized travel, and an additional 52 miles would be limited to administrative use. In the short term, BLM would have to pay for rehabilitation of the roads closed above the rim, but maintenance costs would be reduced in the long term.

Despite the limitation of travel on some routes to administrative use, the overall growth in the road system would open previously isolated areas of public land to motorized use. The limitation to

administrative use of new roads would be beneficial but would not eliminate the increased generation of noise and dust, diminution of visual quality, and changes in wildlife use along new roads or existing roads improved for oil and gas access. However, these potential adverse impacts are also expected to be much less under the Proposed Plan than Alternatives I through V, due both to clustered development and to a focus on locating oil and gas facilities along ridgetops in areas atop the plateau. While having a locally greater visual impact along the ridgetop roads in areas of oil and gas development, this focus reduces substantially the number and length of roads within the more sensitive stream valleys.

Traffic on the remaining open roads and trails would increase incrementally over time and might also show increases due to displaced use from closed roads. However, the change in the character of the landscape above the rim, from heavily motorized to a greater emphasis on non-motorized recreation, might in fact reduce overall use of roads above the rim.

Road segments shared by oil and gas lessees, grazing permittees, and recreationists, whether for vehicular or non-vehicular travel, would represent some level of conflict for the latter group in terms of traffic, noise, dust, safety, and the quality of the experience.

Impacts from Oil and Gas Development — All BLM lands and Federal mineral estates underlying private surface estates in the Planning Area would be available for oil and gas leasing under the Proposed Plan. Eventually, the road network above the rim might change by the addition of an estimated 16 miles of new or upgraded roads due to oil and gas development. This would add substantially to the 86.5 miles to remain open to public motorized or mechanized use and the 52 miles to remain open only to administrative use above the rim. Below the rim, up to 108 miles of roads might be added to the 86.5 miles to remain open to motorized or mechanized use. These additions would require substantial management by BLM to oversee maintenance, maintain closures, and monitor use.

The primary access routes to the area atop the plateau for oil and gas development is via Cow Creek Road, which enters the area from Rio Blanco CR 5 to the north, or from a route across private land to the west (from the Parachute Creek valley). BLM currently intends to preclude use of the closest direct access from Rifle—JQS Road (CR 242)—for oil and gas activities involving heavy or oversize vehicles. Garfield County may elect to establish other restrictions pertaining to oil and gas travel in pickup trucks or other smaller vehicles. The latter restrictions could be based on safety concerns and interference with other uses such as recreational travel.

The amount of traffic due to oil and gas development would depend on the rate and distribution of development in any one year. However, the estimated 78.5 wells drilled per year under this alternative could result in 249 additional trips per day, mostly by vehicles larger than pickups. If all of the pro-rated portion attributable to development atop the plateau (approximately 33 trips per day) were to travel via SH 13 and CR 5 to Cow Creek Road, the impact would represent an increase of 1.6 to 2.2 percent on SH 13 north of Rifle and approximately 16 to 22 percent on CR 5 (see Table 3-27). These estimates assume that traffic associated with development on BLM lands atop the plateau would be compressed into a 6-month drilling season, consistent with the assumption of the RFD (Appendix H).

If half of the oil and gas traffic were to access BLM lands atop the plateau by a planned new route through private lands to the west (from the Parachute Creek valley), the increase in traffic would be halved to approximately 0.8 to 1.1 percent on SH 13 and 8 to 11 percent on CR 5. However, traffic along CR 215 north of Parachute would increase by approximately 1.3 to 1.8 percent (see Table 3-27).

If all of the pickup truck traffic associated with drilling atop the plateau were to travel via the JQS Road, the impact on that road would be approximately 47 trips per day (assuming a 6-month drilling period), representing an increase of 42 to 56 percent (Table 3-27).

Offsite and Cumulative Impacts

Adding an estimated 93 miles of new roads to the existing 259 miles on BLM lands during oil and gas development would be offset to some degree by the closure and rehabilitation of 28 miles of existing roads under the Proposed Plan. New roads or trails built for range improvements would add to the oil and gas total. Oil and gas access roads would have multiple secondary impacts on natural resources and ecosystem values, not only due to physical disturbance but also because the expanded route network would increase vehicular traffic in areas of public and private land that had previously been isolated. Limiting new roads on public lands to administrative access would not eliminate secondary impacts.

It is unlikely that the County road system within the Planning Area will grow, because the dispersed private lands within the Planning Area are already served by County roads. In contrast, the road network on private lands created to serve oil and gas development will continue to grow, with or without implementation of the Proposed Plan or any of the five alternatives analyzed previously. Assuming that the per-well estimate of 0.6 mile used in the RFD (Appendix H) for BLM lands also applies to private lands, approximately 124 miles of new roads might be constructed or upgraded to access development in these areas. The estimate may be high, because the per-well average length of access road is likely to decrease as the number of wells increases through time.

Development of new roads within the Planning Area and increases in traffic on County, State, or Federal highways in response to increased drilling in the Planning Area would be additive to regional increases that are accompanying general population growth and the development of oil and gas resources in nearby offsite areas.

County road maintenance costs would reflect the level of increased activity on County roads.

4.5 MANAGEMENT ENVIRONMENT

4.5.1 Lands and Realty

Under the Proposed Plan, as in Alternative II of the Draft RMPA/EIS, BLM would recommend the revocation of the withdrawals for NOSRs 1 and 3. If approved, this would allow entry and patenting under the Mining Law of 1872.

All public lands within the Planning Area, with the exceptions noted below, would be designated Category II and thus subject to multiple-use management and available for exchange. This would include several parcels (12 to 15, 21, and 22) that were identified for disposal (Category I) under the 1984 GSRA RMP. The parcels are now contiguous with a more substantial parcel of public land (NOSR 3) and are no longer considered small or isolated.

Parcel 11 (approximately 40 acres in the NE¼, SW¼, Section 21, Township 6 South [T6S], Range 96 West [R96W]) and Parcel 20 (39.98 acres in Lot 10, Section 29, T6S, R94W) would remain Category I because they are small and isolated from other public land. Four other parcels formerly within the NOSR surface or mineral estate would be placed in Category I. They are located in the extreme northeastern portion of the Planning Area near SH 13 (35.28 in Lot 11, Section 6, T5S, R93W); on top of the plateau in the middle of a large tract of private property (39.7 acres in Lot 10, Section 10, and Lot 10, Section 11, T6S, R95W); just north of I-70 in the Cottonwood Gulch drainage (40 acres in the SE¼, NE¼, Section 33, T6S, R95W); and in the northwestern portion of the Planning Area (73.38 acres in Lots 5 and 7, Section 4, T5S, R95W).

Some 35,000 acres of the NOSRs and another 5,000 acres would be classified as Category III lands. Their status as lands within one of four ACECs, within areas having wilderness character, would preclude their consideration for exchange or sale.

The utility corridor along the western side of SH 13 and across Hubbard Mesa and Hubbard Gulch to I-70 would be identified as a formal BLM utility corridor for new pipelines and utilities. The 40-acre parcel adjacent to the Rifle Sportsmen's Club would be designated as suitable for expansion of the club under terms of the R&PP.

All direct impacts upon the lands and realty program would be administrative in nature, with no direct environmental impacts. Other programs and resources would be affected by the revocation of the NOSR withdrawals, by the change in land tenure categories, by the availability of land near the Rifle Sportsmen's Club for R&PP lease, and by the designation of formal utility corridors.

This alternative would not result in indirect, offsite, or cumulative environmental impacts on the lands and realty program.

4.5.2 Onsite Travel Management

4.5.2.1 Delineation of Travel Management Areas (TMAs)

The TMA delineation for the Roan Plateau Area allows muscle-powered (i.e., foot, ski, horse, stock) cross-country travel year-round. Mechanized (wheeled conveyance) travel in the TMA is limited to designated routes year-round.

The Hubbard Mesa TMA delineation (same boundary as the Hubbard Mesa OHV Riding Area) allows muscle-powered (i.e. foot, ski, horse, stock) travel and mechanized (wheeled conveyance) travel cross-country year-round consistent with the "open" OHV designation for motorized use below.

All TMA delineations are subject to additional restrictions (e.g., seasonal, area, type, and number) set forth in the ROD or in subsequent travel planning.

4.5.2.2 Designation of Off-Highway Vehicle (OHV) Management Areas

Travel management designations vary among the alternatives analyzed, according to the acreage that would be designated as open to motorized cross-country travel, or limited to designated routes, or closed to motorized and mechanized travel. Additionally, the alternatives vary in the degree to which routes in designated "limited" areas are open to public use, versus administrative use only or closed to all use.

The Hubbard Mesa OHV Riding Area is designated as "open" to cross-country motorized travel. In all other portions of the Planning Area, with BLM surface, motorized travel is classified as "limited" to designated routes except snowmobiles which are allowed to travel cross-country if there is at least 12" of snow (see 43 CFR 8342.1). OHV travel and access may also be restricted at: certain times/seasons, in certain areas, and/or to certain vehicular types and numbers.

The designation excludes:

- Any military, fire, emergency, or law enforcement vehicle while being used for emergency purposes
- Any vehicle whose use is expressly authorized by the authorized officer, or otherwise officially approved (e.g., grazing permittee, CDOW personnel).
- Vehicles in official use. Official use means use by an employee, agent, or designated representative of the Federal Government or one of its contractors, in the course of his employment, agency, or representation (43 CFR 8340.0-5(a)(1-5)).

OHV includes any motorized vehicle capable of, or designed for, travel off an improved road and on, or immediately over, land, water, or other natural terrain. Table 4-27 in Section 4.4.3 summarizes the OHV designations and route management for the Proposed Plan, Alternative III (Preferred), and Alternative I (No Action). Over-snow travel by snowmobile would be allowed throughout the Planning Area under all

alternatives (with at least 12 inches of snow cover), except that Alternative II of the Draft RMPA/EIS would limit snowmobiles to designated routes.

Also under all of the alternatives, closure of any routes would include some degree of reclamation, typically consisting of decompaction, recontouring, seeding with an appropriate native seed mix, and (where needed) installing an erosion-control fabric or similar material. Upon abandonment, any new roads constructed for oil and gas development would also be reclaimed, unless BLM determines that a road should be retained for another use. During the period of oil and gas drilling and production, roads constructed for that purpose are to be closed to public use; in most cases. Locked gates would be placed across the roads to safeguard facility investments from damage by vehicles and reduce conflicts between public land users and gas production.

4.5.2.3 Impacts of Proposed Plan

A total of 28 miles of existing routes would be closed and rehabilitated, another 68 miles would be limited to administrative uses, and 2,640 acres would be open to cross-country travel in the Hubbard Mesa OHV Riding Area (Table 4-27 and Map 27). New roads associated with oil and gas development would be designated for administrative use only.

Direct and Indirect Onsite Impacts

Impacts are summarized below by resource management program. Programs not described below are not expected to affect the system of roads and trails.

Recreation — The public has become accustomed to using the identified route system as open under the interim travel designations. Implementation of the proposed travel designations will cause minor changes in access compared to what is currently available under the interim travel routes. Negligible changes in the current diversity of recreational activity opportunities available to the public will occur.

Oil and Gas Development — With the entire Planning Area available for lease, oil and gas drilling is assumed to result in up to 124 miles of new or upgraded roads, including 16 miles atop the plateau. Note that this is substantially less than under the five alternatives analyzed in the Draft RMPA/EIS (Table 4-2), reflecting the requirement for phased and clustered development on top and BLM management toward clustering to a comparable surface density below the rim. All new roads would be designated for administrative access only. Therefore, the public will see no gain in miles of roads for public use.

Special Management Designations and Restrictions — Special management emphases associated with designation of four ACECs, the Parachute Creek WMA, and the WSR-eligible streams would affect onsite travel management to the extent that any needed new roads could require special alignment, design, and mitigation measures consistent with the qualities emphasized by the special designations. Restrictions on surface uses, including NGD/NSO and SSR/CSU restrictions for a variety of sensitive resources, would also affect the location or design/mitigation of new roads.

Visual Resource Management — The principal VRM component under the Proposed Plan that would affect the system of existing or new routes is the NGD/NSO restrictions for the VRM Class I area of the East Fork Falls and visually highly sensitive areas of the I-70 viewshed (i.e., slopes steeper than 30 percent visible from I-70). These would preclude new road construction unless exception criteria were met (Appendix C). The SSR/CSU restrictions for VRM Class III areas atop the plateau would allow BLM to require relocation of the proposed alignment and/or require special design or mitigation to reduce the visual impacts.

Livestock Management — Over the long term, livestock management would require periodic construction of fences, ponds, springs, and other range improvement projects. Each of these could require a new access route for construction and/or long-term maintenance. Any new roads for this use would be open only for administrative uses.

Wildlife and Special Status Species Management — Seasonal restrictions to protect wildlife, special status species, or their habitat could temporarily limit construction and certain types of use of roads and trails.

Weeds and Weed Management — Roads and trails serve as conduits for the introduction and spread of invasive plants, including State-listed noxious weeds (Section 3.3.1). Noxious weeds and other undesirable invasive plants generally share the ability to become established and proliferate quickly once introduced into suitable environments such as disturbed ground along roads and other travel routes. The spread of weeds is usually at the expense of more desirable native plants (and, indirectly, wildlife). Roads and trails are ideal corridors for weed dispersal because they create long linear disturbances to existing vegetation and soils which are ideal for colonization, result in soil compaction that native species cannot tolerate, change the hydrologic regime by increasing or disrupting runoff, create a zone of warmer temperatures, create zones of dust accumulation, or (if magnesium chloride is used as a dust suppressant) create a zone of saline conditions. Road and trails also serve as corridors along which vehicles, hikers, and livestock serve as vectors to transport weed propagules into uninfested areas.

To reduce dispersal of weeds related to construction of new roads, BLM may require specific abatement or mitigation measures during construction or reclamation of roads in areas of weed infestations.

Riparian/Wetland Areas — To maintain or improve the functioning of riparian/wetland areas, existing roads and trails could be rerouted, repaired (e.g., a culvert installed), or removed. In most cases, new routes would be required to avoid or minimize impacts to these habitats.

Offsite and Cumulative Impacts

A total of 259 miles of existing routes would be closed and rehabilitated for resource reasons, and another 68 miles would be limited to administrative uses. Since the estimated increase of 93 miles of roads would be open only for administrative uses, the cumulative change of all the actions will be a minor loss of publicly accessible routes.

4.5.3 Recreation

4.5.3.1 Introduction

Public lands are increasingly recognized as crucial to meet the growing recreation demand of the neighboring communities. The activity, setting, and experience/benefit opportunities vary among the alternatives in terms of quantity, quality, and distribution. All of the alternatives analyzed, including the Proposed Plan, offer differing levels of dispersed recreation opportunities consistent with the management of priority land uses. Hubbard Mesa was identified as a SRMA in some alternatives for more structured and focused recreation management.

4.5.3.2 Impacts of Proposed Plan

Managers must consider the direct and indirect effects, both short-term and long-term, of the Proposed Plan and subsequent implementation actions to determine the impacts on recreation activities, recreation settings, and the recreation experience and benefit opportunities.

Recreation Activities

The available opportunities for dispersed recreational activity that would remain following implementation of the Proposed Plan would be a consequence of its components rather than a specific management objective. The Consultation and Coordination process, following publication of the Draft RMPA/EIS, did not establish either an identified market for structured recreational opportunities or a need to manage Hubbard Mesa for more than the current activity opportunities associated with OHV driving/riding and mountain biking. To meet the activity opportunity demand, Hubbard Mesa would be designated as the Hubbard Mesa OHV Riding Area but not as an SRMA defined by BLM's *Land Use*

Planning Handbook (BLM 2001a). Hubbard Mesa would be identified for recreation and visitor services with the other public lands as part of the Roan Plateau ERMA. It should be noted that recognition of a singularly dominant activity demand of and by itself, however great, is not a sufficient basis for the identification of an SRMA (BLM 2001a).

Activities, settings, and experience/benefit outcomes are of greatest importance to residents of nearby communities and to destination visitors. Since recreation would not be a management focus but one of several allowable multiple uses, the effects on participants and their recreation opportunities are inconsequential relative to achieving the general management objective of the Proposed Plan.

Recreation Settings

The physical, social, and administrative characteristics of the recreational setting produces different experience and benefit opportunities for recreation participants. During preparation of the Draft RMPA/EIS, and ROS analysis was used as a basis to assess the character of the recreation setting for each alternative. The ROS classes (shown in Maps 39 through 42 of the Draft) portray the existing character of recreational settings (No Action Alternative) and the possible setting character created by each alternative. The physical ROS classes, and the corresponding extent (in acres) of each on BLM lands under existing conditions, are as follows:

- Urban 0
- Rural 2,826
- Front Country 19,076
- Middle Country 24,539
- Back Country 20,493
- Primitive 0

While the Draft RMPA/EIS determined different acres of the ROS classes to the various alternatives, the Proposed Plan does not emphasize recreation or visitor services. Although public comments on the Draft RMPA/EIS indicated a demand for undeveloped recreation settings, BLM has concluded that management to accommodate substantial oil and gas development precludes maintaining characteristics specific to undeveloped recreation settings. Instead, recreation managers would custodially manage the entire Planning Area as an ERMA. This recognizes that recreation settings under the Proposed Plan would be affected by the development of oil and gas and assumes that recreational users would adjust their activities and patterns of use in response to short-term and long-term changes in the physical, social, and administrative setting. The resulting recreational settings and recreation outcomes are considered consequences of the Proposed Plan and not prescribed as recreation management objectives. As the physical, social, and administrative settings change, some recreational activities, experiences, and benefit opportunities would be lost, and some visitors who prefer those recreation settings would be displaced.

Recreation Management

BLM policy limits recreation program investments and implementation actions in ERMAs to those that "take care" of stewardship needs associated with recreation-tourism activity participation. Recreation management within the Roan Plateau ERMA will be limited to custodial implementation actions aimed at (1) providing for visitor health and safety, (2) addressing use and user conflict, and (3) protecting resources. Recreation management guidelines (Appendix E) were developed to help achieve and maintain healthy public lands as defined by the Standards for Public Land Health in Colorado (Appendix F). These guidelines provide implementation methods and techniques that will help custodially manage recreation to meet resource objectives. Thus, the Proposed Plan would not have foreseeable impacts to custodial management of the Planning Area as an ERMA.

Direct and Indirect Onsite Impacts

Oil and Gas Development — Oil and gas development and production facilities often adversely impact recreation opportunities through physical/visual disturbance, noise, dust, odors, and additional traffic and people. Within appropriate densities, effectively designed and implemented gas development can be compatible with maintaining middle-country, front-country, rural, or urban ROS classes and the connected recreational opportunities. Increasing levels of oil and gas development under any of the alternatives would represent decreased opportunities for people seeking back-country or primitive recreational settings but increased opportunities for people seeking the other settings.

The requirement for phased and clustered development atop the plateau would greatly reduce the extent of any changes in recreational settings, since the number of pads would be relatively small (thirteen anticipated during the 20-year period of analysis) and limited to only one development area at a time. Another component of the Proposed Plan that bears on recreation is the focus on locating oil and gas facilities on ridgetops. While this would tend to make the facilities more visible to travelers along access roads servicing the development area, the ridgetop emphasis would avoid or minimize the amount of activity and setting disturbance to the deeper stream valleys.

An indirect impact of oil and gas development on recreation is the likely displacement of big game and other sensitive species by distances of 0.25 to 0.5 mile from access roads, depending on traffic volumes, road quality, topography, and density of vegetation cover near the road (Noss 2003). Changes in big game habitats and habits would alter the experience or even displace people who visit an area because they enjoy the wildlife, scenery, views, and aesthetics of the area. Onsite outfitter/guide operations would also be affected, although the extent of change cannot be estimated.

Livestock Grazing and Range Management — Signs of livestock grazing, such as the presence of cattle or sheep, fences, driveways, stock tanks and ponds, cropped forage, trampled vegetation, or manure affect the natural aesthetics for some recreationists and impair their ability to enjoy the scenery, views, and aesthetics of the area.

Travel Management — Recreational roads and trails enhance access to the outdoors. Travel directly affects setting remoteness, naturalness, site management, and social encounters. A system of designated routes would reduce travel-related impacts on recreation settings and could reduce recreational trespass on adjacent private lands. The quality of recreation activities including hunting and wildlife viewing, would be improved by restricting public travel to designated routes that are designed to reduce displacement of big game animals.

For some visitors, the restriction of motorized and mechanized travel to designated routes throughout most of the Planning Area is likely to be positive, since it is intended to reduce the numbers of informal trails that are created and thus to protect visually and ecologically sensitive areas. For some visitors, however, these restrictions may make the affected areas unsuitable for their intended outcomes. It is hoped that the designation of the Hubbard Mesa OHV Riding Area as "open" to cross-country travel by motorized or mechanized vehicles will help offset the restrictions elsewhere on BLM lands in the Planning Area.

Offsite and Cumulative Impacts

The diversity recreation settings on public lands administered by BLM in the Planning Area offer a multitude of "close-to-home" recreational opportunities (activity, setting, benefit) not provided by other local recreation service providers (e.g., state wildlife areas, state parks, and community parks). The White River National Forest does manage for some of the same recreation activity, setting, and experience opportunities, but these are more distant from the communities.

The demand for recreation and the associated settings and opportunities in the Planning Area would have individually minor but cumulatively moderate or greater impacts, as follows:

- Increased traffic on recreation routes
- Population growth, especially in surrounding communities and within easy driving distance (USFS 2002)
- More diverse values within a changing population and less understanding of traditional uses
- Continued changes in land uses and the different expectations of land users
- Potential reconstruction and upgrading of I-70, resulting in increased use
- Increases or decreases in oil and gas development and other activities on public lands
- Recreation management changes, especially OHV restrictions, in the White River National Forest
- Expansion of destination resorts in the region
- Development on adjacent private property and in-holdings
- Continuing changes in recreational equipment that affect where and how people may recreate; of particular concern to those who pursue activities such as hiking or hunting in less developed and less used areas
- Displacement of some recreationists to other public lands or to other regional providers of dispersed recreation opportunities in undeveloped settings, assuming that capacity is available
- Growth in the extent of the economic benefit of tourism, which may cause a demand for increased recreation opportunities on public lands
- Increased public demand to provide motorized trails in suitable areas
- Increased traffic on recreation routes

Mitigation

Since recreation is not a focus of management but an allowable multiple use within the ERMA, maintaining a specifically identified recreation opportunity is not a management priority, so no mitigation is proposed. If crowding during the hunting season becomes an issue, CDOW has the ability to limit the numbers of hunters in GMU 32, as has been done recently to aid in recovery of mule deer populations following a regional decline.

4.5.4 Grazing and Rangeland Management

4.5.4.1 Introduction

A number of proposed management actions for the Planning Area as part of this RMPA/EIS have the potential to impact livestock grazing and rangeland management and health. Two categories of actions are described and assessed:

1. Management actions specifically directed at rangeland resources in terms of the resources (i.e., range condition) and the grazing permittees who use BLM lands to graze their livestock.
2. All other proposed land uses and management actions that would affect rangeland management and resources, including vegetation management (focused on the ecological aspect of vegetation rather than as forage for livestock), oil and gas development, special land use designations, management of travel and recreation, and actions taken to protect or enhance habitat for fish and wildlife.

Direct impacts to grazing and rangeland management as used in this RMPA/EIS are defined as those that affect the allotment permittees in terms of lease conditions, such as allowable AUMs (Section 4.5.4) and season of use. Direct impacts may affect all three interrelated attributes of rangeland health as defined by BLM: soil/site stability, hydrologic function, and biotic integrity (BLM 1997a). In turn, all of these may

influence the rangeland condition that most directly and proximately affects the number of domestic grazers that can be supported: forage quality and quantity. Impacts to forage quality and quantity may be negative, such as reduced biomass production and increased prevalence of weeds, or positive, such as increased biomass production and increased prevalence of desirable species.

A number of indirect impacts to rangeland management and health are also possible under any of the alternatives analyzed. Indirect impacts of surface disturbance include a general loss of forage area or availability of forage due to surface occupancy for other uses, construction or widening of roads, direct and indirect damage to soils and vegetation, and closure of specific areas to livestock to protect or enhance one or more other resources. Livestock may be harassed by vehicular traffic, human visitors, and their dogs. Introduction or expansion of noxious weeds through various vectors can poison livestock but more commonly replaces preferred forage with unpalatable and or less-productive plant species.

Impacts to soils or vegetation cover can also result in transport of eroded soils to streams and ponds, where the sedimentation reduces the availability and quality of watering areas. A catastrophic release of a chemical pollutant into a watering source could cause direct harm to livestock or make watering areas unusable; such releases are infrequent, but could occur during oil and gas development or chemical control of noxious weeds or other undesirable plant species.

Cumulative impacts are discussed in terms of past, present, and future actions on private lands within the Planning Area and both public and private lands in nearby offsite areas.

This section discusses vegetation as a forage source in support of ranching operations in the Planning Area. In many cases, the AUMs on BLM lands utilized by the local ranches form a key source of forage in the yearly feed budgets for their operations. However, the vegetation resources in the Planning Area are also managed for their intrinsic values under the Proposed Plan guided by specific objectives for the major natural plant communities in the Planning Area. Land Health Standards for riparian systems (#2) and upland vegetation and animal communities (#3) acknowledge the multiple uses of the vegetation resource by discussing management along a continuum of characteristics. Managing vegetation for one aspect of the resource can result in conflicts with the other. For example, precluding livestock use of sensitive plant communities such as riparian habitats would enhance the vegetation (and associated fish and wildlife) values but would reduce the amount and quality of forage for livestock, require augmented management, and force grazing permittees to provide for additional sources of water.

The converse would also be true. Managing vegetation for maximum livestock productivity, palatability, and nutrition often involves planting non-native forage species to supplement native species suppressed or lost due to prolonged grazing use. Maximizing livestock production generally also means placing these large grazers into plant communities that are less resilient to the impacts of trampling and selective plant removal. This is acknowledged by Stoddart et al. (1975):

> "It is impossible to obtain the best use of a range without some disturbance, and the rancher cannot always have climax vegetation as his goal."

In a more recent edition of their book, the same authors (Stoddart et al. 1975) discuss this point farther. For example, at page 428 is the following statement:

> "Grazing…and wildlife production are…legitimate and important uses of rangelands. Since no single use can be maximized without affecting and perhaps negating the other, trade-offs must be evaluated in some sort of optimizing process. In some cases, a landowner or [governmental entity] may unilaterally decide to emphasize a given product at the expense of others. However, this kind of land use is becoming rare, since society demands many goods and services from land whether public or private."

The conflicts between livestock operations, wildlife management, and other uses are addressed throughout this analysis; additional ramifications to vegetation are discussed in Section 4.3.1.

Wild herbivores that rely directly on vegetation for food range from mice to elk. Besides competing among themselves for this resource, wildlife also compete directly with livestock for the forage and thermal cover and hiding cover this vegetation provides, as well as for the other limiting resources of water and space. Any changes in use of vegetation by livestock necessarily affects wild herbivores, and vice versa. Because livestock occupy an area at greater than-sustainable levels (i.e., they are grazed in numbers that exceed the long-term carrying capacity of an area and then removed seasonally or when conditions are poor), the result of the direct competition is generally in favor of livestock and at the expense of wildlife. For example, where focused livestock use of riparian areas is allowed, the quality of the plant community as an intrinsically valuable resource and important wildlife habitat is reduced. Likewise, increased areas of human activity can cause wildlife to avoid an area with suitable forage, leaving more of the resource available to livestock than might otherwise occur. In some locations—not the Planning Area—where native hoofed herbivores (ungulates) are not hunted, they quickly habituate to human presence or occupy the land at abnormally high densities due to the refuge effect (e.g., parks and residential areas on the margins of cities and towns). In these situations, native ungulates can adversely affect ranching operations by removing substantial amounts of forage planted and managed primarily for livestock.

Other land use and resource management considerations would cause BLM to apply various surface-use restrictions and management prescriptions to protect specific resource values. These protective measures are listed and defined in Section 2.2. Note that NGD/NSO restrictions do not affect use of an area for grazing but would affect the ability of a permittee to construct permanent improvement range improvements (e.g., construction of fences, stockponds, etc. to direct livestock use), except as approved by BLM on a case-by-case basis. This is also true of the SSR/CSU restrictions that give BLM the authority to require relocation of a proposed ground-disturbing activity by more than 200 meters if necessary to protect a specific resource value. Unlike other alternatives, the Proposed Plan also requires any long-term ground-disturbing activity resulting from range improvements to be subject to reclamation guidelines and BMPs to meet resource objectives and standards (Appendices I and L). Such actions are subject to annual monitoring and reporting as a basis for assessing revegetation success and correcting shortcomings (Appendices J and K).

Note that TL restrictions (seasonal restrictions on use) intended to protect raptor nests, waterfowl nests, and big game winter range, do not apply to livestock but could be applied to applications for ground-disturbing activities such as construction of a stockpond, road, fence, or water pipeline.

As with all the considered alternatives, the continuing authorization of livestock grazing in the Planning Area under the Proposed Plan would be managed for conformance with BLM's Colorado Standards for Public Land Health and Guidelines for Livestock Grazing Management (Appendix F). Therefore, categories used to define impacts of specific land use or management actions on range condition and livestock grazing are defined in terms of these standards and guidelines, as follows:

- **None –** Effects are unlikely to impair the resource value, with no amount of physical disruption to the resources. Permittees would see no impacts to current lease terms and conditions, allotment sizes, stocking rates, or season-of-use conditions.
- **Negligible –** Detectible effects could occur but would last no more than one year (that is, not detectable after one full growing season). Anticipated effects are unlikely to result in noticeable impairment or enhancement of the resource value in terms of Land Health Standards. Permittees would see no noticeable impacts to current lease terms and conditions, allotment sizes, stocking rates, or season-of-use conditions.
- **Minor –** Effects are likely to result in noticeable but not substantial impairment of the resource value in terms of Land Health Standards, but the total area of disruption would include less than 5 percent of the resource. Permittees would see less than 5-percent impairment to current lease terms and conditions, allotment sizes, stocking rates, or season-of-use conditions.

- **Moderate –** Effects would be noticeable and could include substantial impairment of the resource value in terms of Land Health Standards. These effects could increase over time, or be long-term or permanent. The total area of disruption would include 6 to 15 percent of the resource. Permittees would see 6- to-15 percent impairment of current lease terms and conditions, allotment sizes, stocking rates, or season-of-use conditions.
- **Major –** Effects would be noticeable and are likely to include substantial impairment of the resource value. These effects may increase over time or be long-term or permanent. Permittees would see more than 15 percent impairment in current lease terms and conditions, allotment sizes, stocking rates, or season-of-use conditions.

Note that the same terms are used, although in a more relative sense, to describe anticipated beneficial impacts. The following subsections describe the anticipated impacts of proposed rangeland management activities, as well as impacts of all other resource values, on rangeland management.

4.5.4.2 Impacts of Proposed Plan

Livestock grazing would be managed under the Proposed Plan to conform to BLM grazing regulations and meet Land Health Standards as well as vegetation community objectives. Allotment management plans, to be developed and reviewed in collaboration with grazing permittees on a regular schedule, would provide a basis for monitoring rangeland health, evaluating existing grazing management, and making necessary grazing management adjustments to meet resource objectives and standards. Regular monitoring would occur on all allotments, using the Glenwood Springs Monitoring Plan (Appendix K).

A combination of administrative solutions (e.g., season-of-use revisions, livestock exclusions, and stocking level adjustments), range improvement projects (e.g., construction of fences or stockponds to direct livestock use), and application of BMPs and reclamation standards would be applied to meet resource objectives and standards. These would utilize the most recent version of BLM Technical Reference 1734-6 or an equivalent document. As under Alternatives I through V, rangeland projects that do not function to meet resource values and management objectives would be abandoned and rehabilitated.

Provisions would be made for applications of adaptive management of livestock grazing to prevent long-term ecological damage during droughts. Criteria would be identified for determining the beginning and end of drought periods on the basis of scientifically credible methods and data (e.g., Palmer Drought Severity Index, Crop Moisture Index, and soil moisture). Under potential drought conditions, the Field Office Manager would determine the beginning of a drought and assign proactive grazing management measures to be taken to mitigate damage to livestock and ecological values (i.e. season of use adjustments, reduced stocking levels, or complete rest). Upon determination by the Field Office Manager that a drought had ended, gradual restocking and season of use adjustments would be initiated.

Direct and Indirect Onsite Impacts

Grazing and Rangeland Management — As described above, rangeland management under the Proposed Plan is expected to result in general and gradual long-term improvements to range condition and trend, with minor to moderate positive impacts to rangeland resources.

The Proposed Plan would require regular development and review of AMPs by permittees and BLM and regular monitoring of allotment health. Administrative solutions and/or range improvement projects may be required of permittees to meet resource objectives and standards. BMPs and reclamation standards would apply to range improvement projects, as would monitoring and reporting of revegetation success in such areas. These actions may result in minor negative impacts to some permittees.

Vegetation Management Actions — Vegetation would be managed for its intrinsic value, with a focus on achieving specific objectives for the major natural plant communities in the Planning Area as well as a forage base for livestock grazing. These include supporting diverse native community composition and

production on upland sites, using primarily only native species in revegetation seed mixes, and encouraging range, fuels, fire, and vegetation management activities that protect and/or enhance the health and productivity of native plant communities. It is expected that this combination of management actions would result in direct moderate positive impacts to upland vegetation and rangeland resources.

The Proposed Plan includes an emphasis on noxious weed inventory, detection, and monitoring. These actions would allow a more focused and effective application of the current weed management program by providing data and information upon which to base management decisions. These would include incipient population locations, priority-to-control strategies, and the efficacy of different integrated methods for particular species and locations. Over time, this would indirectly provide a minor to moderate positive impact to range resources.

Due to protection of range resources in riparian areas and river corridors, individual grazing permittees may be subject to more administrative solutions than at present. This could result in some minor to moderate impacts to affected permittees from potential adjustments to stock level and/or season of use.

Travel and Recreation Management — This alternative would restrict travel to designated routes, except that cross-country travel would be permitted in the Hubbard Mesa OHV Riding Area. When combined with the closure and revegetation of existing routes, these proposed management actions are likely to result in minor improvements to range condition and trend and decreased livestock disturbance.

Oil and Gas Development — Development of fluid mineral resources under the Proposed Plan would result in an estimated 193 well pads and an associated 812 acres of new long-term disturbance (1.1 percent of BLM lands in the Planning Area) during the 20-year period of analysis (Table 4-2). An additional 318 acres of temporary impacts are also estimated, for a total disturbance to 1.5 percent of BLM lands in the Planning Area.

Direct and indirect impacts to vegetation above the rim would be reduced by the requirement of phased and clustered oil and gas development atop the plateau and the goal of managing toward clustered development below the rim. Atop the plateau, key components of the Proposed Plan would include a minimum separation of 0.5 mile between well pads, location of pads on ridgetops with slopes of 20 percent or less, limiting development at any one time to a single "development area," and limiting the amount of "currently disturbed" ground at any time to 350 acres (approximately 1 percent of BLM lands atop the plateau). In this context, "currently disturbed" means areas where vegetation has been stripped or otherwise removed or destroyed, and for which revegetation has not been initiated, has been in progress for less than two growing seasons, and/or is not showing satisfactory progress toward achieving revegetation success standards. If assumed BMPs, reclamation standards, and mitigation monitoring are implemented as described above, impacts to rangeland resources throughout the Planning Area would be minor. Exceptions may include some localized minor negative impacts to upland allotment areas, mostly below the rim, where allowed ground-disturbing activities would be cumulative to habitat degradation from ongoing ground-disturbing activities and drought effects and existing weed infestations. This could result in some negligible to minor impacts to affected permittees from required implementation of potential adjustments to stock level and/or season of use.

Special Management Designations and Restrictions — In general, few special resource management actions would result in impacts to rangeland resources. Some indirect benefits may occur as a result of selected ACEC and WMA management prescriptions for vegetation resources (Tables 2-2 and 2-3, respectively). Large and sometimes overlapping, NGD/NSO polygons would indirectly result in reduced loss of forage by limiting long-term ground-disturbing activities for the protection of other resources. Under the Proposed Plan, minor positive impacts to rangeland resources would result from special resource management actions and surface-use restrictions. Negative impacts to permittees as a result of these actions are expected to be negligible.

Offsite and Cumulative Impacts

Potential offsite impacts to rangeland resources would generally track those for vegetation resources. Although livestock grazing management under the Proposed Plan is expected to result in improvements to vegetation resources, the same management on private offsite lands cannot be assumed. Therefore, any potential negative impacts from livestock management offsite, including erosion, siltation, and other impacts to streams, as well as general vegetation degradation and noxious weed infestations, could negatively impact lands and forage within the Planning Area.

Negative impacts to forage production from oil and gas development are expected to be negligible to minor. However, in terms of cumulative impacts to vegetation it is important to note that a higher proportion of private lands within the Planning Area are below the rim, where upland habitat is already more degraded than above the rim. This is compounded by an assumed lesser emphasis on clustering (e.g., with an assumed 40-acre surface density throughout, versus a goal of 160-acre surface density on new Federal leases) and the fact that private landowners negotiate their own agreements with oil and gas companies regarding BMPs, reclamation standards, road designs, and other environmentally protective aspects of development. Failure to perform adequate reclamation or avoid riparian/wetland vegetation during offsite development could in turn potentially result in indirect impacts to BLM lands through the increased incidence of noxious weed and other undesirable plant introductions or transport of eroded soils and sediments.

Noxious weeds and other undesirable vegetation are assumed to occur at approximately the same densities offsite as onsite. If unmanaged, the offsite populations would serve as a source of continual infestation of the Planning Area, especially where human traffic and livestock or wildlife movement can serve to spread weed seeds, thus offsetting active, coordinated management under the Proposed Plan.

Summary of Impacts to Grazing and Rangeland Management

The general condition of rangeland resources would be expected to parallel those of vegetation resources and move in an upward trend under the Proposed Plan. However, this would be somewhat offset by existing fair to poor condition with a declining trend in some upland vegetation areas below the rim. Negative impacts to individual permittees could be negligible to moderate, depending on allotment location, timing of season of use, location, and existing conditions. Table 4-29 summarizes beneficial and adverse impacts to rangeland resources and grazing permittees under the Proposed Plan and five previously analyzed alternatives.

Table 4-29. Summary of Impacts to Rangeland Resources and Grazing Permittees [1, 2]

Management Action	*Alt. I No Action*	*Alt. II*	*Alt. III Preferred*	*Alt. IV*	*Alt. V*	*Proposed Plan*
Rangeland Management	*Resources:* Negligible to Minor (+) *Permittees:* None	*Resources*: Minor to Moderate (+) *Permittees:* Minor to Moderate (-)	*Resources:* Minor to Moderate (+) *Permittees:* Negligible to Minor (-)	*Resources:* Minor to Moderate (+) *Permittees:* Negligible to Minor (-)	*Resources:* Minor to Moderate (+) *Permittees:* Negligible to Minor (-)	*Resources:* Minor to Moderate (+) *Permittees*: None to Minor (-)
Upland and Riparian/ Wetland Vegetation Management	*Resources:* Negligible to Minor (-) *Permittees:* Negligible to minor (-)	*Resources:* Minor (+) *Permittees:* Minor (-)	*Resources:* Minor (+) *Permittees:* Negligible to Minor (-)	*Resources:* Minor (+) *Permittees:* Negligible to Minor (-)	*Resources:* Minor to Moderate (-) *Permittees:* None	*Resources:* Moderate (+) *Permittees*: None to Moderate (-)

Table 4-29. Summary of Impacts to Rangeland Resources and Grazing Permittees [1, 2]

Management Action	*Alt. I No Action*	*Alt. II*	*Alt. III Preferred*	*Alt. IV*	*Alt. V*	*Proposed Plan*
Travel and Recreation Management	*Resources:* Minor (-) *Permittees:* None	*Resources:* Minor (+) *Permittees:* None to Moderate (-)	*Resources:* Minor (+) *Permittees:* None to Moderate (-)	*Resources:* Minor (+) *Permittees:* Minor to Moderate (-)	*Resources*: Minor (+) *Permittees:* None to Minor (-)	*Resources:* Minor (+) *Permittees: None to* Minor (-)
Oil and Gas Development	*Resources:* Minor (-) *Permittees:* None	*Resources:* Minor (-) *Permittees:* Negligible to Minor (-)	*Resources:* Minor to Moderate-) *Permittees:* Negligible to Minor (-)	*Resources:* Minor to Moderate (-) *Permittees: None* to Moderate (-)	*Resources:* Minor to Moderate (-) *Permittees:* None to Moderate (-)	*Resources:* Minor (-) *Permittees:* None to Minor (-)
Special Management Designation and Restrictions	*Resources:* Negligible (-) *Permittees:* None	*Resources:* Negligible (-) *Permittees:* Minor (-)	*Resources:* Negligible to Minor (+) *Permittees:* Negligible to Minor (-)	*Resources:* Negligible to Minor (+) *Permittees:* Negligible to Minor (-)	*Resources:* Minor (+) *Permittees:* Negligible to Minor (-)	*Resources:* Minor (+) *Permittees:* Negligible (-)

[1] *Overall impact level after combining adverse (-) and beneficial (+) effects of land uses and management actions and after incorporating mitigation measures described in text.*

[2] *Impact levels of "None" indicate no impacts. Impact levels with "None" at the lower end of a range indicate that impacts would affect only some of the permittees.*

4.5.5 Oil and Gas

4.5.5.1 Introduction

As described in Section 3.5.5.1, the Planning Area consists of 127,009 acres, of which 73,597 is Federal mineral estate (including split estate) and 53,412 acres of private minerals. Approximately 18,744 acres (25 percent) of Federal mineral estate is currently leased. The estimated technically recoverable gas resource within the Planning Area is 15,416 BCF, with the Federal mineral estate contributing 8,933 BCF of this total. This represents ultimate gas recovery assuming that all land within the Planning Area can be developed. The RFD (Appendix H) estimates actual producible reserves at 6,733 BCF and 14,938 MBO within the Planning Area and 3,632 BCF and 8,066 MBO within the Federal mineral estate for the 20-year planning period.

To help put the natural gas resource in the 73,602 acres of Federal mineral estate in the Planning Area into perspective, consider the following: Based on the estimated RFD production of 6,733 BCF of gas from the Federal mineral estate during the operational life of the field, an average Colorado household size of 2.5 persons (U.S. Census Bureau 2002), and an average annual consumption of natural gas per consumer in Colorado of 94,000 cubic feet (94 MCF)(DOE 2002), this resource is equivalent to the amount of natural gas needed to serve 3.6 million households for 20 years.

In general, the number of potential oil and gas wells drilled under each alternative depends in part on the amount of surface acreage made available for drilling. Areas available for drilling are open to oil and gas development and have no attached NSO stipulation (although fluid minerals beneath NSO areas are available using directional drilling). The length of time required to recover the oil and gas resource fully is unknown. A portion of the 18,744 acres of previously leased Federal mineral estate in the Planning Area is already being developed.

The Proposed Plan would differ from Alternative I by allowing leasing throughout currently unleased portions of NOSRs 1 and 3, and it would differ from Alternatives II through V by the creation of a Federal Unit atop the plateau. Components of the Federal Unit and accompanying assumptions are described in detail in Section 2.3 and summarized below:

Alternatives I through V	Proposed Plan
Atop the Plateau. Surface density: 40 acres. Downhole spacing: Mesaverde – 40 acres assumed, but closer spacing allowed with directional drilling. Wasatch – 160 acres	*Atop the Plateau*. Surface density: 160 acres, established by minimum of 2,640 feet (0.5 mile) between pads. Downhole spacing: Mesaverde – 10 acres. Wasatch – 160 acres.
Below the Rim: Surface density: 40 acres, except 20 acres for wells to drill beneath the cliffs. Downhole spacing: Mesaverde – 10 acres on 80% of pads, 20 acres on 20%. Wasatch – 160 acres.	*Below the Rim*: Surface density: Managed for maximum practicable clustering (average of 80-acre surface density on new and existing leases assumed for impact estimation). Downhole spacing: Mesaverde – 10 acres. Wasatch – 160 acres.

To avoid a situation in which oil and gas development precludes or affects future oil shale development, BLM may require that wells drilled on top of the plateau be vertical until a depth below the oil-bearing shale strata is reached.

Table 4-30 compares the estimated number of wells and produced resource assumed to result on Federal mineral estate lands in the Planning Area under the Proposed Plan and other alternatives. Note that some values differ from the equivalent table in the Draft RMPA/EIS. This reflects different assumptions in regrading the downhole spacing (uniformly 10 acres in Table 4-30, but with 20-acre and 40-acre downhole spacings in the analogous table of the Draft).

Table 4-30. Anticipated Oil and Gas Development in BLM Portions of the Planning Area

Planning Area Oil and Gas Components	*Alt. I No Action*	*II*	*Alt. III Preferred*	*Alt. IV*	*Alt. V*	*Proposed Plan*
Total Planning Area	127,000 ac					
Federal Mineral Estate	73,602 ac					
Federal Minerals Leased	18,670 ac					
No-Lease Area	44,267 ac	21,382 ac	0 ac	0 ac	0 ac	0 ac
Deferred-Lease Area [1]	0 ac	0 ac	34,758 ac	0 ac	0 ac	0 ac
NSO Stipulations	13,912 ac	31,200 ac	30,928 ac	30,928 ac	21,609 ac	38,411 ac
CSU Stipulations	8,256 ac	7,015 ac	29,594 ac	27,486 ac	21,517 ac	30,833 ac
Standard Lease Terms, including Areas with TLs	7,167 ac	14,006 ac	13,080 ac	15,188 ac	30,476 ac	4,358 ac
Area Available for Surface Facilities [2]	15,423 ac	21,021 ac	42,674 ac	42,674 ac	51,993 ac	35,191 ac
New Wells in 20 Years [3]	855	905	1,324	1,324	1,582	1,570
Recoverable Reserves on BLM Lands	3,632 BCF					
Gas from Wells on BLM	974 BCF	1,031 BCF	1,510 BCF	1,510 BCF	1,803 BCF	1,790 BCF

Table 4-30. Anticipated Oil and Gas Development in BLM Portions of the Planning Area

Lands in 20 Years [3, 4]						
Percent of Gas Reserves Recovered in 20 Years	27%	28%	42%	42%	50%	49%
Oil from New Wells on BLM Lands in 20 Years [5]	1.9 MBO	2.1 MBO	3.0 MBO	3.0 MBO	3.6 MBO	3.6 MBO
Alternatives I – V			***Proposed Plan***			

[1] For Alternative III only, leasing and drilling atop the plateau would be deferred until 80% of the total wells anticipated below the rim under Alternative III have been effectively completed to total depth and a production test performed.

[2] Leasable area minus areas with NSO stipulations.

[3] Natural gas produced over operational life of wells drilled on BLM lands in Planning Area during 20-year period of analysis. Based on RFD (Appendix H). Assumes 1.17 BCF per Mesaverde well and 0.7 BCF per Wasatch well; weighted average approximately = 1.14 BCF per well.

[4] Does not include 197 existing BLM wells.

[5] Oil recovered at average rate of 0.002 MBO per BCF of gas.

4.5.5.2 Impacts of Proposed Plan

Direct and Indirect Onsite Impacts

The currently unleased Federal mineral estate in the Planning Area (about 55,000 acres) is likely to be developed in two groups: about 13,000 acres at lower elevations and 42,000 acres above the rim. It is probable that the latter area would be developed more slowly because of the greater costs of drilling and production associated with longer travel distances, less reliable access (including snow cover), the additional 2,000 to 3,000 feet of drilling depth required, and limitations on directional drilling.

As discussed previously, the top of the plateau would be leased as a Federal Unit. The purpose of this is to provide a mechanism by which BLM can ensure that development occurs in the phased and clustered progression that constitutes the CDNR proposal adopted by BLM as an outgrowth of the Consultation and Coordination process (Chapter 6). With an effective surface density of one pad per 160 acres resulting from the minimum distance of 2,640 feet (0.5 mile) between surface locations (well pads), and a downhole spacing of 10 acres for Mesaverde wells and 160 acres for Wasatch wells, this yields multi-well pads with up to 17 total wells (ten 16 Mesaverde and one Wasatch). By using directional drilling, with a currently assumed lateral reach of 2,500 feet, a GIS analysis of hypothetically located well pads in non-NSO areas, and along ridgetops with slopes of 20 percent or less (another component of the CDNR concept), it is estimated that more than 95 percent of the underlying oil and gas resources could be accessed.

Below the rim, BLM would not require phased and clustered development but would manage toward greater clustering than typifies current drilling in that area. The juxtaposition and irregular boundaries of private lands, leased Federal lands, and unleased Federal lands precludes the more regimented approach atop the plateau.

Under the Proposed Plan, the development scenario presented above is estimated to result in a total of 1,570 wells during the 20-year period of analysis. This number is derived from assumptions used in the RFD (Appendix H) and current drilling levels in the Planning Area. The assumptions used for the purpose of this RMPA/EIS are as follows:

- **Atop the Plateau —** BLM assumes that for most of the 20-year period, two drill rigs will be operating on Federal lands on top of the plateau. This assumption is based on the much thicker section of bedrock that must be penetrated, combined with difficult access and an assumed 6-month drilling season due to inclement winter weather and snowpack. Additionally, BLM assumes that only one rig will be operating for the first 4 years as part of the initial exploration and "ramping up" phase. Other assumptions, taken directly from the RFD, are that a drill rig can complete 6 wells per year, based on 30 days per well and 6 months of drilling. Together, these assumptions result in an estimated 210 wells atop the plateau during the 20-year period of analysis.
- **Below the Rim** – BLM assumes that seven drill rigs will be operating on Federal lands below the rim for most of the 20-year period. Assumptions taken directly from the RFD include an average of 10 wells per drill rig per year, based on 20 days per well and a 7-month drilling window due to the 5-month TL for big game winter range. BLM also assumes that only six rigs will operate for the first 4 years because of current drilling programs in the area. Together, these assumptions result in an estimated 1,360 wells in 20 years.
- **Combined Area** – Summarizing the analyses presented above for the upper and lower plateau, the assumed development scenario for Federal lands includes one drill rig atop the plateau and six below the rim for the first 4 years, and then two drill rigs on top and seven below for the remaining 16 years. Therefore, an assumed total of 1,570 new wells would be drilled during the 20-year planning period. The actual number and distribution of rigs, and the actual number of wells, may vary from the assumed level due to a variety of factors such as gas prices, drilling costs, rig availability, and success rates that cannot be predicted with complete accuracy. Changes due to currently unanticipated factors associated with other resources, land uses, or management priorities for BLM could also affect future development rates. However, the assumed total is believed to be reasonable for the purposes of analysis of impacts under the Proposed Plan and comparison with the five previous alternatives.

Indirect impacts associated with oil and gas development within the Planning Area under the Proposed Plan and other alternatives are related primarily to reduced habitat quality from erosion and sediment transport to area streams, increased vehicular activity (including much larger vehicles than at present), reduced solitude on Planning Area roads, decreased scenic quality, and reduced opportunities for certain types of recreation. The increased traffic and reduced solitude could result in decreased quality of life for area residents and have adverse economic impacts on local communities that rely heavily on recreational visitors. These impacts are described in other sections of Chapter 4.

Offsite and Cumulative Impacts

Offsite impacts of development of oil and gas resources beneath the Planning Area include impacts associated with increased human population size in the region. This growth would continue with or without additional development in the Planning Area but would be more rapid at the increasing levels of development. Offsite impacts could also include shifting of some recreational use to other areas in the region, potentially affecting those areas adversely.

An estimated 2,121 new wells are assumed to be drilled on the 53,405 acres of private mineral estate within the Planning Area during the 20-year period of analysis, after subtracting areas with slopes steeper than 50 percent and currently developed areas. This level of development would be in addition to the development scenarios for Federal minerals described above (Tables 4-3 and 4-28). The combination of drilling on new and existing Federal lands, plus private lands, would have cumulative adverse impacts resulting from ground-disturbing activities and associated operation of drilling- and production-related vehicles and other equipment. The cumulative impact in terms of additional production of natural gas and petroleum would be beneficial in terms of the National Energy Policy.

Summary of Impacts of Oil and Gas Development

Due to the phased and clustered development approach of the Proposed Plan, the combined level of oil and gas development would result in the lowest, or one of the lowest, levels of impacts to most other resources among any of the alternatives analyzed. On the other hand, it would represent effective utilization of the recoverable reserves of natural gas and petroleum at a level only slightly below Alternative V. This would result in recovery of an estimated 49 percent of the recoverable gas reserves in BLM portions of the Planning Area during the first 20 years of development following implementation of the RMP Amendment.

4.5.6 Other Minerals

As described in Section 3.5.6, substantial oil shale deposits are located within the Planning Area (including NOSRs 1 and 3 and areas of private land). While these have been the subject of considerable investigation in the past, the low likelihood of development in the foreseeable future was a major factor in the decision to transfer the former NOSR lands to BLM to make available for oil and gas development and other uses consistent with FLPMA. Extraction of oil from oil shale, such as following development of a cost-effective *in-situ* process, could occur at some point in the future depending on technologies and market factors.

Recently, proposals have been submitted to BLM for research and development projects involving *in-situ* processes. However, none of these was for lands within the Planning Area. In the apparently unlikely event that oil shale development becomes a viable component of multiple use on BLM lands in the Planning Area, the development would be required to comply with the surface-use restrictions (e.g., NGD/NSO and SSR/CSU stipulations) and BMPs required of other ground-disturbing activities. To avoid a situation in which oil and gas development precludes or diminishes the potential for future oil shale development, BLM will require that wells drilled on top of the plateau be vertical until a depth below the oil-bearing shale strata is reached. Because the oil shale is much shallower than the natural gas, this constraint is not expected to hinder natural gas development.

Based on the limited resource potential of other mineral resources (coal, coalbed natural gas, construction materials, and soda ash/sodium bicarbonate), implementation of any of the alternatives is unlikely to adversely affect the potential for development. The exception is that Alternative I (No Action) would retain the current withdrawal of NOSRs 1 and 3 from development of other mineral resources.

Production of coalbed natural gas would also not be precluded by implementation of Alternatives II through V (or Alternative I for areas outside the NOSRs) should future technologies and market factors affect feasibility. Because the oil and gas leases under these alternatives would include coalbed natural gas, it is possible that it could eventually be incorporated into the overall production of natural gas.

Construction materials could potentially become a valuable resource within the Planning Area. However, only certain portions of the site would likely be suitable in terms of materials present, and localized quarries or other mining operations could probably be developed within portions of the Planning Area outside the oil and gas leases. It is also possible that construction materials could be produced following termination of an oil and gas lease upon completion of economic recovery.

Soda ash and sodium bicarbonate do not appear to occur at developable concentrations beneath the Planning Area.

Although no locatable minerals (e.g., metals) are known or believed to occur in the Planning Area, revocation of the withdrawal of NOSRs 1 and 3 from entry under the Mining Act of 1872 could conceivably result in speculative claim filings, including in some sensitive resource areas. This potential is considered remote.

In summary, implementation of any of the alternatives in this RMPA/EIS would not adversely affect reasonably foreseeable development of these other types of mineral resources. Therefore, no indirect, offsite, or cumulative impacts associated with the development, or lack of development, of these other resources is anticipated. However, some land uses and management actions could represent an irreversible and irretrievable commitment of mineral resources (Section 4.6).

4.5.7 Areas of Critical Environmental Concern

4.5.7.1 Introduction

The analysis of impacts to ACECs is necessarily an analysis of impacts on the relevant and important values and resources that are given special management attention through the designation of ACECs. This section summarizes the analysis of impacts on the relevant and important scenic, geological, fisheries, wildlife, and botanical values delineated and described in Section 3.5.7. A complete evaluation of impacts to these values is incorporated into the appropriate impact analysis sections addressing geology and paleontology (Section 4.2.1), vegetation and riparian/wetland areas (Section 4.3.1), wildlife and fisheries (Section 4.3.2), special status species and communities (Section 4.3.3), and visual resources (Section 4.4.1).

Impacts of Proposed Plan

The Proposed Plan provides an intermediate level of protective management for relevant and important values between Alternative II and the Preferred Alternative. Four ACECs would be designated, but their footprints would be reduced from those in Alternative II, comprising 21,034 acres instead of 36,184 acres. Even this smaller area, however, represents almost 29 percent of the Planning Area. Management of the four designated ACECs would also differ from that under Alternative II. The four ACECs would no longer be covered by NGD/NSO restrictions specific to relevant and important values. Rather, these values would be protected from surface disturbance by the restrictions discussed for the specific resources in earlier sections. Relevant and important scenic, geological, fisheries/wildlife, and botanical/ecological values to be given special consideration in management of the four ACECs are detailed in Tables 2-2a-d.

Direct and Indirect Onsite Impacts

Under the Proposed Plan, large portions of the ACECs would be provided protection from long-term ground-disturbing activities through various resource-specific NGD/NSO and SSR/CSU restrictions. These include the entire Parachute Creek watershed, areas along streams and adjacent or upstream areas critical to ecosystem processes, and large blocks of sensitive habitats for certain types of vegetation and wildlife. Consequently, most direct negative impacts to these values within the ACECs would be prevented.

The same protective restrictions, and especially those related to minimizing soil loss and erosion and maintaining watershed processes, would also limit the potential for indirect impacts to relevant and important criteria for each ACEC. An exception to this generalization is that some indirect impacts to wildlife from disturbance, and to vegetation from dust generation, could result in portions of the ACECs available for oil and gas development or used for access to oil and gas development.

Direct positive impacts to some relevant and important resources in the ACECs would result from some aspects of the Proposed Plan, primarily the restriction of motorized and mechanized travel to designated routes throughout most of the Planning Area and measures to more rapidly control weeds and improve areas of degraded rangeland.

A complete evaluation of direct and indirect impacts to specific relevant and important values under this alternative is provided in the individual impact analysis sections.

Offsite and Cumulative Impacts

Negative impacts to relevant and important resources are likely to occur from ongoing human development throughout the general region, which will occur regardless of management actions within the Planning Area. This development results in a number of activities that directly and negatively impact these resources, including new roads, housing projects, commercial development, and increased recreational use of wildlands. A number of indirect impacts are also expected as a result. These impacts will continue to occur on a regional scale and will have an additive relationship to the impacts expected from management activities within the Planning Area. If negative impacts continue to increase as expected, their condition on public lands becomes even more important in terms of their contribution to global species viability, as well as their intrinsic value and the biodiversity they represent.

Most resources defined as relevant and important values will experience positive impacts as a result of the cumulative actions and protections contained in the Proposed Plan in addition to those special management prescriptions for ACEC management.

A positive impact to offsite areas could occur should some or all existing populations of special status plant species within the Planning Area expand, or new populations be recruited, as a positive result of management actions. These populations could potentially serve as larger sources for propagation into new offsite areas. In addition, information collected from monitoring these species could be useful to management on other sites. Similar positive offsite impacts could potentially occur if populations of sensitive wildlife species on the Planning Area increase due to special management; they could emigrate out of the Planning Area to establish new populations offsite. In the case of the Colorado River cutthroat trout, should populations expand due to protection and enhancement of habitat under ACEC management, individuals from streams on the Planning Area could be used to establish new populations in designated restoration sites.

4.5.8 Areas Managed to Protect Wilderness Character or Specific Wilderness Values

Inventories for wilderness characteristics within the Planning Area were conducted following the transfer of NOSRs 1 and 3 (Section 3.5.8.1). The Draft RMPA/EIS included an analysis of alternative management prescriptions for three areas (19,322 acres) found to contain wilderness characteristics. However, on April 14, 2003, a settlement agreement was reached between USDI and the State of Utah, Utah School and Institutional Trust Lands Administration, and Utah Association of Counties. Consistent with that settlement and subsequent policies issued by BLM, neither the Draft RMPA/EIS nor the Proposed Plan considers the designation of new WSAs or the classification or management of BLM lands as if they are, or may become, WSAs. Unlike Alternatives II and III of the Draft RMPA/EIS, the Proposed Plan would not apply management prescriptions specific to the protection of roadlessness, naturalness, and outstanding opportunities for solitude and primitive and unconfined types of recreation, and values identified in the wilderness inventories would not be protected. Although some of these characteristics may benefit from protection of other resources in areas with NGD/NSO stipulations, no contribution would be made toward preservation of wilderness characteristics.

Direct and Indirect Onsite Impacts

While pockets of naturalness and opportunities for solitude and primitive and unconfined types of recreation may be protected with NGD/NSO stipulations for other resources, they would be fragmented and smaller than 5,000 acres in size. This would effectively eliminate wilderness character in the three inventory units as a whole. An increase in development such as road and pipeline construction, development of drill pads, and increased human activities would substantially degrade all wilderness characteristics within the Planning Area.

Offsite and Cumulative Impacts

Opportunities for primitive and unconfined types of recreation, naturalness, and solitude would not be preserved under the Proposed Plan. The resultant decrease in lands having wilderness values would be cumulative to other such losses in Garfield County and the region. Some of the areas of cumulative offsite losses are Federal lands, including areas managed by BLM and USFS. These lands are subject to increasing levels of oil and gas development, possible future mining operations, and other changes in land use.

In comparison to the 19,322 acres found to contain wilderness characteristics within the Planning Area, a total of 41 wilderness areas have already been designated in Colorado, variously managed by BLM, USFS, USFWS, and NPS. Of the more than 66 million acres of total land area in Colorado, the designated wilderness areas represent 3.4 million acres, or approximately 5 percent. In addition to designated wilderness areas, BLM lands in Colorado contain 54 WSAs with a total area of approximately 622,000 acres. An additional 4.4 million acres of lands managed by USFS in Colorado are designated as roadless; this represents nearly one-third of the total National Forest lands in the state.

4.5.9 Wild and Scenic Rivers

4.5.9.1 Introduction

The process of designating a WSR under the authority of the WSRA involves a threshold determination of eligibility, a further assessment of suitability of eligible rivers, and Congressional action. BLM has already assessed the eligibility and classification of rivers and streams found in the Planning Area and described its findings in the Roan Plateau Eligibility Report for the National Wild and Scenic Rivers System (BLM 2002e)(Section 3.5.9 and Map 16).

BLM's policy is to protect the values contained within the eligible stream segments until the suitability analysis has been completed. All alternatives except the no action alternative contain measures to protect the 7,883 acres and 24 miles of stream corridors found to be eligible. The Proposed Plan would protect the identified ORVs and the identified preliminary stream classifications with a specific NGD/NSO restriction. This restriction would apply to all long-term ground-disturbing activities within an area of a 0.25 mile-wide buffer on either side of stream centerlines within WSR-eligible corridors until a suitability analysis has been completed.

As with ACECs, the analysis of impacts to WSR-eligible streams is necessarily an analysis of impacts on identified ORVs. These include scenic values, fishery values, and botanical ecological values. These values are described in Section 3.5.9. A complete evaluation of impacts to these values is incorporated into the appropriate impact analysis sections addressing visual resources (Section 4.4.1), wildlife and fisheries (Section 4.3.2), special status plant species and significant plant communities (Section 4.3.3), and vegetation and riparian/wetland areas (Section 4.3.1).

4.5.9.2 Impacts of Proposed Plan

Impacts to the WSR-eligible stream corridors under the Proposed Plan are summarized below by specific ORVs.

Direct and Indirect Onsite Impacts

Scenic Values — East Fork Parachute Creek, including the falls and box canyon, would retain its outstanding scenic quality under the Proposed Plan. Due to overlapping protections under the Proposed Plan no direct impacts are expected. However, it is reasonable to expect that indirect effects have the potential to degrade the overall ORV scenic value. This indirect effect would result from management activities on adjacent private lands on the western end of the viewshed.

Fisheries Values – Direct effects to populations of genetically pure Colorado River cutthroat trout in five of the streams that were found to be eligible (Trapper, Northwater, East Fork Parachute, East Middle Fork Parachute, and JQS) would be minimal and at a reduced risk under this alternative. Overlapping NGD/NSO restrictions on the WSR-eligible stream corridors would prevent long-term ground-disturbing activities in those corridors. Supporting management of livestock grazing and motorized and mechanized travel would improve fish habitat both directly and indirectly by reducing impacts to soils and vegetation in the corridors. Under the Proposed Plan, watersheds adjacent to WSR-eligible streams would receive surface protection from a number of overlapping surface-use restrictions as well as special management prescriptions due to ACEC designation (Table 2-2) and the Parachute Creek WMA (Table 2-3). Indirect effects to the cutthroat trout may occur due to increased recreational demand (specifically fishing) and other human activities within the Planning Area. These effects would result from increased public awareness of the plateau, workers in the oil and gas industry, and from the expected population growth occurring in adjacent communities.

Botanical/Ecological Values – No direct effects are expected to the seven WSR eligible stream segments with special status plants and/or significant plant communities. These ORVs would be largely protected under the Proposed Plan by overlapping surface-use restrictions and special management prescriptions. Those measures and supporting management of livestock grazing, restrictions on motorized and mechanized travel, and protective aspects of oil and gas development would combine to ensure the long-term viability of these resources. It is anticipated that small incidental indirect effects may occur over time due to increases in human activities within the Planning Area. While the effects are anticipated to be minor, monitoring of the sites should be conducted to establish damage thresholds and any subsequent management actions needed to protect the specific ORVs if thresholds are exceeded and preliminary classifications threatened.

Offsite and Cumulative Impacts

Overall regional growth and human-related activities will place increasing demands on the area, irrespective of any changes resulting specifically from implementation of any of the alternatives. Cumulative effects that would degrade the ORVs and potentially change the preliminary classifications could occur over the life of the Plan and may affect the suitability determination. Removal of the WSR-eligible streams in the Planning Area from the inventory of such streams in the region would be cumulative to any other losses on offsite Federal lands, including those managed by BLM and USFS in the region. The offsite losses to which the onsite losses would be cumulative could result from oil and gas development, potential future mining operations, and other changes in land use.

4.5.10 Forest Products

This RMPA/EIS assumes no management actions for forest products. All alternatives, including the Proposed Plan, anticipate management to maintain and promote forest health, consistent with other resource objectives. Because demand for forest products from the Planning Area is apparently low or non-existent, and no forest management activities are proposed, anticipated impacts on forest products are considered none to negligible under each alternative.

The only recognizable impact is the possible access limitation to forest stands for implementation of pest control, thinning operations, or potential future harvesting due to varying combinations of road closures, timing limitations, and other measures. If timber harvesting were to become economically viable, the approximately 11,000 acres of mature aspen atop the plateau would be the resource most likely to be sought. Old-growth Douglas-fir generally occurs in relatively rugged and inaccessible areas. However, if this resource was sought, the Proposed Plan and Alternatives III, IV, and V would allow up to 10 percent of these trees to be removed, with restrictions on the harvest pattern and method to reduce other impacts.

See the Fire Management discussion below concerning the potential need for fire suppression or vegetation treatments (e.g., fuel load reduction) as a result of increased oil and gas development.

4.5.11 Fire Management

4.5.11.1 Introduction

Public lands are managed under one of four management categories for the purposes of wildland fire management and prescribed vegetation management. Due to different management goals and objectives proposed under the five alternatives in this RMPA/EIS, modifications to the FMP, including reclassifying some of the existing fire management units to different FMZs, would be necessary to help meet vegetation management goals the ultimately support the goals and objectives of each alternative. Definitions of FMZs A through D are provided in Table 3-36 in Section 3.5.11.3. The FMP for the GSFO is cited in this document as BLM (2002f).

4.5.11.2 Impacts of the Proposed Plan

Approximately 25 percent of BLM lands in the Planning Area would be managed as FMZ B and 75 percent as FMZ C. FMZ B consists of lands where unplanned wildland fire is not desired, with a high priority of suppression using aggressive suppression techniques. FMZ C consists of lands where wildland fire is desired, but with a moderate level of suppression because of ecological, social, or political constraints. This classification would be the same among all of the alternatives and not only for the Proposed Plan.

Direct and Indirect Onsite Impacts

Roan Plateau — Fire is considered a desirable component of the ecosystem under the GSFO FMP, as emphasized by the prior classification of this portion of the Planning Area as FMZ D (fire desirable, with a low priority on suppression). However, BLM had determined that reclassification and management of this area from FMZ D to FMZ C is more appropriate because of the constraints of oil and gas development and the high resource values associated with the existing forest, riparian/wetland and aquatic habitats. These high resource values include wildlife, water quality, visual quality, and recreation as well as the vegetation.

Roan Cliffs — The Roan Cliffs will continue to be managed as FMZ C. The GSFO FMP acknowledges that fire is a desirable component of the ecosystem. However, this is balanced by constraints such as private lands and homes, rugged topography, archaeological and historical sites, visual aesthetics, wilderness characteristics, rare plants, the old-growth Douglas-fir community, high-quality pinyon/juniper communities, and associated sensitive wildlife. Wildland fires will continue to be managed using the appropriate management response commensurate with predetermined constraints. Management strategies are intended to ensure that wildland fire is contained within natural or man-made barriers/firebreaks. FMZ C areas have a lower suppression priority in multiple wildland fire situations than FMZs A or B but the same goal of no more than 50 percent of the unit burning over a 10-year period.

1-70 Corridor — Lower elevations along the I-70 corridor will continue to be managed as FMZ B. The higher prioritization for fire suppression associated with FMZ B is needed due to the combination of intensive oil and gas development, the commingling of Federal and private lands, and the proximity to human population centers. The GSFO FMP recognizes that fire plays a natural role in the function of the ecosystem. However, an unplanned ignition in this area could have negative effects until mitigation takes place. Suppression of all wildland fires, regardless of ignition source, will be a high priority to protect human health. Fire suppression will usually be aggressive to minimize spread. Wildland fire suppression guidelines apply for bald eagle winter range, Federally listed Colorado River fishes, and the Great Basin spadefoot toad and northern leopard frog. Managers emphasize prevention/mitigation programs that reduce unplanned ignitions and threats to life, property, and natural and cultural resources.

4.5.12 Renewable Energy

No development of renewable energy is currently anticipated for the Planning Area. Section 3.5.13 includes a discussion of the low potential of the Planning Area for wind generation. However, thinning of timber for fire risk management or removal of timber in conjunction with construction of oil and gas well pads, pipelines, and new or widened access roads could be used as a fuel source if biomass energy generation becomes a reality during the life of this RMP Amendment.

4.6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Any project involving significant changes in land use and management results in the consumption of one or more resources — materials, fuel, and monies — during and after its implementation. Thus, the land use and management activities incorporated into the alternatives analyzed would result in permanent loss of resources within or intricately related to the Planning Area. Potential irreversible and irretrievable commitments are noted throughout the appropriate sections of the impact analysis in this chapter and are summarized below.

Although the various resource-specific sections of Chapter 4 use quantitative measures to assess anticipated impacts, these are only estimates. The exact nature and extent of any irreversible and irretrievable commitment of resources cannot be defined due to uncertainties about its location, scale, timing, and rate of implementation, as well as its relationship to other actions and the effectiveness of mitigation measures. Therefore, the summary below is qualitative only.

- **Mineral Resources** – Future oil and gas development anticipated under all alternatives would result in capture of a portion of the total reserves underlying Federal lands in the Planning Area. These captured resources are non-renewable and would be unavailable for extraction and use by future generations. Portions that would not be recovered during the 20-year period of analysis, given the surface and downhole spacing assumed in the RFD (Appendix H), the current recovery efficiency, and the limitations on leasing and surface occupancy, would remain available for future extraction.

  Other energy resources within the Planning Area, including oil shale, coal, and coalbed natural gas, are not expected to be developed during the 20-year period of analysis of this RMPA/EIS (Table 2-1). It is not known to what extent the construction of 855 to 1,582 wells under Alternatives I through V (1,570 under the Proposed Plan) would interfere with future (post-oil and gas) development of these other resources. It is expected that the presence of the wells would complicate but not prevent future development.

- **Paleontological Resources** – Future oil and gas development and other ground-disturbing activities could result in permanent destruction of some fossil resources. However, special stipulations to protect high-value resources, and monitoring and mitigation requirements outlined in this RMPA/EIS would reduce the potential extent of this impact and could bring additional fossil resources to light.

- **Recreation** – The physical recreation settings as defined by the ROS classes would be changed and permanently altered due to construction of roads and oil and gas wells, and other ground-disturbing activities. Special stipulations for visual resources would indirectly reduce these losses. However, the losses would be essentially permanent, even with the best currently available habitat restoration technology and funding levels.

- **Vegetation Resources** – Some areas of essentially native vegetation would be lost or permanently altered during construction of roads, oil and gas wells, and other ground-disturbing activities. Special stipulations to protect high-value resources, and monitoring and mitigation requirements outlined in this RMPA/EIS, would be implemented to reduce these losses. However, any unavoidable losses would be essentially permanent, even with the best currently available revegetation technology. This

is due to long time period (many decades to centuries) required for full recovery of the natural assemblage of species, habitat components, and ecosystem functions that make specific resource areas unique. Some of these impacts could never be reversed, especially those that eliminate genetically unique resources represented by local populations of rare or disjunct species.

- **Fish and Wildlife Resources** – Some areas of high-quality wildlife habitat would be lost or permanently altered during construction of roads and oil and gas wells, and other ground-disturbing activities. Special stipulations to protect high value resources, and monitoring and mitigation requirements outlined in this RMPA/EIS, would be implemented to reduce these losses. However, any unavoidable losses would be essentially permanent, even with the best currently available habitat restoration technology, because of the long time period (many decades to centuries) required to restore the natural assemblage of species, plant-soil and plant-animal interactions, and ecosystem functioning that make specific resource areas unique. Some of these impacts could never be reversed, especially those that eliminate genetically unique resources represented by populations of rare or disjunct species such as genetically pure Colorado River cutthroat trout.
- **Visual Resources** – Some high-quality scenery and views would be lost or permanently altered due to construction of roads and oil and gas wells, and other ground-disturbing activities. Removal of vegetation, creation of artificial lines, and dramatic changes in color, form, and texture would be unavoidable. Special stipulations and the mitigation requirements outlined in this RMPA/EIS would be implemented to reduce these losses. However, any unavoidable losses would be essentially permanent, even with the best currently available habitat restoration technology.
- **Cultural (Archaeological) Resources** – Future oil and gas development and other ground-disturbing activities could result in permanent destruction of some cultural resources. Special stipulations to protect high value resources, and the monitoring and mitigation requirements outlined in this RMPA/EIS would reduce the potential extent of this impact and could bring additional cultural resources to light.
- **Sociologic and Economic Resources** – Implementation of any of the five alternatives would result in a permanent commitment of monies, in both the public and private sectors, in pursuing the objectives of each alternative and providing the infrastructure needed to serve the resultant population growth. Once spent, these monies are not available for other uses.

  Implementation of Alternatives II through V or the Proposed Plan (and, to a lesser extent, Alternative I) would cause an irreversible and irretrievable change in aspects of the environment, affecting quality of life. The anticipated changes, including loss of solitude and rural character, are not viewed as uniformly "good" or "bad" by individuals interviewed as part of this RMPA/EIS. However, all individuals contacted agreed that change would occur beyond that likely without the RMP Amendment. That is, the amendment would hasten quality-of-life impacts that are occurring anyway. Certainly the deferral of oil and gas leasing and development on top of the plateau under Alternative III would delay the onset of change in the portion of the Planning Area that is of greatest overall concern to most interviewees and local governments.

- **Wilderness Characteristics** – Future oil and gas development and other ground-disturbing activities could result in permanent loss of individual wilderness characteristics and would be a permanent loss of wilderness character as a whole. Roadless areas over 5,000 acres, naturalness, outstanding opportunities for solitude and primitive and unconfined recreation would be irretrievably compromised within the units analyzed in this RMPA/EIS. Any losses would be essentially permanent even with the best currently available restoration technologies.

Other types of impacts — both negative and positive — would result from implementation of one or a combination of the alternatives analyzed. However, these other impacts would involve renewable resources such as air and surface water and would occur with or without the selected RMP Amendment

(grazing, recreational use) or would not be permanent (e.g., precluding leasing for oil shale during the life of the Plan).

CHAPTER 5

REFERENCES

5 REFERENCES

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