DES04-04

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

Glenwood Springs Field Office

Roan Plateau Planning Area
Including Former Naval Oil Shale Reserves Numbers 1 and 3

Resource Management Plan Amendment and Environmental Impact Statement

Draft
November 2004

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Glenwood Springs Field Office
50629 Highway 6 and 24
P.O. Box 1009, Glenwood Springs, Colorado 81602

November 12, 2004

Dear Interested Party:

Enclosed for your review and comment is the Draft Roan Plateau Resource Management Plan Amendment/Draft Environmental Impact Statement (Draft RMP Amendment/DEIS). This Draft considers management for all Bureau of Land Management (BLM) administered lands and resources in the planning area, including former Naval Oil Shale Reserves 1 and 3.

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

This Draft RMP Amendment/DEIS was prepared pursuant to the National Environmental Policy Act, the Federal Land Policy and Management Act, and other laws and regulations. It addresses the effects of various management strategies. Five alternative approaches for the management of public lands and resources of the Roan Plateau Planning Area are analyzed, and the effects discussed. This is not a decision document; it is informational and analytical, designed to inform the public of the effects of the various alternatives.

If you wish to comment on this document, please make your comments as specific as possible. Comments will be more helpful if they include suggested changes, methodologies, and sources of information, and focus on components of the various alternatives. The final plan may be a combination of various components of the alternatives analyzed in this Draft. Comments that contain only opinions or preferences will not receive a formal response in the Proposed Amendment/Final EIS; they will, however, be considered as part of the BLM decision-making process. BLM will respond to all comments in the next planning document, the Proposed RMP Amendment/Final EIS. In order to participate later in the protest process, the protesting party must have raised the issue earlier during the planning process. The BLM will accept written comments on this Draft RMP Amendment/ EIS which are postmarked or received within 90 days following the notice of its availability in the Federal Register by the Environmental Protection Agency.

Submit written comments to: Roan Plateau Comments - Attention Greg Goodenow, Glenwood Springs Field Office, Bureau of Land Management, P.O. Box 1009, Glenwood Springs, Colorado 81602. Comments may also be submitted electronically at www.roanplateau.ene.com; click on the comment tab and follow the directions. Submissions from organizations or businesses will be made available to the public in their entirety. Individuals, however, may request confidentiality with respect to their name, address, and phone number. If you wish to have your name, address, and phone number withheld from public review, or from disclosure under the Freedom of Information Act, the first line of your comments must start with the words "CONFIDENTIALITY REQUESTED" in uppercase letters in order for BLM to comply with your request. Such requests will be honored to the extent allowed by law. Comment contents will not be kept confidential. Anonymous comments will not be considered. Comments, including names and addresses of respondents, will be available for public review at the BLM Glenwood Springs Field Office, 50629 Highways 6 & 24, Glenwood Springs, Colorado, during normal working hours (7:45 a.m. to 4:30 p.m., except weekends and holidays).

Public meetings and any other public involvement activities will be announced at least 15 days in advance through public notices in local newspapers (Glenwood Springs and Rifle, Colorado), through local media news releases, on the project website at www.roanplateau.ene.com, and/or through mailings.

Associated documents such as maps and supporting background information can be reviewed at several locations: the project web site at www.roanplateau.ene.com, the BLM Glenwood Springs Field Office (50629 Highways 6 & 24, Glenwood Springs, Colorado) or White River Field Office (73544 Highway 64, Meeker, Colorado 81641) during normal working hours (7:45 a.m. to 4:30 p.m., except weekends and holidays), and the Garfield County (Colorado) Public Libraries.

I appreciate your participation and interest in this planning effort, and look forward to your continued involvement. For more information, or clarification regarding this document please contact Greg Goodenow, Planning and Environmental Coordinator at the address shown above.

Sincerely,

Jamie E Connell

Jamie E. Connell
Field Manager

Draft
Roan Plateau Resource Management Plan Amendment and Environmental Impact Statement

Draft (X) **Final ( )**

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

Abstract: The Draft Roan Plateau Resource Management Plan Amendment and Environmental Impact Statement analyzes five alternatives for managing approximately 73,602 acres of federal land within the Planning Area in western Colorado in Garfield and Rio Blanco Counties. Alternative I is the continuation of present management or No Action alternative. Alternatives II through V present differing balances of land use allocations. Alternative III is the agency-preferred alternative. The plan amendment which is ultimately adopted may combine components from the various alternatives presented in this Draft.

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

Date Comments Must Be Received: The BLM will accept written comments on this Draft RMP Amendment/ EIS which are post marked or received within 90 days following the notice of its availability in the Federal Register by the Environmental Protection Agency. The close of the comment period will be announced on the Roan Plateau RMP Amendment website at www.roanplateau.ene.com, or may be obtained by contacting the BLM at the address or telephone number below. Please see the inside front cover of this document for information on how to comment. Additional information on how to comment, where to review documents, how to obtain additional information, and the time and location of public meetings can be found on the website, or by contacting the BLM.

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

Draft

Roan Plateau Resource Management Plan Amendment and Environmental Impact Statement

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November 2004

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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
AIRFA	American Indian Religious Freedom Act
AMP	Allotment Management Plan
AMS	Analysis of the Management Situation
ANC	Acid Neutralizing Capacity
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
bbl	Barrel
BCC	Birds of Conservation Concern
BCF	Billion cubic feet
BLM	Bureau of Land Management
BMP	Best Management Practices
BO	Biological Opinion
CALPUFF	CALifornia PUFF Dispersion Model
CBEF	Center for Business and Economic Forecasting, Inc.
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
COA	Condition of Approval
COGCC	Colorado Oil and Gas Conservation Commission
COLA	Colorado Department of Local Affairs
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

ACRONYMS

DEM	Digital Elevation Model
DOE	[U.S.] Department of Energy
DOI	[U.S.] Department of the Interior
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
FAR	Functioning At Risk
FLAG	Federal Land Managers' AQRV Workgroup
FLPMA	Federal Land Policy and Management Act
FMP	Fire Management Plan
FMZ	Fire Management Zone
FOOGLRA	Federal Onshore Oil and Gas Leasing Reform Act
FSEIS	Final Supplemental Environmental Impact Statement
GHGs	Greenhouse Gases
GIS	Geographic Information System
gm/h-hr	grams per horsepower-hour
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
IMPROVE	Interagency Monitoring of Protected Visual Environments
IB	Information Bulletin
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 Generators
MBF	Million Board Feet
MBO	Thousand barrels of oil
MCF	Thousand cubic feet
MCL	Maximum Contamination Level
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

ACRONYMS

MMCF	Million cubic feet
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NDIS	National Diversity Information System
NEPA	National Environmental Policy Act
NF	Non-Functioning
NGD	No Ground Disturbance
NHPA	National Historic Preservation Act
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 Center
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
NSR	New Source Review
NWPS	National Wilderness Preservation System
OHV	Off-Highway Vehicles (off-road vehicles)
OMP	Operational Management Plan
ONA	Outstanding Natural Area
ORV	Outstandingly Remarkable Values
PA	Programmatic Agreement
PCRAMMET	PC Version of EPA Rammet Meteorological Preprocessor Program
PICA	PSD Increment Consumption Analysis
PFC	Proper Functioning Condition
PILT	Payment in Lieu of Taxes
$PM_{2.5}$	Particulate Matter < 2.5 Microns in Effective Diameter
PM_{10}	Particulate Matter < 10 Microns in Effective Diameter
PNC	Potential Natural Community
ppm	parts per million
PSD	Prevention of Significant Deterioration
R&PPA	Recreation and Public Purposes Act
RCRA	Resource Conservation and Recovery Act
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

ACRONYMS

SQG	Small Quantity Generators
SRMA	Special Recreation Management Area
SRP	Special Recreation Permits
SSR	Site-Specific Relocation
SVIM	Soil and Vegetation Inventory Method
T&E	Threatened and Endangered
TDS	Total Dissolved Solids
TL	Timing Limitation
TSD	Technical Support Document (for Air Quality)
TSP	Total Suspended Particulates
TCF	Trillion cubic feet
UDEQ	Utah Department of Environmental Quality
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 Compounds
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
$\mu g/m^3$	micrograms per cubic meter

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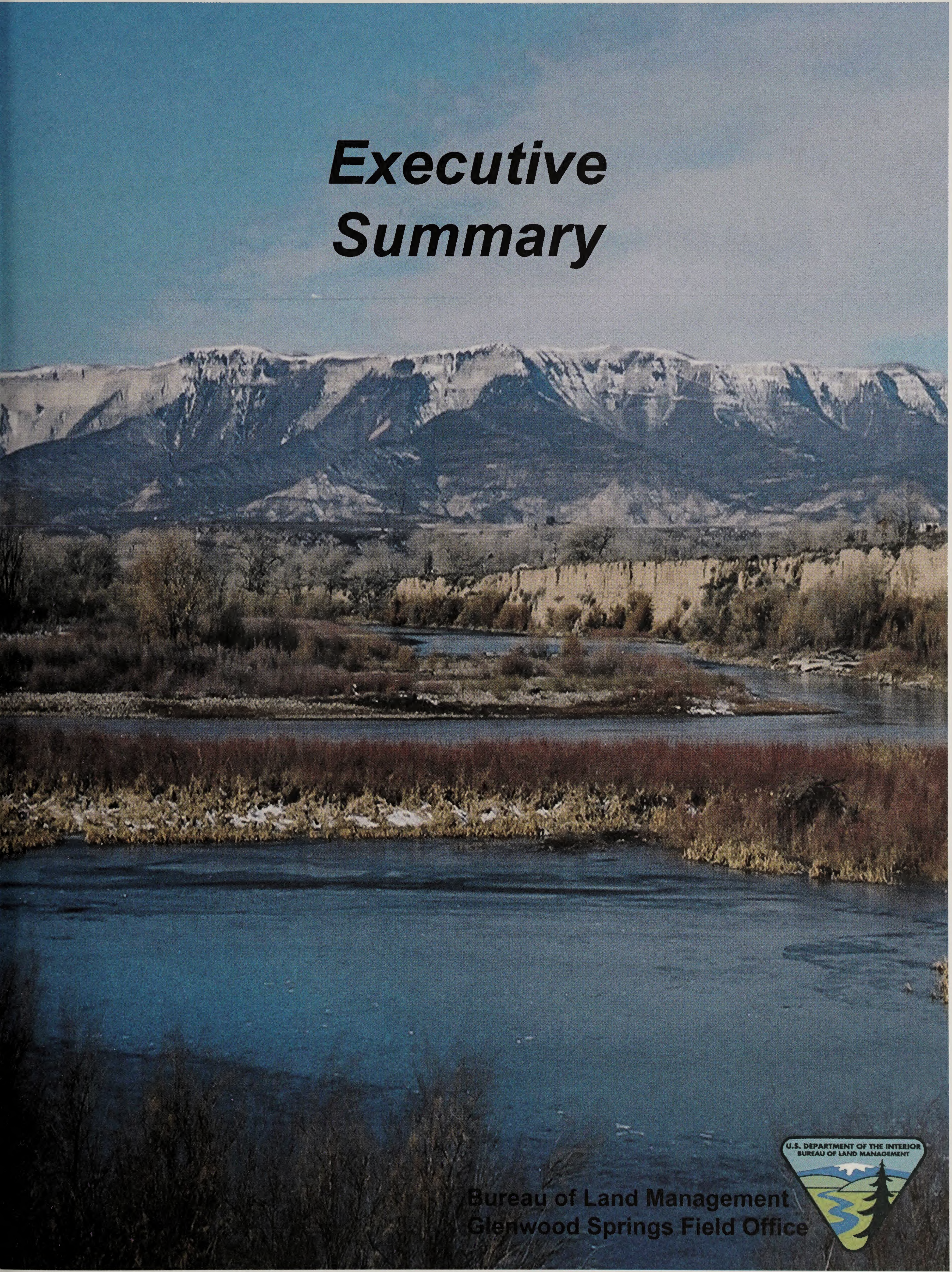
Executive Summary



Bureau of Land Management
Glenwood Springs Field Office

EXECUTIVE SUMMARY

This Draft Roan Plateau Resource Management Plan Amendment (RMPA) and Environmental Impact Statement (EIS) presents options for management of Bureau of Land Management (BLM) administered lands in the Roan Plateau Planning Area. This includes former Naval Oil Shale Reserves (NOSRs) Numbers 1 and 3. The Planning Area includes approximately 73,602 acres of Federal land in western Garfield County and a small portion of southern Rio Blanco County, both in Colorado.

The Planning Area lies north of Interstate 70 (I-70) between the towns of Rifle and Parachute and consists of three visually, geologically, and ecologically distinct areas: (1) xeric (dry) semi-desert habitats at lower elevations, (2) relatively mesic (moist) montane and subalpine habitats at higher elevations, and (3) a band of high and mostly unbroken cliffs separating these areas. Lands within the Planning Area drain westward to Parachute Creek, eastward to Government Creek, or southward to the Colorado River. Parachute Creek and Government Creek are also tributaries of the Colorado River.

Plan Foundation

The National Defense Authorization Act for Fiscal Year 1998, Public Law 105-85 (Transfer Act) transferred jurisdiction for lands within NOSRs 1 and 3 from the U.S. Department of Energy to the BLM. This 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 be managed in accordance with the Federal Land Policy and Management Act (FLPMA) and other laws applicable to public lands.

FLPMA requires the preparation of land use plans for public lands. This RMPA will establish management prescriptions, resource objectives, and land use allocations for the Roan Plateau Planning Area.

This Draft RMPA/EIS was developed with input from the following Cooperating Agencies: State of Colorado Department of Natural Resources; Garfield County, Colorado; Rio Blanco County, Colorado; the Town of Rifle, Colorado; and the Town of Parachute, Colorado.

Management Alternatives

Management alternatives and associated environmental impacts in this document are analyzed as part of the requirements for an EIS pursuant to the National Environmental Policy Act (NEPA). The five alternatives represent possible amendments to the current management of the Planning Area.

Current management direction is provided by the 1984 Resource Management Plan (RMP) for the Glenwood Springs Resource Area (GSRA), revised in 1988 and amended in 1991, 1996, 1997, 1999, and 2002 and the 1997 White River Resource Area (WRRA) RMP. The 1999 GSRA RMPA for Oil and Gas Leasing and Development allowed for the leasing of much of the former NOSR 3, including lands that already contained oil and gas production and facilities.

The alternatives described and analyzed in this document represent possible management scenarios. They reflect a reasonable range of potential future land use and resource management scenarios based on information received as part of the public scoping process and at locally held BLM focus group meetings. Input was received from BLM staff, other resource or land management agencies, local governments, individual citizens, BLM's Northwest Colorado Resource Advisory Council (RAC), environmental groups, industry, and other interested parties.

These alternatives are not "set in stone" but instead may be refined as part of this RMPA/EIS process. The final RMPA may include components from all of the alternatives.

- **Alternative I** is the No Action Alternative, a requirement of NEPA. For this RMPA/EIS, Alternative I generally assumes that current management actions and goals and existing or approved land uses would continue. An exception is that the interim travel management of the transferred lands (NOSRs 1 and 3) would be vacated, and travel would be managed the same as for other BLM lands in the Planning Area. Specifically, cross-country motorized and mechanized travel would be permitted throughout the Planning Area. Interim management of the transferred lands, announced in Federal Register on July 3, 2000, closes the NOSRs to cross-country motorized and mechanized travel and restricts travel to designated routes.

  The other four alternatives represent differing levels of resource development and human activity with applicable environmental provisions. Some oil and gas development already occurs within a portion of the 73,602 acres of Federal surface and/or minerals and the 53,405 acres with both private surface and private minerals.

  In Alternative I, a large portion of the Planning Area would remain unavailable for further oil and gas leasing and development during the anticipated 20-year life of this RMPA. Management actions and restrictions on surface use described in the 1999 Final Supplemental EIS (FSEIS) would continue to be applied. These include more than 22,000 acres with NGD (no ground disturbance) and/or SSR (site-specific relocation) restrictions that would be applied to avoid, minimize, or mitigate impacts to sensitive resources. For the purposes of this RMPA/EIS, the terms NGD and SSR include NSO (no surface occupancy) and CSU (controlled surface use) lease stipulations, respectively, for oil and gas development. A 5-month seasonal restriction (timing limitation [TL] stipulation) limits activity in areas of deer and elk winter range.

  Cross-country motorized or mechanized travel is permitted throughout the Planning Area under this alternative.

- **Alternative II** analyzes management for a full array of multiple-use activities, including mineral leasing, for all lands except 21,382 acres identified as having wilderness character. Although not designated as Wilderness Study Areas (WSAs), these areas would be managed to protect and maintain their characteristics of roadlessness, naturalness, and opportunities for solitude or primitive and unconfined recreation (Map 35).

  Other resource protection goals would be accomplished through special management prescriptions associated with the designation of four Areas of Critical Environmental Concern (ACECs). Streams eligible for a suitability study under the Wild and Scenic Rivers Act (WSRA) will be managed to protect those values pending the results of the study. Alternative II analyzes more than 59,000 acres with no leasing, NGD, and/or SSR restrictions, as well as the 5-month TL for deer and elk winter range.

  Motorized or mechanized travel, including over-snow travel by snowmobile, would be restricted to designated routes throughout the Planning Area. Hubbard Mesa would be designated a Special Recreation Management Area (SRMA) to be managed for off-highway vehicle (OHV) use on designated routes.

- **Alternative III**, BLM's Preferred Alternative, analyzes management for a full array of multiple-use activities, including mineral leasing, while maintaining key ecological, visual, and recreational values. The two drainage-based ACECs in Alternative II (Trapper/Northwater Creek and East Fork Parachute Creek) would also be designated in Alternative III although reduced in area to include primarily the floors of the major drainages. Additionally, however, the entire Parachute Creek watershed atop the plateau, with a total area of more than 29,000 acres, would be combined into a Parachute Creek Watershed Management Area (WMA).

Alternative III would protect roadlessness and naturalness on a total of 9,006 acres (Map 36) through NGD restrictions for other resource values. NGD areas within the 9,006 acres would not be subject to modification, waiver, or exceptions.

Protection of river segments found eligible under the WSRA would continue pending a suitability study. Resource protection goals would be achieved by applying NGD and/or SSR restrictions to more than 60,000 acres, as well as the 5-month TL for deer and elk winter range.

Motorized or mechanized travel would be restricted to designated routes, including the Hubbard Mesa SRMA but excluding over-snow travel by snowmobile.

A key difference between Alternative III and the other alternatives is that leasing and drilling for oil and gas in nearly 35,000 acres above the rim would be deferred until 80 percent of anticipated wells below the rim have been completed. The exact time to reach the 80-percent threshold cannot be predicted with certainty because it depends on a number of technical, geological, and economic factors. The estimate used in this RMPA/EIS is 16 years, although the threshold could be met as early as 10 years or as late as 20 years or more. The basis for the estimate of 16 years is discussed in Section 4.5.5.3, along with information on BLM's monitoring of progress toward reaching the threshold and potential adjustments. BLM could issue leases on top of the plateau during leasing of lands below the rim if necessary to prevent drainage, although the acreage is likely to be minimal.

- **Alternative IV** analyzes management for a full array of multiple-use activities, including mineral leasing, while maintaining key ecological, visual, and recreational values. Alternative IV would designate ACECs for the two principal watersheds on top of the plateau (Trapper/Northwater and East Fork Parachute Creeks), and the former would also be designated as a WMA. No areas would be managed specifically for maintenance of wilderness characteristics. Protection of river segments found eligible under the WSRA would be maintained pending the results of a suitability study. Resource protection goals would be achieved by identifying more than 58,000 acres subject to NGD and/or SSR restrictions. Impacts in deer and elk winter range would be mitigated with a 2-month TL applied in the permitting process as a condition of approval instead of a lease stipulation.

  Motorized or mechanized travel would be restricted to designated routes, excluding over-snow travel by snowmobile, throughout most of the Planning Area. However, the Hubbard Mesa SRMA would be designated as open to cross-country OHV travel.

- **Alternative V** analyzes management for a full array of multiple-use activities, emphasizing mineral development and motorized public access while protecting all special status species and limiting development on slopes steeper than 50 percent. This alternative would identify more than 43,000 acres subject to NGD and/or SSR restrictions.

  Except for over-snow travel by snowmobile, Alternative V would limit motorized or mechanized travel to designated routes throughout the Planning Area. This restriction would apply to the Hubbard Mesa OHV area, although it would not be designated an SRMA.

Table ES-1 summarizes the types and extent of land-use restrictions and protective designations incorporated into each of the five alternatives, including some areas not available for oil and gas leasing. Figure ES-1 illustrates the extent of the land-use restrictions and limitations.

Table ES-2 summarizes anticipated levels of gas development for the five alternatives, based on the types and extents of lease stipulations and other surface use restrictions and assumptions used in BLM's Reasonable Foreseeable Development (RFD)(Appendix H).

Table ES-3 presents general impact levels for the alternatives, including impacts associated with oil and gas development, other land uses (e.g., recreation and grazing), and the resource designations and management actions outlined in Table ES-1 (described fully in Chapters 2 and 4).

The impacts summarized in Table ES-3 incorporate positive effects of proposed special designations, management actions, mitigation measures, and best management practices to reduce or partially offset negative impacts. Table ES-3 does not reflect positive socioeconomic impacts of increasing the supply of natural gas, including direct and indirect economic benefits from increased employment, tax revenues, and royalty payments.

The general terms used in Table ES-3 to describe impact levels (negligible, minor, moderate, and major) are intended for relative, comparative purposes only — i.e., as a general comparison of impact levels among alternatives within a resource category. Thus, Table ES-3 is essentially a "roll-up" table of the impact levels identified in the technical resource sections of Chapter 4. Where the technical resource sections describe a range of potential impacts, the more severe impact level is presented in Table ES-3. Specific definitions of the impact levels differ among the resource categories and are defined more fully in Chapter 4.

Note that the increasing levels of impacts defined above may reflect increasing number, size, or permanence of impact areas, or some combination of these. Under none of the alternatives would land uses, resource development activities, or management actions be allowed to violate Federal or State laws or exceed applicable Federal or State standards.

Maps 1 through 10 (Appendix A) depict the relative area of land available for oil and gas leasing and subject to different levels of surface-use restrictions under Alternatives I through V. As noted above, these surface-use restrictions also apply to other land uses and management actions (e.g., grazing and recreation) as appropriate.

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

Limitation/Designation		Alternative				
		I	II	III	IV	V
Areas with Surface Stipulations or Other Restrictions, Limitations, or Special Requirements [1]						
No Lease for Oil and Gas[1]		44,267 ac	21,382 ac	0	0	0
Deferred Lease for Oil and Gas [2]		0	0	34,758 ac	0	0
No Ground Disturbance, No Surface Occupancy (NGD/NSO)		13,912 ac	31,200 ac	30,928 ac	30,928 ac	21,609 ac
Site-Specific Relocation, Controlled Surface Use (SSR/CSU)		8,256 ac	7,015 ac	29,594 ac	27,486 ac	21,517 ac
Timing Limitation (TL) for Deer Winter Range [3]		24,978 ac (5 months)	24,978 ac (5 months)	24,978 ac (5 months)	24,978 ac (2 months)	0 ac
Timing Limitations (TLs) for Raptor, Shorebird, and Waterfowl Nesting [3]		3,692 ac	3,692 ac	3,692 ac	3,692 ac	3,692 ac
Standard Restrictions, Limitations, and Oil and Gas Stipulations		7,167 ac	14,006 ac	13,080 ac	15,188 ac	30,746 ac
Areas with Protective Designations or Management Actions [1]						
Designated Areas of Critical Environmental Concern		0	36,184 ac	11,529 ac	11,529 ac	0
Areas Managed to Protect Roadlessness and Naturalness [4]		0	21,382 ac	9,006 ac	0	0
Streams Managed to Preserve Wild & Scenic River Eligibility		0	7,883 ac	7,883 ac	7,883 ac	0
Watershed Management Areas		0	0	29,073 ac	14,219 ac	0
Motorized or Mechanized Travel	Open	66,934 ac	0	0	2,460 ac	0
	Designated Routes Only [5]	0	45,552 ac	66,934 ac	64,474 ac	66,934 ac
	Closed	0	21,382 ac	0	0	0
Visual Resource Management	VRM Class I	0	37,240 ac	925 ac	925 ac	0
	VRM Class II	24,039 ac	13,428 ac	48,752 ac	48,752 ac	0
	VRM Class III	37,115 ac	14,607 ac	15,563 ac	15,563 ac	63,022 ac
	VRM Class IV	10,340 ac	8,350 ac	8,350 ac	8,350 ac	10,568 ac
	VRM Class V	2,096 ac	0	0	0	0
Upland Vegetation – Condition Rating Objective		40%	70%	50%	50%	40%
Riparian and Wetland Vegetation – Level of Protection		Existing	Enhanced	Enhanced	Enhanced	Existing
Deer and Elk Seclusion Areas		Maintain	Preserve and Enhance	Mitigate	Mitigate	None
Colorado River Cutthroat Trout Habitat		Maintain	Enhance	Enhance	Enhance	Maintain

[1] *Includes overlap between stipulations and protective designations on which they are based. See text for definitions of NGD, NSO, SSR, CSU, TL, and COA. 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% 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 a lease stipulation under Alternatives I through III and a Condition of Approval under Alternative IV; raptor TL also includes bald eagle winter roosts.*

[4] *For Alternative II, the areas would be managed to protect roadlessness, naturalness, and solitude or primitive and unconfined recreation (i.e., wilderness character). For Alternative III, the areas would be managed in ways that would protect roadlessness and naturalness, and the associated NGD/NSO restrictions would allow no modification, waiver, or exceptions.*

[5] *Over-snow travel by snowmobile limited to designated routes under Alternative II.*

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

Component	Alternative				
	I	II	III	IV	V
Area Available for Pads, Other Surface Facilities, and Roads [1]	15,423 ac	21,021 ac	42,674 ac	42,674 ac	51,993 ac
Wells (Pads) atop the Plateau [2,3]	10 (7)	87 (66)	51 (39)	168 (126)	234 (175)
Wells (Pads) below the Cliffs [3]	845 (247)	818 (244)	1,273 (363)	1,156 (323)	1,348 (409)
Total Wells (Pads) [3]	855 (254)	905 (310)	1,324 (402)	1,324 (449)	1,582 (584)
Long-term Ground Disturbance for Pads and Associated Facilities [4]	638 ac	745 ac	944 ac	1,079 ac	1,373 ac
Length and Area of New or Widened Access Roads [4]	152 miles (513 ac)	186 miles (603 ac)	241 miles (817 ac)	270 miles (861 ac)	350 miles (1,112 ac)
Total Long-term Ground Disturbance	1,151 ac	1,346 ac	1,761 ac	1,940 ac	2,495 ac
Total Gas Produced by New Wells on BLM Lands [5]	983 BCF	1,041 BCF	1,523 BCF	1,523 BCF	1,819 BCF

[1] *Leasable area minus areas with NSO stipulations.*

[2] *For Alternative III, 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.*

[3] *Based on 40-acre surface spacing, except 20-acre surface spacing for directional drilling below cliffs. Downhole spacing as follows: Mesaverde: above the rim: 40 acres; below the rim: 80% at 10 acres, 20% at 20 acres; Wasatch: 160 acres.*

[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% existing roads widened by 20 feet; below the rim: 20% new roads 30 feet wide and 80% 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 RFD (Appendix H). Assumes 1.17 BCF per Mesaverde well and 0.7 BCF per Wasatch well; weighted average approximately = 1.15 BCF per well.*

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

Resource		Alternative				
		I	II	III	IV	V
Anvil Points Cave		Minor	Negligible	Minor	Minor	Minor
Fossils		Minor	Negligible	Negligible	Negligible	Negligible
Soils		Minor	Minor	Minor	Minor	Minor
Groundwater		Negligible	Negligible	Negligible	Negligible	Negligible
Surface Water	Quality [2]	Minor to Moderate	Minor	Minor	Minor to Moderate	Moderate
	Quantity	Negligible	Negligible	Negligible	Negligible	Negligible
Air Quality	Hazardous Air Pollutants, Priority Pollutants, Visibility	Minor	Minor	Minor	Minor	Minor
	Sulfur and Nitrogen Deposition, Acid Neutralizing Capacity	Negligible	Negligible	Negligible	Negligible	Negligible
Vegetation [2]		Minor	Negligible	Minor to Moderate	Moderate	Moderate
Fish and Wildlife [2]		Minor	Minor	Minor to Moderate	Moderate	Major
Special Status Species [2]		Minor	Minor	Minor to Moderate	Moderate	Major
Visual Quality [2]		Minor	Minor	Moderate	Moderate	Major
Cultural Resources		Minor	Minor	Minor	Minor	Moderate
Recreation and Travel [2]		Minor	Minor	Minor to Moderate	Moderate	Major
Livestock Grazing [2]		Minor	Minor	Minor to Moderate	Moderate	Moderate

[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] *Range of impact levels reflects estimated 16-year deferral period during which no oil and gas development would occur on top of the plateau under Alternative III.*

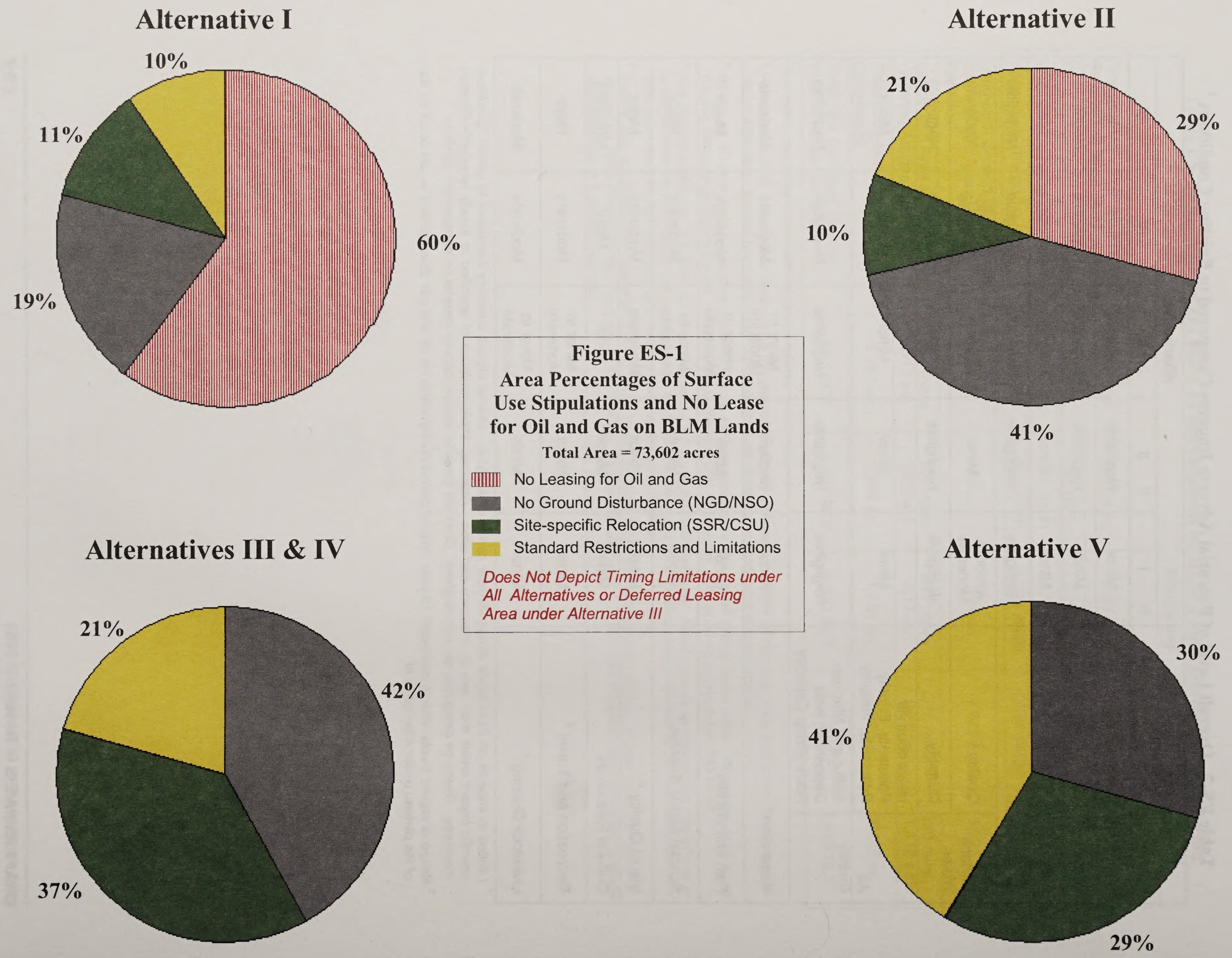
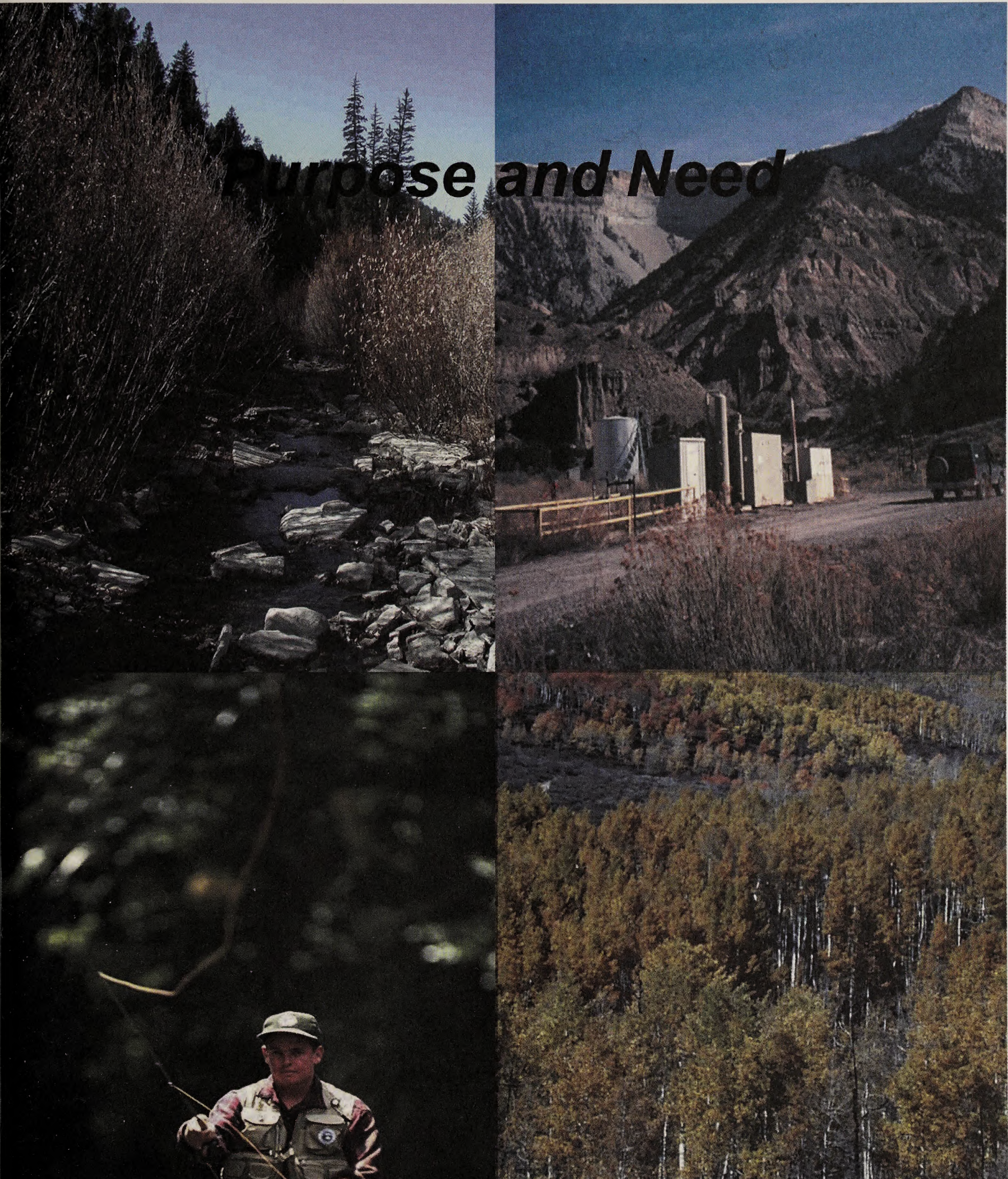


Figure ES-1
Area Percentages of Surface Use Stipulations and No Lease for Oil and Gas on BLM Lands
Total Area = 73,602 acres

Does Not Depict Timing Limitations under All Alternatives or Deferred Leasing Area under Alternative III

Purpose and Need



Bureau of Land Management
Glenwood Springs Field Office

1 PURPOSE AND NEED

1.1 OVERVIEW OF THE RMPA/EIS

This Resource Management Plan Amendment and Environmental Impact Statement (RMPA/EIS) evaluates the environmental consequences of updating 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 Planning Area in relation to Colorado, land ownership status, and topography, respectively. Figure 1-3 also shows the location of the line used to differentiate areas referred to throughout this RMPA/EIS as "above the rim" versus "below the rim" or "atop [on top of] the plateau" versus "below the rim." This line ("the rim") represents the top of the Roan Cliffs.

The U.S. Department of the Interior (USDI) Bureau of Land Management (BLM) is updating these plans in accordance with the Federal Land Policy and Management Act (FLPMA). Existing plans are being amended to incorporate lands for which management has been transferred to BLM, and to incorporate periodic amendments of existing RMPs to guide public land management for all public lands within BLM's jurisdiction. These BLM administered public lands include Federal surface and subsurface estate, and Federal subsurface estate overlain by private surface estate.

Management of the Planning Area is currently guided by the following documents, which in some cases provide overlapping and outdated direction:

- 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 & 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 July 1988)(BLM 1988a), hereafter referred to as the 1988 GSRA RMP
- White River Resource Area RMP (BLM 1996a). [The ROD was issued in July, 1997, and the document is 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 comprises a total of 127,007 acres, including 55,354 acres in former Naval Oil Shale Reserves (NOSRs) 1 and 3. The NOSRs were formally transferred to BLM from the U.S. Department of Energy (DOE) in 1998. The primary reason for this RMPA/EIS is that the portion of the Planning Area within NOSRs 1 and 3 has never been the subject of a coordinated planning process and is currently managed under the guidance of DOE's Operational Management Plan, the 1988 GSRA RMP, and the 1997 WRRA RMP. These documents provide inconsistent land use management guidance based on conditions that existed when they were prepared 15 years ago.

In recent years, the Planning Area and nearby areas have been subject to rapid human population growth and greater than previously anticipated oil and gas development. These factors cause competing pressures on land use management that 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 and Travel Management Designations into their land management program. Another reason to amend the RMPs is that FLPMA requires BLM to inventory public lands, giving priority to the designation and protection of Areas of Critical Environmental Concern (ACECs).

In response to the requirements of FLPMA to develop an RMP for all BLM lands and the social and environmental factors mentioned above, BLM developed five alternatives, each comprising different levels of environmental protection, resource management, and opportunities for oil and gas development. The RMPA/EIS evaluates these five alternatives on Federal lands within the Planning Area.

FLPMA provides the authority for BLM to formulate land use plans and requires that an RMP 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.

This chapter of the RMPA/EIS describes the purpose for amending the RMP. It presents BLM's goals and objectives for the amendments. It also explains the need for the amendments by describing the environment and social context in which BLM manages the Planning Area and the laws, regulations, and planning policies that contribute to BLM's approach to managing public lands under its jurisdiction. This section also gives an overview of the National Environmental Policy Act (NEPA) process with which this RMPA/EIS conforms, the RMPA/EIS schedule and a summary of the issues addressed in this RMPA/EIS that were identified through the scoping process.

Chapter 2, Alternatives, describes the five alternatives evaluated in detail in the RMPA/EIS. It 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 each of the five alternatives. 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 presented are cited in the text.

Appendices A through H provide supporting information for the chapters described above. A List of Acronyms is provided following the Table of Contents.

1.2 PURPOSE OF THE ACTION

The purpose of amending the existing RMPs for portions of 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:

- Implements BLM's mission to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.
- Facilitates 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.

- Complies with the provisions of Public Law 105-85 transferring the approximately 55,354 acres within NOSRs 1 and 3 from the Department of Energy to the Department of the Interior.
- Ensures a consistent, coordinated approach to managing lands within the Planning Area.

To achieve these goals, BLM has established the following objectives for the RMPA:

- 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 Areas of Critical Environmental Concern (ACECs) for areas that contain resource values that meet BLM's criteria for relevant and important values.
- Evaluate the need for designation of SRMAs or other special 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 characteristics, Research Natural Areas (RNAs), 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 sensitive. Conservation measures are designed to prevent the need for listing of additional species 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 for Programmatic Endangered Species Act Section 7 Consultation and BLM Manual 6840, Special Status Species Management.)
- Use recommendations and information from land health assessments (H-4180-1, Land Health Standards) 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 CFR 1600)
- BLM Land Use Planning Handbook (Handbook H-1601, Updated January 5, 2001)(BLM 2001a)
- BLM Manual 1613 (Areas of Critical Environmental Concern)(BLM 1988b)
- BLM Manual 6840 (Special-Status Species Management)(BLM 2001b)

- BLM Public Land Health Standards, H-4180-1 (BLM 1997a)

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 USDI in 1998. A total of 55,354 acres of land were involved in the transfer, comprising 36,362 acres in NOSR 1 and 18,992 acres in NOSR 3. These lands were added to the 18,248 acres of BLM land (including Federal surface or mineral estate) previously 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 (below the rim) be leased within one year. At the time the NOSR 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 ("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, pertaining to the 12,029 acres in the production area of NOSR 3. The remaining lands in NOSR 3 and the lands in NOSR 1 would be subject to an additional planning process, specifically this RMPA/EIS process.

The currently unleased portion of the NOSRs is the primary focus of this RMPA/EIS. Most of this area lies above the Roan Cliffs and generally corresponds to the highland area known as the Roan Plateau. This area was managed historically by BLM, although under the authority of DOE and in accordance with the DOE's Operational Management Plan (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 and the nation since 1970 (Sonoran Institute 2002). 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 of the area. While the economy of the area has traditionally been based on ranching, hunting and related services, and oil and gas development, the influx of new residents from outside of the area has brought different expectations about the future development of the Planning Area. Opinions expressed during public scoping for this document indicate that some prefer a low level of development and others would prefer that the RMP Amendments emphasize commodity production. Conflicting community goals for the Planning Area contribute 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) "Region 4," including the production area of NOSR 3. 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 Region 4 had already been leased. The ROD established lease stipulations, but those stipulations apply only to new leases and are enforceable only to the extent they are consistent with the existing lease rights granted or can be applied as Conditions of Approval (COAs) during the permitting process. The portion of the Planning Area in NOSR 1 and the remainder of NOSR 3 differ from the production area in that the lands have not already been leased for oil and gas production. Increasing demand and subsequent increases in drilling of wells for oil and gas development in western Colorado has resulted in the need for a management plan that facilitates orderly economic and environmentally sound exploration and development of oil and gas resources using balanced multiple-use management.

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, this RMPA/EIS assumes that for Alternative I the interim closures and restrictions will be vacated and that permanent designations for NOSRs 1 and 3 will 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 in 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 for the transferred lands has been considered in the development and analysis of alternatives.

Three areas (totaling 21,382 acres), found by BLM to contain wilderness characteristics, are being considered for management to maintain their wilderness characteristics within the range of alternatives. This Draft RMPA/EIS includes an analysis of alternative management prescriptions for these three areas. On April 14, 2003, a settlement agreement was reached between the Department of Interior and the State of Utah, Utah School and Institutional Trust Lands Administration, and the Utah Association of Counties. Consistent with that settlement and subsequent policies issued by BLM, the Draft RMPA/EIS does not consider 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, alternatives for the protection and management of wilderness characteristics are considered in two alternatives.

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. Information included in the assessments used to support this analysis, and ultimately the selection of a resource management plan 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 contains 73,602 acres of Federal land and 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). Of the entire 73,602 acres of public land within the Planning Area, a total of 68,447 acres of lands with BLM surface and 4,455 acres with private surface but Federal minerals are managed by the GSFO. A small portion of the site (320 acres) is managed by the White River Field Office (WRFO) out of Meeker in Rio Blanco County.

The Planning Area includes both public and private lands, although the RMP guides only BLM efforts on the public lands that it administers. About 58 percent of the Planning Area is public land; the proportion of public land is higher for the area on top of the plateau than for the area below the rim.

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 GSRA includes 568,000 acres. The WRFO manages about 1.5 million acres.

1.5 AGENCY ROLES AND RESPONSIBILITIES

The National Environmental Policy Act (NEPA) of 1969 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 action and is therefore responsible for preparing an EIS that evaluates the effects of amending the RMPs and conforms to the guidance set forth in the Act. BLM will use the evaluation in this EIS to make an informed selection of resource management options and amend the two RMPs.

The resource management plan amendments and their ultimate implementation are the sole responsibility of BLM. However, other agencies have jurisdiction 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 Endangered Species Act (ESA) regarding potential adverse effects of the RMPA/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, which includes the Colorado Division of Wildlife and the Colorado Oil and Gas Conservation Commission. BLM has also consulted with Garfield, Mesa, and Rio Blanco Counties and the towns of Rifle and Parachute.

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. FLMPA 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 Part 1600. These regulations outline the interdisciplinary, cooperative approach that BLM must take to 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 Area 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.
- **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 Amendments, five alternatives were formulated for detailed analysis. These alternatives describe a reasonable range of management options to assist decision-makers and the public in understanding the positive and negative consequences of future actions in the Planning Area.
- **Estimate Effects** – Each of the (five) alternatives is evaluated for its 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** – BLM planning regulations require that a preferred alternative be identified in the Draft RMPA/EIS. However, the final selection of an alternative is likely to be different from any of the five alternatives analyzed, instead including some elements from one or more other alternatives to reflect public and other agency input. This input will be captured during a 90-day public comment period following the publication of the Draft RMPA/EIS. The public comments and other input will be considered in the proposed plan (i.e., the final preferred alternative), which will be evaluated, described, and published in the Final RMPA/EIS adopted by BLM.
- **Prepare the Record of Decision (ROD)** – BLM's Colorado State Director will issue a decision documenting the completion of the environmental review and adoption of the proposed RMP Amendment. The ROD will be signed after conclusion of a 30-day

protest period that follows publication of the Final RMPA/EIS.

- **Monitor and Evaluate** – Once the preferred alternative is implemented, BLM will monitor and evaluate how well the plan is guiding the Planning Area toward the desired resource condition. If management issues are not being resolved or desired conditions not being met, the RMP 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 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 RMP Amendment and Final EIS containing the amendment published in the Federal Register by 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 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; and
- a concise statement explaining why the protestor believes that the State Director's decision is wrong.

After the public comment period on the Draft RMPA/EIS, a Proposed Plan Amendment/Final EIS will be prepared. A 30-day protest period (no-action period) will follow the Notice of Availability for the Final Environmental Impact Statement. In early 2004, the State Director will issue a ROD that sets forth the specifics of the resource management plan alternative selected.

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 environmental impact statement 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 action. As discussed in Chapter 2, the issues identified during the scoping process were taken into consideration during alternative formulation.

The following subsections identify issues raised during scoping, including those considered in the RMPA/EIS and those eliminated.

1.8.2 Planning Issues Considered in this RMPA/EIS

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

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 as Threatened or Endangered under the Endangered Species Act (see August 30, 2000, Interagency MOA for Programmatic Endangered Species Act 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, if any and as appropriate, including Areas of Critical Environmental Concern (ACECs) and Special Recreation Management Areas (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 may 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, Endangered Species Act, 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.

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

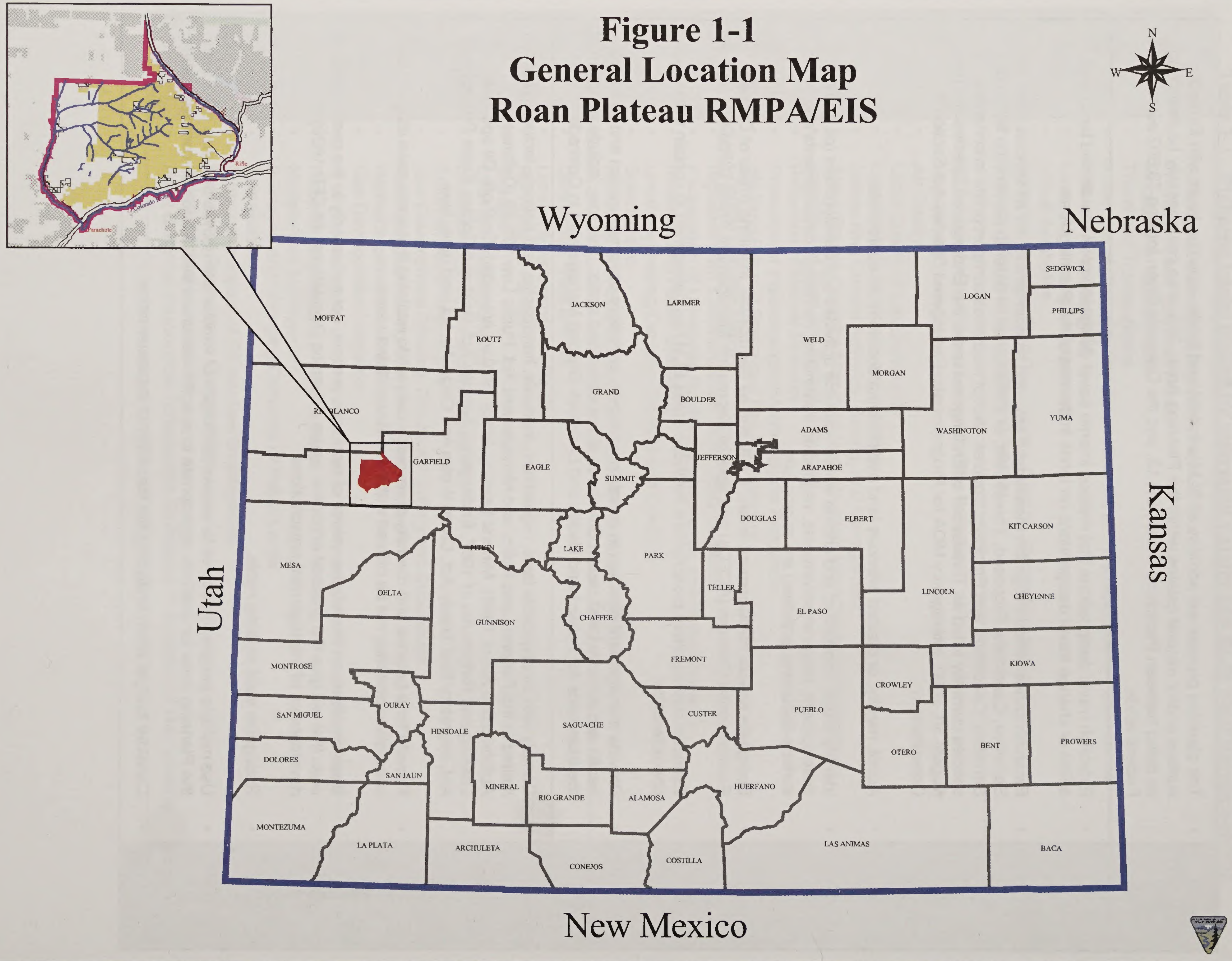
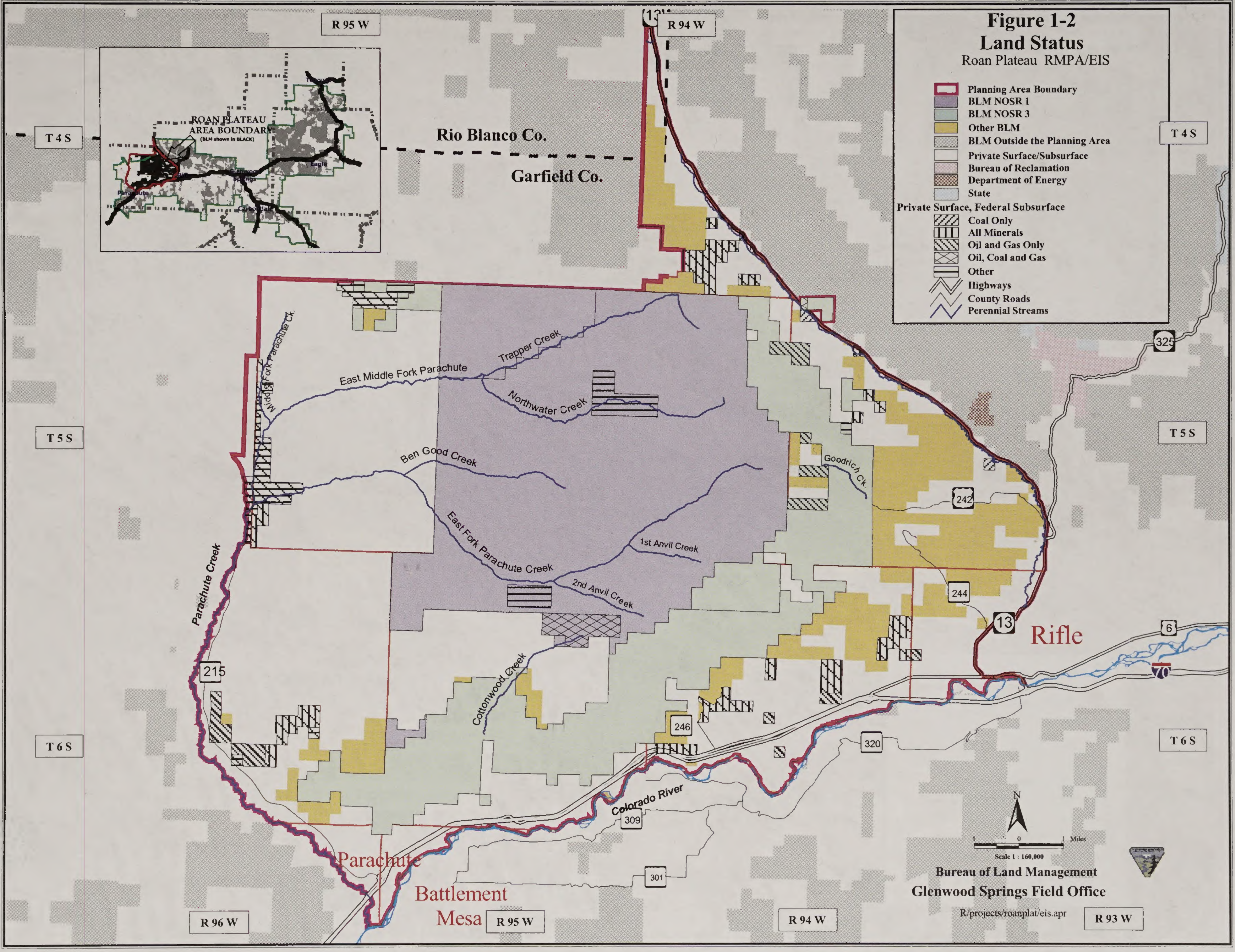


Figure 1-2
Land Status
Roan Plateau RMPA/EIS



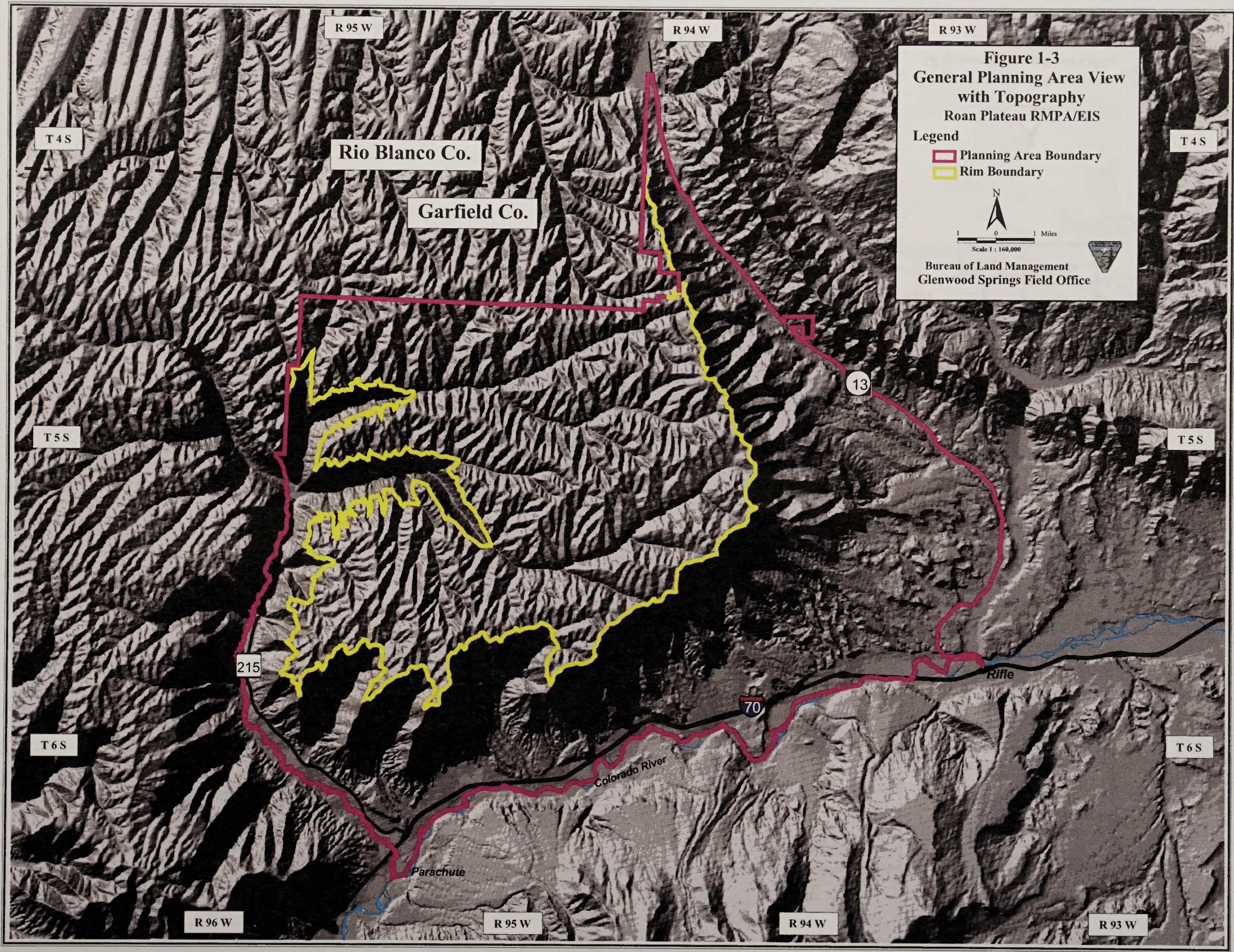
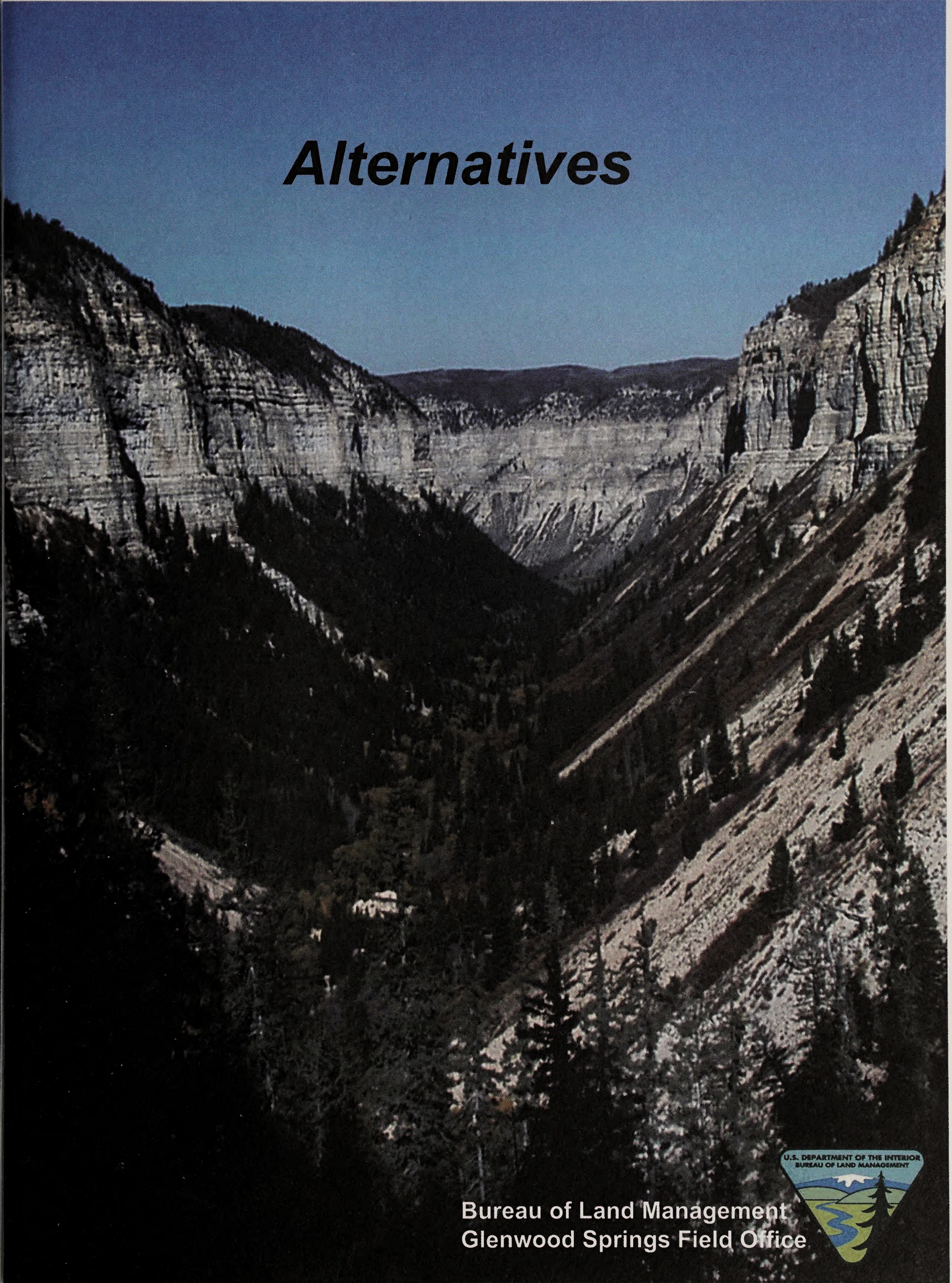


Figure 1-3
General Planning Area View
with Topography
Roan Plateau RMPA/EIS



Alternatives

Bureau of Land Management
Glenwood Springs Field Office

2 ALTERNATIVES

2.1 INTRODUCTION

Chapter 2 describes the five alternatives evaluated in detail in this RMPA/EIS. The chapter also describes how the alternatives developed and briefly explains why some alternatives were considered but not analyzed in detail. Major management elements of the five alternatives analyzed are presented in the following subsections and depicted on maps provided in Appendix A. A comparison of the alternatives along with a table of detailed information about each alternative 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. Alternatives analyzed integrate management of the GSRA and WRRA and consider management techniques for the Planning Area that are successful in other parts of these areas. Objectives also express BLM's purpose for the RMPA/EIS by addressing multiple-use mandates as described in 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 in the planning process 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 Analysis of the Management Situation dated August 2002. 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 and which 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 Reserves Numbered 3)."

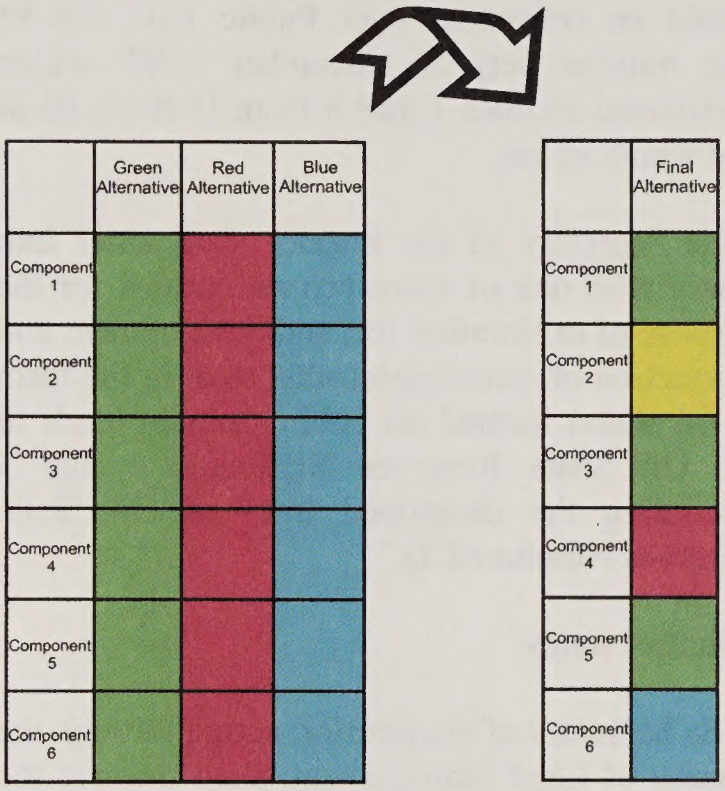
It further states:

"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 were selected to represent a reasonable range of implementable alternatives. The alternative adopted by BLM as the RMP Amendment arising from this process may differ substantially from any of the five alternatives presented in this Draft RMPA/EIS and may contain elements from any or all them. Thus, it is likely that the final RMP Amendment will represent a mix of components comprising the five alternatives described and analyzed in this Draft. Figure 2-1 illustrates such a possible recombination of alternative components for a final RMP Amendment.

Figure 2-1. Example of How Alternative Components may be Recombined for the Final RMP Amendment



Based on an analysis of the issues and technical information available, a multidisciplinary team of BLM staff formulated six preliminary alternatives, described in Section 2.4. Those six preliminary alternatives have been modified and condensed into the five alternatives analyzed in this document. Other alternatives were also considered during this early stage but were dropped from further consideration because they would not comply with the intent of the transfer act, fulfill the requirements of FLPMA or other applicable laws, or reflect existing resource values.

2.3 ALTERNATIVES ANALYZED IN DETAIL

This section summarizes the five alternatives analyzed in detail as part of this RMPA/EIS process. 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. Management prescriptions under each alternative would apply to all resource uses and management actions, whether or not specifically discussed in Chapter 2.

Considerations in the formulation of the five alternatives include the following:

- The five alternatives are intended to represent a wide range of reasonable alternatives and to encompass a broad array of management actions.
- No alternatives were analyzed that clearly would conflict with existing law or regulation.
- The No Action Alternative (Alternative I) may not be implementable without additional legislation. Each of the other four alternatives is considered by BLM to be implementable and practicable.
- Oil and gas leasing is considered consistent with the transfer act and FLPMA. No special designations for oil and gas resources (e.g., as a Strategic Petroleum Reserve) were considered, nor are any designations directed by legislation, executive order, or policy.
- BLM is not considering WSA designation in the Planning Area, and no WSAs have been proposed or are analyzed in this RMPA/EIS (see discussion in Section 1.3.8). However, management to protect and maintain wilderness character or specific wilderness values as identified through the inventory process is incorporated into two alternatives. Reclamation or enhancement of other areas in order to restore wilderness character was not considered or analyzed.
- Stream segments found through inventories to be eligible for a study to determine their suitability for designation as WSRs would be managed under some alternatives to protect and maintain those values until a suitability decision is made.
- ACECs were designated only where relevant and important values were found to be present. The extent of ACEC designation

differs among the alternatives to allow analysis of a range of protection.

- Alternative energy sources, including wind, solar, geothermal, and biomass, were considered but are not specifically addressed in detail in this document. Alternative energy developments would be allowed to the extent that they are consistent with the management prescriptions adopted in this RMP amendment process. If and when a proposal is made, and details of potential development provided, additional analysis may be required.

It is important to note that the actions described under each alternative would not specifically be permitted by adoption of any alternative through the planning process. For example, although some oil and gas development would be allowed under all of the alternatives, actual 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 alternatives represent reasonable projections of what could occur, it is impossible to predict with certainty the precise outcome of any of the alternatives due to the large number of variables involved. Actual development may differ substantially from the scenarios presented.

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 directional drilling may or may not prove technically or economically feasible in some areas.

Additionally, it should be noted that the number of new 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, annual drilling rates, and surface-use restrictions. This Draft RMPA/EIS uses the number of existing wells referenced in the RFD of February 2004 (Appendix H). However, some new wells have since been developed in areas of existing leases below the cliffs. Therefore, the impact analyses in Chapter 4 are conservative regarding future impacts below the cliffs, since a portion of the assumed new wells have already been drilled, and the number of new wells that could be drilled is thus smaller. Total impacts (i.e., existing plus future) are not affected by the ongoing development in areas of existing leases below the cliffs.

Under any of the alternatives, any action or development must be consistent with applicable Federal, State, and local laws and regulations. Nothing presented in this analysis should be construed as exempting activities from applicable legal or regulatory requirements.

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)** – Use or occupancy of the land surface for fluid mineral exploration or development is prohibited 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 two years). For example, an NSO designation would preclude construction of a well pad but not a pipeline (if revegetated within two years) and not the recovery of underlying fluid minerals if accessed from outside the area by directional drilling. Except for specified situations, individual NSOs may include exceptions by which a ground-disturbing activity would be allowed if it met specific, stated criteria. In situations where ground-disturbing activities are permitted by exceptions, the activities may be subject to the special mitigation measures described later in this section.

- **Timing Limitation (TL)** – Prohibits surface use during specified time period to protect identified resource values but does not apply to the operation and maintenance of production facilities unless the findings of analysis demonstrate the need for such mitigation and that less stringent, project-specific measures would be insufficient. This means that an area is subject to long-term impacts, but the impacts cannot occur during a specified season (e.g., raptor nesting, bald eagle winter roosting, and period of winter range by big game).

- **Controlled Surface Use (CSU)** – Use and occupancy are allowed (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** – Areas leased under standard lease terms are subject to restrictions and limitations related to environmental protection. 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), may include shifting the location of the proposed facility or activity by up to 200 meters, prohibiting activity within a period of up to 60 days, and requiring special mitigation measures to minimize impacts and facilitate restoration of temporarily disturbed areas.

- **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 new or additional restrictions.

- **Condition of Approval (COA)** – Conditions or provisions (requirements) under which an Application for a Permit to Drill (APD) is approved (see Standard Lease Terms, above).

For lands leased for oil and gas development, and especially for areas with one or more CSU stipulations, BLM's goal is to encourage clustering, collocation, and consolidation of surface facilities and other ground-disturbing activities where appropriate 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. The desirability of these measures would be evaluated on a case-by-case basis, depending on the type of activity and portion of the Planning Area involved. Although generally considered beneficial, the clustering, collocation, or consolidation of facilities may not be so in all instances (i.e., some situations may exist in which a large, centralized facility has more impacts than multiple smaller facilities).

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

The reader should note that:

1. Many of the new or additional stipulations applicable to new leases are based on existing stipulations, although they may differ somewhat in one or more details. For example, the existing NSO for steep slopes does not apply to pipelines, while the new NSO for steep slopes would.

2. Statements in this RMPA/EIS to the effect that certain existing stipulations would be applied, extended, retained, or dropped with regard to new leases under Alternatives II through V 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 be applied to new leases, *per se*. Instead, new stipulations may mirror some of the existing stipulations.

3. For convenience, new stipulations based on existing stipulations retain the numbering system used for existing stipulations in the 1999 ROD and RMP Amendment.

4. Gaps in the numbering system for new stipulations described in this RMPA/EIS are an artifact of the planning process and will be corrected when the RMP Amendment arising from this process is prepared. At that time, all stipulations applicable to new leases will be renumbered sequentially.

Appendix C lists and describes the existing stipulations applicable to current leases and the proposed new stipulations applicable to new leases in the Planning Area.

The reader should also note that new stipulations resulting from this RMPA/EIS would be applied not only to new oil and gas leases, but also to other types of land uses and management actions in order to maintain or achieve the desired resource conditions and to ensure equitable treatment to all public land users. Examples of other land uses and management actions include 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 stipulations:

- **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. Activities permitted within an NGD area may be subject to the special mitigation requirements listed below.

- **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. SSR areas also are subject to the special mitigation measures listed below.

- **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.

For all alternatives, BLM will require Best Management Practices (BMPs) as needed in specific situations to ensure adequate protection of resource values. BMPs would be applied to oil and gas operations as COAs and would include a variety of measures to minimize impacts over the short term or long term. Examples include:

- Reducing the footprint of roads to the smallest safe standard and using dust suppression to minimize impacts to air, water, vegetation, and wildlife
- Selection of appropriate color, shape, size, and location of surface facilities to reduce visual impacts
- Using centralized or automated facilities to reduce the length and frequency of travel
- Collocating utilities in common corridors and aligning them along roadways
- Using powerline pole designs to minimize the risk of raptor electrocution

Under Alternatives II through IV, BLM may also require **special mitigation measures** in addition to BMPs and the restrictions and limitations on surface uses applicable in a specific area. Special mitigation measures could be required in areas with NGD/NSO or SSR/CSU designations and in all areas with one or more special management designation. The latter include ACECs, WMAs, SRMAs, areas managed to preserve WSR eligibility, and areas managed to maintain wilderness characteristics.

Examples of special mitigation measures or BMPs that BLM may require in specific situations include the following:

- Using culverts at stream crossings (culverts would have to be adequately sized so as not to create a barrier to along-stream movement of aquatic species or impede runoff conveyance and channel/bank stability)
- Surfacing roads with gravel or implementing dust-suppression techniques to reduce dust and sediment generation
- Using protective fencing to exclude livestock from sensitive areas or areas being revegetated
- Using biodegradable erosion blankets to stabilize disturbed soil and enhance revegetation
- Seeding only with native species
- Including native shrubs in the reclamation seed mixes
- Planting containerized shrub "tubelings" during reclamation.

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

Table 2-1 provides a detailed comparison of the resource and management components of the five alternatives and summarizes the resource management goals, policies, and approaches under each. Table 4-1 in Chapter 4 summarizes the level of oil and gas development expected under Alternatives I through V based on the "filters" of land availability and resource management restrictions incorporated into each. Maps 1 through 10 depict the distribution of land availability and restrictions for the alternatives. The following subsections highlight the major components of each alternative.

2.3.1 Alternative I – Continuation of Current Management (No Action Alternative)

This alternative (Maps 1 and 2) represents the "no action" alternative required by the NEPA process. However, two considerations must be noted:

1. 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." The latter is not applicable because, 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, restricting motorized and mechanized travel to designated routes, would be vacated, and the entire Planning Area would be open to cross-country OHV use.
2. 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.

The overall management objective for Alternative I is to "maintain present uses by continuing present management direction and activities." This objective 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. No special management designations would be created for the protection of other resource values.

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) – 28,670 acres (39.0 percent) – may overlap with other restrictions
- Standard Lease Terms – 7,167 acres (9.7 percent)

Alternative I is assumed to result in up to 855 new wells on 254 well pads during the 20-year period of analysis. This would cause a total of 1,151 acres of long-term disturbance from pads, roads, and other facilities, representing 1.6 percent of the BLM lands. Less than 3 percent of the new oil and gas impacts would be on top of the plateau due to the small area available for leasing.

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

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

Visual quality would be protected to the degree necessary to maintain current Visual Resource Management (VRM) objectives for each designated class, with emphasis on protecting the visual quality of the heavily traveled I-70 and SH 13 corridors. This includes 0 acres in VRM Class I and 24,039 acres in VRM Class II (see Appendix D for a discussion of VRM classes).

No SRMAs would be created for recreation, and existing uses would continue to be permitted to the extent consistent with protection of resources. This would include current OHV use of the Hubbard Mesa area and continued opportunities for non-motorized, mechanized, and motorized travel (see Appendix E).

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 also 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 the other alternatives, 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.

The goal for ecological resources is to maintain or restore upland vegetation to at least a 40-percent Ecological Condition Rating (ECR) and manage riparian areas to meet a minimum condition rating of Proper Functioning Condition (PFC). See Appendix F and the BLM land use planning handbook (BLM 2001a) 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 seclusion areas and movement corridors for big game (mule deer, American elk, mountain lion, and black bear), protecting raptor and waterfowl nesting and brood-rearing areas, and protecting bald eagle winter roosts. 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.

Livestock grazing would continue to be permitted on existing allotments, although subject to some increased management to meet the goals for upland vegetation, riparian areas, and aquatic habitats (see Appendix F).

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.

2.3.2 Alternative II

Alternative II (Maps 3 and 4) would allow leasing for oil and gas development in slightly more than half of the portion of former NOSRs 1 and 3 that currently is unavailable for leasing. However, due to other constraints on surface use, the total amount of land available for oil and gas leasing within the Planning Area as a whole would be increased by only 36 percent compared to Alternative I, and the anticipated number of wells would be increased by only 6 percent.

The limited additional development under Alternative II is the result of extensive areas with NGD/NSO stipulations and implementation of a number of management actions and restrictions to protect and enhance certain resources and the natural processes on which they depend. These include (a) restrictions on motorized cross-country travel; (b) management to protect four ACECs, areas having wilderness character, WSR-eligible streams and watersheds, and Colorado River cutthroat trout habitat; management for higher ecological condition; (d) systematic noxious-weed management and range improvement; (e) more stringent revegetation standards, including use of native species and natural processes; (f) higher levels of visual resource protection; and (g) higher levels of cultural and paleontological resource inventory and protection.

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 includes an emphasis on non-consumptive resource uses on top of the plateau and incorporation of appropriate management actions needed to meet, or make significant progress toward meeting, the required land health standards.

These objectives would be achieved within the framework of the following land availability or development/use restrictions (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) – 28,670 acres (39.0 percent) – may overlap with other restrictions
- Standard Restrictions and Limitations – 14,006 acres (19.0 percent)

Alternative II is assumed to result in up to 905 new oil and gas wells on 310 new pads during the 20-year period of analysis. Resultant long-term disturbance would be 1,348 acres, or 1.8 percent of BLM lands within the Planning Area. Approximately 21 percent of the disturbance would be on top of the plateau.

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.

Air quality monitoring will be conducted under Alternatives II to V. Mitigation measures will be applied as required to meet all applicable Federal and State air quality regulations and standards and any local standards.

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 (Map 35). Appendix G presents the interim management prescriptions for these areas. 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.

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

Visual Resource Management under Alternative II would protect and preserve the visual values and natural landscape within the ACECs, WSRs, areas having wilderness character, and areas of high and very high visual sensitivity, while allowing some change to existing landscape character outside special designation areas. A total of 37,024 acres would be managed as VRM Class I (see Appendix D).

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. It would also provide opportunities for motorized and mechanized travel but would limit OHV use to preserve and protect natural areas. Appendix E presents the management objectives for this SRMA.

Travel would be limited to designated routes, with 173 miles of routes 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. Over-snow travel by snowmobiles would be limited to designated routes.

Upland vegetation would be maintained or restored to at least a 70 percent ECR. Riparian areas would be managed to achieve or exceed 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 seclusion areas and movement corridors for big game (mule deer, American 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 crucial big game winter range.

Livestock management would emphasize administrative solutions to meet resource management objectives and progress towards meeting land health standards would be accelerated.

Soils would be managed in the same manner specified in Alternative I, but more stringent mitigation standards might apply.

Approximately 120 acres of isolated parcels would be eligible for disposal, and BLM would allow continued use of the utility rights-of-way along I-70 and SH 13.

2.3.3 Alternative III – Preferred Alternative

BLM has designated Alternative III as the "preferred alternative." However, it is important to remember that the five alternatives are not "set in concrete" and instead are subject to modification in response to further input from governmental agencies, the public, and representatives of interest groups. Thus, the selected alternative may be a hybrid of two or more of the alternatives described and analyzed in this Draft RMPA/EIS.

The goal of Alternative III (Maps 5 and 6) is to emphasize 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.

Achieving these objectives 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
- 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) – 28,670 acres (39.0 percent) – may overlap with other restrictions
- Standard Restrictions and Limitations – 13,080 acres (17.8 percent)

Implementation of Alternative III is assumed to result in up to 1,324 new wells on 402 well pads, with a total long-term disturbance of 1,761 acres (2.4 percent of BLM lands) through the 20-year period of analysis. During this period, only 9.4 percent of this disturbance would be on top of the plateau due to the deferral of oil and gas development there (see following discussion).

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. This provision was developed in response to ongoing input by cooperating agencies, including the Colorado Department of Natural Resources (CDNR) and local governments. The threshold for leasing above the rim is defined as the point at which 80 percent of anticipated wells below the rim under Alternative III during the 20-year life of the RMP Amendment have been effectively completed to total depth and a production test performed. A threshold number of 2,342 wells below the rim was calculated as 80 percent of the sum of projected Federal wells below the rim (1,273), projected private wells below the rim (1,244), and existing Federal and private wells below the rim (411). Thus, 0.8 x (1,273 + 1,244 + 411) = 2,342. The numbers of existing and projected new wells were derived from the RFD (Appendix H), which used data as of June 1, 2001. Figure 1-3 depicts the areas above and below the rim. Section 4.5.5.3 of this RMPA/EIS provides additional details on the deferral process.

While the exact time to reach the 80-percent threshold cannot be predicted precisely, a reasonable estimate is that 16 years would be required, based on the annual drilling rate assumed given the amount of land available for drilling and the various surface use restrictions. The actual time required could range from 10 years to more than 20 years, depending on technical, geological, and economic factors.

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 without the constraint of the NSO and CSU stipulations on oil, gas, or oil shale.

Air quality monitoring will be conducted under Alternatives II to V. Mitigation measures will be applied as required to meet all applicable Federal and State air quality regulations and standards and any local standards.

A combined 9,006 acres would be managed in ways that will protect naturalness and roadlessness (Map 36). 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 NSO stipulation would remain in place to protect naturalness and roadlessness. Two ACECs would be designated — East Fork Parachute Creek and Trapper/Northwater Creek — with a combined area of 11,529 acres. Tables 2-2a-d 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 (Alternative IV would be the same as Alternative III in this regard).

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 entire WMA would be subject to application of the special mitigation measures described previously. 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 Standards for Public Land Health described in Appendix F.

Visual Resource Management under Alternative III includes only 920 acres of VRM Class I (the East Fork Parachute Creek waterfalls), with the bulk of the area (48,752 acres) in VRM Class II. Thus, the combined area in Class I and Class II would be comparable to that of Alternative II and much larger than Alternative I.

Alternative III would also designate an SRMA for OHV recreation on Hubbard Mesa and would provide for motorized and mechanized travel as opportunities allow. Appendix E presents the management objectives for the Hubbard Mesa SRMA.

Travel would be limited to designated routes throughout the Planning Area, excluding over-snow travel by snowmobile. Approximately 209 miles of existing routes 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.

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 to potential habitat and disturbance to ecosystem processes would be minimized to the extent possible.

Wildlife management would retain the same protective stipulations as for Alternatives I and II, including the 5-month TL stipulation for deer and elk winter range, except that big game seclusion areas would be protected by restrictions on travel rather than through NGD/NSO stipulations. 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.

A combination of administrative solutions and rangeland projects would be used to manage livestock and make significant progress toward meeting land health standards.

2.3.4 Alternative IV

The goal of Alternative IV (Maps 7 and 8) is to emphasize 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.

Achieving these objectives 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) – 28,670 acres (39.0 percent) – may overlap with other restrictions
- Standard Restrictions and Limitations – 15,188 acres (20.6 percent)
- Permit-Level TLs – 24,978 acres (33.9 percent) – may overlap with other restrictions

Implementation of Alternative IV is estimated to result in up to 1,324 new wells on 449 well pads, with a total long-term disturbance of 1,940 acres (2.6 percent of BLM lands) through the 20-year period of analysis. Of this total, approximately 28 percent of the impacts would be on top of the plateau.

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 without the constraint of the NSO and CSU stipulations on oil and gas or oil shale.

Air quality monitoring will be conducted under Alternatives II to V. Mitigation measures will be applied as required to meet all applicable Federal and State air quality regulations and standards and any local standards.

Like Alternatives II and III, Alternative IV would protect 7,883 acres of streams and stream corridors found to be eligible as WSRs until a suitability decision is made. No areas would be managed specifically to protect and maintain wilderness characteristics.

Two ACECs would be designated — East Fork Parachute Creek and Trapper/Northwater Creek, with a combined area of 11,529 acres. Tables 2-2a-d 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 would be subject to the special mitigation measures described previously. 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 Standards for Public Land Health described in Appendix F.

Visual Resource Management under Alternative IV includes only 920 acres of VRM Class I (the East Fork Parachute Creek waterfalls), with the bulk of the area (48,752 acres) in VRM Class II. Thus, the combined area in Class I and Class II would be the same as for Alternative III and much larger than current management under Alternative I.

This alternative would designate an SRMA for OHV use on Hubbard Mesa. 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 Planning Area, excluding over-snow travel by snowmobile. Approximately 209 miles of existing routes would be open to 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.

The goal for ecological resources would be to achieve no less than a 50 percent Ecological Condition Rating 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 stipulations as for the previous alternatives, except that the big game seclusion areas would be protected by restrictions on travel rather than through NGD/NSO stipulations. 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.

A combination of administrative solutions and rangeland projects would be used to manage livestock and make significant progress toward meeting land health standards.

2.3.5 Alternative V

Alternative V (Maps 9 and 10) accommodates energy and other non-renewable resource development throughout the Planning Area. This alternative permits 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.

Achieving these objectives would be accomplished within the framework of the following land availability or use restrictions (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) – 3,692 acres (5 percent) – may overlap with other restrictions

Implementation of Alternative V is estimated to result in up to 1,582 new wells on 584 pads, with a total long-term disturbance of 2,495 acres (3.4 percent of BLM lands) through the 20-year period of analysis. Of the total oil and gas impacts, approximately 30 percent would occur on top of the plateau.

Stipulations regarding oil shale, coal, and both locatable and salable minerals would be the same as for Alternative IV. This includes research-scale lease tracts for oil shale, subject to the NSO and CSU stipulations for oil and gas. All lands would be open for salable minerals, also subject to NGD and SSR stipulations, while locatable minerals would not be subject to these stipulations.

Air quality monitoring will be conducted under Alternatives II to V. Mitigation measures will be applied as required to meet applicable Federal and State air quality regulations and standards and any local standards.

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 eligible streams and stream corridors would not be designated as WSRs. However, ground-disturbing activities would be prevented should the 7,883 acres be deemed suitable, with the corridors managed as NGD/NSO until a suitability decision is made.

Visual Resource Management 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").

Alternative V does not include designation of an SRMA in the Hubbard Mesa OHV area. Travel management would provide for non-motorized, mechanized, and motorized travel as opportunities allow. All OHV use would be limited to designated routes, with 259 miles of existing routes remaining open to motorized and mechanized travel. 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.

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 or maintain a minimum condition rating of at least 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 or mitigation measures 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.

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

2.4 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 RMPA/EIS (see Section 2.3.1).
- **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 Special Recreation Management Area (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 the current Alternatives I through V, described above in Section 2.3 and analyzed in detail in Chapter 4.

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
GENERAL MANAGEMENT OBJECTIVES AND TECHNIQUES				
Maintain present uses by continuing present management direction and activities. Includes no oil and gas leasing on top of plateau.	Emphasize landscape management, visual aesthetics, natural values, wilderness character, geological features, ecological richness, and unique ecosystem values for rare and sensitive species. Encourage non-consumptive resource uses, while allowing for limited consumptive resource uses on top of the 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 a variety of multiple resource uses, specifically allowing for oil and gas development where feasible. Protect resource values by balancing development of mineral resources with focused mitigation.	Emphasize energy development and other non-renewable resources through leasing and allowing development. Protect key resource values on a site-specific basis by reducing impacts through mitigation, to meet the requirements of law, regulation, and policy.
Utilize current stipulations. No special management designations.	Emphasize highest natural values through extension of current stipulations, administrative and legislative designations. Designate four ACECs (Anvil Points, Magpie Gulch, East Fork Parachute Creek, and Trapper/ Northwater Creek). Manage streams eligible for a suitability study for possible designation as WSRs to protect values until suitability is determined.	Emphasize natural values through extension of current stipulations, administrative and legislative designations. Designate two ACECs (East Fork and Trapper/Northwater Creek). Protect important ecological values outside ACECs through site-specific mitigation. Designate Parachute Creek Watershed Management Area to protect ecosystem integrity and function related to the Colorado	Emphasize natural values through extension of current stipulations, administrative and legislative designations. Designate two ACECs (East Fork and Trapper/ Northwater Creek). Protect important ecological values outside ACECs through site-specific mitigation. Designate Trapper/ Northwater Creek Watershed Management Area to protect ecosystem integrity and function	Emphasize oil and gas development, while protecting key resources through extension of current resource area-wide stipulations (except for visual resources, wildlife seclusion areas, and timing limitations). No ACECs would be designated. Resources protections would meet all policy, legislative, and regulatory requirements. Assumes no streams would be found to be suitable for WSR designation. Eligible

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
	Manage a total of 21,382 acres in three areas (as provided by Section 202 of FLPMA) to protect and maintain wilderness characteristics. However, these areas would not be designated as WSAs.	River cutthroat trout and supporting factors through graduated stipulations. Apply critical big game winter range timing limitations 5 months of every year. 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.	related to the Colorado River cutthroat trout and supporting factors through graduated stipulations. No stipulations for wildlife seclusion areas or big game winter range. Manage streams eligible for a suitability study for possible designation as WSRs to protect values until suitability is decided. No areas would be managed specifically to maintain and protect wilderness character.	streams would be managed to protect values until a suitability determination is made. No areas would be managed specifically to maintain and protect wilderness characteristics.
LAND HEALTH STANDARDS				
Ensure that all activities are authorized in a manner that would meet, or make progress towards meeting, Land Health Standards.	Implement appropriate management actions that result in meeting or making significant progress toward meeting all Land Health Standards with emphasis on natural processes.	Implement appropriate management actions on a landscape basis that would result in meeting Land Health Standards with emphasis on intensive management.	Same as Alternative III	Ensure that all activities authorized would meet Land Health Standards, with emphasis on intensive management, development, and mitigation.
GOALS, OBJECTIVES, AND CONSTRAINTS BY RESOURCE				
The following management objectives and prescriptions are presented by resource. Management constraints designed to protect a variety of resources and/or mitigate impacts are also presented. Stipulations, conditions, and mitigating measures will 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				

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
resource. Several types of constraints apply. They include No Ground Disturbance/No Surface Occupancy (NGD/NSO), Site Specific Relocation/Controlled Surface Use (SSR/CSU), Timing Limitations (TL), and special mitigation. NSO, CSU, and TL are terms that apply specifically to oil and gas leasing, while NGD and SSR would apply to other activities. Special mitigation and other protective measures within BLM's authority to require would apply to all activities when authorized, including the permitting process for oil and gas activities.				
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 cave. Restrict activities that could cause direct or indirect impacts such as collapse or dewatering.	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I
PALEONTOLOGICAL RESOURCES				
Require paleontological clearances/mitigation prior to surface disturbance in Condition 1 and some Condition 2 areas. Significant resources would be avoided or recovered through the authorization process.	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I
Protect Sharrard Park paleontological resources through SSR/CSU stipulation.	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
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% to maintain site stability and site productivity. SR/CSU on erosive soils and slopes greater than 30%.	Similar to Alternative I, except that the stipulations developed in the 1999 Oil and Gas FSEIS would be applied to steep slopes and erosive soils throughout the Planning Area, higher standards of mitigation may apply, and more areas would be managed to surpass the Land Health Standards for soils. Natural processes would be emphasized.	Same as Alternative I, except that the stipulations developed in the 1999 Oil and Gas FSEIS would be applied to steep slopes and erosive soils throughout the Planning Area.	Same as Alternative III	Same as Alternative III
WATER QUALITY				
Meet all State and Federal water quality standards.	Meet or exceed all applicable Federal and State water quality standards, relying on natural processes.	Same as Alternative I	Same as Alternative I	Same as Alternative I

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
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 Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I
GENERAL ECOLOGICAL VALUES				
Maintain current ecological values and processes, and biological diversity, with existing management direction and activities.	Protect ecological values and processes and biological diversity by designating four ACECs, managing areas for wilderness character and WSR eligibility, limiting surface disturbance, and promoting natural ecosystem processes and functions in all systems.	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 surface disturbance, implementing site-specific mitigation, and limiting or mitigating effects of allowed disturbances.	Protect core ecological values and natural processes by designating two ACECs and the Trapper/Northwater Creek WMA, managing areas for WSR eligibility, designing and implementing management prescriptions that would limit surface disturbance, implementing site-specific mitigation, and limiting or mitigating effects of allowed disturbances.	Protect or lessen impacts to the most important/highest ecological values and processes by designing and implementing management prescriptions and mitigation that would limit surface disturbance, implementing site-specific mitigation, and limiting or mitigating effects of disturbances. Allow other ecological values, natural processes, and biological diversity to be modified by surface disturbance.
Rehabilitate areas affected by wildland fire and other surface-disturbing activities	Emphasize natural processes to rehabilitate or restore natural vegetative	Rehabilitate areas affected by wildland fire and other surface disturbing activities	Rehabilitate areas affected by wildland fire and other surface disturbing activities	Rehabilitate plant communities that are not meeting desired range of

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
to protect soil, water, vegetation and other resources and ensure overall watershed protection.	communities following wild land fires or other surface disturbing activities. Where seeding is needed to protect soil, water, and vegetation resources, only seed mixtures of native species will be used.	to protect soil, water, and vegetation resources and ensure overall watershed protection. Utilize seed mixtures containing forage-producing, native, and species preferred by wildlife.	to protect soil, water, and vegetation resources and ensure overall watershed protection. Utilize seed mixtures containing forage-producing, native, and species preferred by wildlife.	conditions due to dominance by annual or weedy species, or invasive juniper. Seed mixes would emphasize forage-producing perennials that support livestock production and other commodity values.
Maintain or improve the ecological condition and integrity of native stands of aspen, mountain shrubs, grasslands, conifers, where consistent with other resource objectives and uses.	Maintain or improve the ecological condition and integrity of native stands of aspen, mountain shrubs, grasslands, conifers. Utilize natural processes wherever practicable.	Same as Alternative I	Same as Alternative I	Same as Alternative I
Defer grazing use for 2 years following wildfire and/or prescribed fire or until monitoring data or professional judgment indicate that desired vegetative cover, composition and root reserves, and litter accumulation have recovered to levels adequate to support and protect watershed values.	Defer grazing use for 2 years following wildfire and/or prescribed fire, or until monitoring data indicate that desired vegetative cover, composition and root reserves, and litter accumulation have recovered to levels adequate to support and protect watershed values, and vegetative objectives.	Same as Alternative II	Same as Alternative II	Same as Alternative I
Improve ecological condition and increase forage production through	Emphasize natural values and processes associated with the diverse	Improve ecological condition and increase forage production through	Same as Alternative III	Improve ecological condition and increase forage production through

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
development and implementation of economically feasible grazing systems and range improvements.	composition and structure of native vegetation. Improve ecological condition and increase forage production where feasible through development and implementation of economically feasible grazing systems and range improvements.	development and implementation of economically feasible grazing systems and range improvements. Optimize forage production, given other uses and objectives.		development and implementation of economically feasible grazing systems and range improvements, Optimize forage production where practical given other resource uses.
Riparian/Wetland Communities				
Manage riparian/wetlands to achieve a minimum condition rating of PFC. 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.	Manage riparian communities to achieve or exceed PFC while attaining potential natural condition or a late seral plant community stage. Concentrate on achieving diverse native species composition and productivity. 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.	Same as Alternative II	Same as Alternative II	Same as Alternative I, except that stipulations from the 1999 Oil and Gas FSEIS would apply throughout the Planning Area.

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
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 affect (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.	Same as Alternative II	Same as Alternative II	Same as Alternative I, except that stipulations from the 1999 Oil and Gas FSEIS would apply throughout the Planning Area.
Riparian restoration projects would be initiated within those systems that have been identified as not functioning or functioning at risk with a downward or static trend.	Riparian restoration projects would be initiated within those systems that have been identified as functioning at a level below PFC or below late seral stage plant community.	Same as Alternative II	Same as Alternative II	Same as Alternative I
Determine grazing systems or exclusions on riparian/ wetland areas on a case-by-case basis to promote or maintain PFC.	Implement grazing systems and exclusions on riparian/wetland areas that would result in achieving or exceeding PFC.	Same as Alternative II	Same as Alternative II	Same as Alternative I

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
Relocate existing routes, wherever possible, and locate new routes outside riparian zones to reduce or eliminate negative impacts to the stream and/or riparian zone.	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.	Same as Alternative II	Same as Alternative II	Same as Alternative I
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). Continue and expand public education efforts.	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). Promote natural processes and healthy native plant communities to deter noxious weeds. Continue and expand public education.	Same as Alternative I	Same as Alternative I	Same as Alternative I
Big Game and Other Terrestrial Wildlife				
Maintain or enhance habitats capable of sustaining current	Maintain or enhance habitats capable of sustaining at least a 20% increase in existing mule	Within the constraints of other resource management objectives and activities, maintain or	Same as Alternative III	Allow limited habitat modifications that may lead to a limited decrease in some non-special status

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
populations of wildlife. Protect wildlife seclusion areas as identified in the 1999 Oil and Gas FSEIS from human disturbance. An NGD/NSO stipulation would apply. No planned management actions to enhance big game habitat, but site-specific actions to enhance wildlife habitat would be allowed.	deer populations (to meet current CDOW objectives). Provide habitat capable of sustaining existing populations of other species. Provide wildlife seclusion through ACEC designation and special management to protect unfragmented habitat. Reduce roads in wildlife seclusion areas. Allow no long-term (greater than two growing seasons) ground-disturbing activities in unroaded habitat below the rim. Accomplish habitat management largely via natural processes within special designations. Initiate management actions to enhance habitat where practical.	enhance habitats capable of sustaining existing or increasing populations of wildlife. Minimize loss of habitat connectivity and displacement of wildlife through management actions such as (1) applying travel restrictions on new routes within wildlife seclusion areas, and (2) clustering disturbances so they do not create fragmentation or loss of more than a 10% contiguous block of unroaded wildlife habitat below the rim. Initiate mitigation and vegetation management to maintain or enhance big game habitat where practical.		wildlife populations while mitigating to the extent practicable. Develop and apply mitigation where allowed surface-disturbing activities might impact wildlife seclusion habitat. No management actions to protect or enhance big game habitat planned.
Apply a winter TL to protect big game winter range from December 1 through April 30 below the rim.	Same as Alternative I	Same as Alternative I	In place of a winter TL , a COA would protect big game winter range from January through February below the rim.	No winter TL or COA.
Raptors				
In accordance with theMigratory Bird Treaty	In accordance with theMigratory Bird Treaty	In accordance with theMigratory Bird Treaty	In accordance with theMigratory Bird Treaty	In accordance with theMigratory Bird Treaty

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
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.	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.	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.	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.	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.
The NGD/NSO and TL stipulations identified in the 1999 Oil and Gas FSEIS would apply below the rim only.	Same as Alternative I except that NGD/NSO and TL stipulations would apply throughout the Planning Area.	Same as Alternative I except that NGD/NSO and TL stipulations would apply throughout the Planning Area.	Same as Alternative I except that NGD/NSO and TL stipulations would apply throughout the Planning Area.	Same as Alternative I except that NGD/NSO and TL stipulations would apply throughout the Planning Area.
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	Protect and enhance fishery and other aquatic	Maintain and enhance aquatic habitats on a site-	Maintain and enhance aquatic habitats on a site-	Maintain existing Colorado River cutthroat trout

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
quality for Colorado River cutthroat trout and other native fish species.	species habitat. Restore habitats important to Colorado River cutthroat trout and other native fish, consistent with the objectives of special management designations. Aquatic habitat condition would be determined more by natural processes than in other alternatives.	specific basis. Restore habitats important to Colorado River cutthroat trout and other native fish, consistent with other resource uses and objectives. Designate Parachute Creek WMA to protect ecosystem integrity and function related to the Colorado River cutthroat trout and supporting factors through graduated stipulations.	specific basis. Restore habitats important to Colorado River cutthroat trout and other native fish, consistent with other resource uses and objectives. Designate Trapper/Northwater Creek WMA to protect ecosystem integrity and function related to the Colorado River cutthroat trout and supporting factors through graduated stipulations.	populations and habitat quality. Apply mitigation to watersheds where allowed activities might otherwise have detrimental effects.
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	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
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.				
Protect and maintain occupied habitat for special status plants and significant plant communities. 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.	Designate four ACECs and provide special management attention to preserve, restore, and enhance known/potential special status plant and significant plant community habitat and ecological processes. Avoid ground-disturbing activities in occupied and high-risk habitat for special status plants and significant plant communities or in potential habitat and areas important to ecosystem processes. To maintain ecosystem function and long-term viability of special status species and significant plant communities, implement some active habitat management measures and close selected routes.	Designate two ACECs and the Parachute Creek WMA and provide special management attention to preserve, restore, and enhance known/potential special status plant and significant plant community habitat and ecological processes. 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.	Designate two ACECs and the Trapper/Northwater Creek WMA and provide special management attention to preserve, restore, and enhance known/potential special status plant and significant plant community habitat and ecological processes. 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 occupied habitat for special status plants and significant plant communities. Avoid ground-disturbing activities in occupied habitat and immediately adjacent ecosystem processes. Disturbances to potential special status plant habitat and ecosystem processes would be allowed, but some mitigation would be applied to lessen impacts. Prohibit collection of rare plants or plant parts, except for scientific or research purposes.

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
	Protect and maintain the hydrologic and ecological processes that support rare plants and significant plant communities. Allow only activities within moderate risk plant habitat or high value watershed areas that would not disturb, alter, or interrupt the hydrologic or ecological processes. Within areas identified as moderate risk plant habitat, NGD/NSO would apply. Within the high value watershed, special mitigation or relocation of activities beyond 200 meters may be required. Future conditions would be determined largely by natural processes. Revegetate any allowed surface disturbance using locally adapted native species. Maintain the significant riparian plant communities in mid- to late-seral stage to maintain current ecological values.	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. Revegetate any allowed surface disturbance using locally adapted native species. Maintain the significant riparian plant communities in mid- to late-seral stage to maintain current ecological values.	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. Revegetate any allowed surface disturbance using locally adapted native species. Maintain the significant riparian plant communities in mid- to late-seral stage to maintain current ecological values.	

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
		Prohibit collection of rare plants or plant parts, except for scientific research.	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 existing recovery plans and consultations completed with the USFWS. Manage special status fish and wildlife consistent with the Colorado Standards for Public Land Health. Implement the strategy outlined in the "Conservation Agreement and Strategy for Colorado River Cutthroat Trout" in the States of Colorado, Utah, and Wyoming.	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I
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	Designate four ACECs and provide special management attention to protect, preserve, restore, and enhance special status fish and wildlife species and their habitats. ACEC	Designate two ACECs to protect, maintain, and enhance habitat immediately adjacent to occupied Colorado River cutthroat trout streams. ACEC management	Designate two ACECs to protect, maintain, and enhance habitat immediately adjacent to occupied Colorado River cutthroat trout streams. ACEC management	Same as Alternative I

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
wildlife. 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. Manage habitat conditions specific to the requirements of individual species versus ecosystem approaches.	management prescriptions are presented in Table 2-2. Protect Colorado River cutthroat trout from direct and indirect impacts. Allow no loss or degradation of high or moderate risk habitat and no long-term ground-disturbing activities 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% of the stream length. Protect and maintain habitat for sensitive bat species at the Anvil Points cave. Disturbance to habitat would be mitigated or relocated more than 200 meters. Allow natural processes to have significant influence on future conditions of special status species and their habitats. Some active management of habitat and	prescriptions are presented 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. 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% of the stream length. Protect and maintain habitat for sensitive bat	prescriptions are presented in Table 2-2. Designate Trapper/Northwater Creek WMA to protect ecosystem integrity and function related to the Colorado River cutthroat trout and supporting factors through graduated stipulations. 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% of the stream length. Protect and maintain	

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
	closure of routes would occur. Emphasis on an ecosystem basis.	species at the Anvil Points cave. Disturbance to habitat would be mitigated or relocated more than 200 meters. Manage habitat conditions specific to the requirements of individual species and focus on needed mitigation. Parachute Creek WMA goals, objectives, and actions are presented in Table 2-3.	habitat for sensitive bat species atthe Anvil Points cave. Disturbance to habitat would be mitigated or relocated more than 200 meters. Manage habitat conditions specific to the requirements of individual species and focus on needed mitigation. Trapper/Northwater Creek WMA goals, objectives, and actions are presented in Table 2-3.	
VISUAL RESOURCES				
Restrictions based on visual resource management (VRM) would not apply to the existing utility corridors.	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I
Allow changes in the landscape associated with maintaining current Visual Resource Management Classes throughout the Planning Area. Current VRM objectives emphasize maintaining and mitigating for visual integrity of VRM Class II areas. Current Class II areas	Protect and preserve visual values and a natural appearing landscape within areas managed to protect and maintain wilderness characteristics, ACECs, WSRs, and in areas of High Visual Sensitivity, while allowing for some changes to the existing landscape character outside these special	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	Same as Alternative III	Allow for changes in visual values within the existing landscape character throughout the Planning Area. Allow for changes that attract attention, but do not dominate the landscape. Allow for changes to scenic quality and the existing character of the landscape.

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
consist of lands that receive the greatest amount of public viewing (high visual sensitivity) within the viewsheds of I-70, portions of the NE Cliffs, East Fork Parachute Creek Canyon, and all lands managed by the White River Resource Area. The stipulations developed in the 1999 Oil and Gas FSEIS will be carried forward for the protection of visual resources only on some of the lands below the rim and will not apply to any lands on top of the plateau. Apply NGD/NSO on slopes >30% having high visual sensitivity in the I-70 viewshed. Apply an SSR/CSU stipulation only to lands within VRM Class II areas available for lease. Lands managed as VRM Class III would partially retain the existing characteristic landscape. The level of change in the landscape due to	designation areas. Emphasize preservation and protection of areas with high scenic quality, sensitive viewsheds, and maintain a natural appearing landscape within areas with protective designations or management actions (ACECs, areas managed to protect and maintain wilderness characteristics and WSRs). These areas would be managed as VRM Class I which allows for very limited landscape modifications. Visual resources and sensitive viewsheds within the I-70, SH 13, and County Rd. 25 corridors, and within East Fork Parachute Creek Canyon, would be protected. All developments, land alterations, and vegetative manipulations would be designed to avoid or minimize visual impacts. An NGD/NSO stipulation would be applied to surface disturbances on slopes steeper than 30% with high visual sensitivity in the I-70	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. Apply NGD/NSO stipulations within the East Fork Parachute Creek Canyon and on slopes over 30% with high visual sensitivity in the I-70 viewshed. Special measures would be required to retain the overall landscape character in VRM Class II areas by SSR/CSUs stipulations. Lands managed as VRM Class III will partially retain the existing characteristic landscape through the use of special mitigation measures. The level of change in the landscape due to management activities may be moderate to evident. Lands managed as VRM Class IV will allow for high levels of modification in the	Same as Alternative III	No special provisions would be made that would necessarily preclude or relocate development, although some mitigation would be applied to lessen visual impacts. Manage the top of the plateau, cliffs, and sensitive viewsheds as Class III, and the remaining lands as Class IV. Lands managed as VRM Class III will partially retain the existing characteristic landscape through the use of special mitigation measures. The level of change in the landscape due to management activities may be moderate to evident. Lands managed as VRM Class IV will allow for high levels of modification in the landscape.

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
management activities may be moderate to evident. Lands managed as VRM Class IV allow for high levels of landscape modification. Disturbed areas (Class V) areas would be restored to meet VRM Class objectives for adjacent lands.	and SH 13 viewsheds. Special measures would be required to retain the overall landscape character in VRM Class II areas through SSR/CSU. Lands managed as VRM Class III will partially retain the existing characteristic landscape through the use of special mitigation measures. The level of change in the landscape due to management activities may be moderate to evident. Lands managed as VRM Class IV will allow for high levels of modification in the landscape. Class V areas will be managed under the VRM Class objectives for the areas immediately adjacent to the disturbance.	landscape. Class V areas will be managed under the VRM Class objectives adjacent to the disturbance.		

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
VRM Classes by acre: • Class I: 0 • Class II: 24,039 • Class III: 37,115 • Class IV: 10,340 • Class V: 2,096	VRM Classes by acre: • Class I: 37,240 • Class II: 13,428 • Class III: 14,607 • Class IV: 8,350 • Class V: 0	VRM Classes by acre: • Class I: 925 • Class II: 48,752 • Class III: 15,563 • Class IV: 8,350 • Class V: 0	VRM Classes by acre: • Class I: 925 • Class II: 48,752 • Class III: 15,563 • Class IV: 8,350 • Class V: 0	VRM Classes by acre: • Class I: 0 • Class II: 0 • Class III: 63,022 • Class IV: 10,568 • Class V: 0
Urban				
12 acres	12 acres	12 acres	12 acres	12 acres
Class I: Preservation of existing character of the landscape. (Typically results in NGD/NSO with very limited exceptions.)				
0 acres	37,240 acres (within four ACECs and three areas managed to protect and maintain wilderness characteristics)	925 acres (associated with waterfall and canyon)	925 acres (associated with waterfall and canyon)	0 acres
Class II: Retention of existing character of the landscape. Level of allowable change is low. (Typically results in NGD/NSO or SSR/CSU, reclamation and mitigation required.)				
24,039 acres	13,428 acres	48,752 acres	48,752 acres	0 acres
Class III: Level of change to the characteristic landscape can be moderate. (Reclamation and mitigation required.)				
10,340 acres	8,349 acres	15,563 acres	15,563 acres	10,568 acres
Class IV: Level of change to the characteristic landscape can be high. (Reclamation and mitigation required.)				
37,115 acres	14,607 acres	8,350 acres	8,350 acres	63,022 acres
Class V: Remaining disturbed areas, after reclassification after required reclamation and mitigation.				
2,096 acres	0 acres	0 acres	0 acres	0 acres

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
TRANSPORTATION AND TRAVEL MANAGEMENT				
Area Restrictions				
Provide opportunities for non-motorized, mechanized, and motorized travel, within the framework of existing decisions. No designated routes on transferred lands. Open to cross-country travel. (Present travel restrictions are temporary, subject to land use planning.)	Provide for non-motorized, mechanized, and motorized travel as opportunities allow. Limit off-road vehicle use to preserve and protect wilderness characteristics. Provide for responsible use by limiting travel to designated routes or areas throughout the Planning Area, including the Hubbard Mesa SRMA and over-snow travel by snowmobile.	Provide for non-motorized, mechanized, and motorized travel as opportunities allow. Limit off-road vehicle use to preserve and protect roadlessness and naturalness. Provide for responsible use by limiting travel to designated routes or areas throughout the Planning Area, including the Hubbard Mesa SRMA but excluding over-snow travel by snowmobile.	Provide for non-motorized, mechanized, and motorized travel as opportunities allow. Provide for responsible use by limiting travel to designated routes or areas throughout the Planning Area, except within the Hubbard Mesa SRMA and except for over-snow travel by snowmobile.	Provide for non-motorized, mechanized, and motorized travel, as opportunities allow. Provide for responsible use by limiting travel to designated routes throughout the Planning Area, except for over-snow travel by snowmobile.
As oil and gas or other development occurs, travel in areas (other than the SRMA in Alternatives II through IV) 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 will be designated dministrative access only, unless specific objectives	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
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.	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 66,934 acres).	Same as Alternative III
Limited to designated routes: 0 acres	Limited to designated routes: 45,552 acres (includes over-snow travel).	Limited to designated routes: 66,934 acres (excludes over-snow travel.	Limited to designated routes: 64,474 acres (excludes Hubbard Mesa).	Same as Alternative III
As oil and gas or other development occurs, travel in areas (other than the SRMA in Alternatives II, III, and IV) that are 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 or other uses would be designated administrative access only, unless specific objectives for other resources (e.g. recreational travel routes or access to recreational sites) are	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
present that warrant other designations.				
Closed to motorized and mechanized travel: 0 acres	Closed to motorized and mechanized travel: 21,382 acres.	Closed to motorized and mechanized travel: 0 acres	Closed to motorized and mechanized travel: 0 acres	Closed to motorized and mechanized travel: 0 acres
Routes				
Open to motorized (public and administrative) and mechanized use: 259 miles Closed to motorized and mechanized use: 0 miles	Open to motorized and mechanized use: 173 miles (includes approximatley 35 miles of designated routes in Hubbard Mesa SRMA) Open only for administrative use: 43 miles Closed to motorized and mechanized use: 43 miles	Open to motorized and mechanized use: 209 miles Open only for administrative motorized use: 24 miles Closed to motorized and mechanized use: 26 miles Routes subject to closure or restrictions for public safety.	Same as Alternative III	Open to motorized (public and administrative) and mechanized use: 259 miles Closed to motorized and mechanized use: 0 miles Routes subject to closure or restrictions for public safety.
	Closed routes will be rehabilitated and may be designated/managed for foot and horse travel.	Same as Alternative II	Same as Alternative II	Same as Alternative II
The "JQS Road" (Garfield CR 242) 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 will access the top of the plateau across private lands from the west	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
or via public access on "Cow Creek Road" (Rio Blanco CR 5 and Garfield CR 249) 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.				
As oil and gas or other development occurs, travel on routes (other than the Hubbard Mesa SRMA in Alternatives II through IV) that are 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 oils and gas or other uses will be designated for administrative use only, unless specific objectives for other resources (e.g., recreational transportation routes or access to a recreational site of interest) exist, in which case other designations may be considered on a case-by-	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
case basis.				
LANDS AND REALTY				
Acquisitions of in-holdings and other areas with important resource values would be encouraged or allowed.	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I
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.	Same as Alternative II	Same as Alternative II	Same as Alternative II
BLM would continue to allow development in existing rights-of-way along SH 13 and I-70. No direction identified for transferred lands. Acquisition of in-holdings and areas of important resource values allowed. 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.) All lands are suitable for	Major utility corridors are identified for the public lands along SH 13 and north of I-70. This is an existing corridor and will continue to be made available for new pipelines and utilities rights-of-way. Retention of 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, areas managed to protect and	Major utility corridors are identified for the public lands along SH 13 and north of I-70. This is an existing corridor and will continue to be made available for new pipelines and utilities rights-of-way. Retention of 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	Major utility corridors are identified for the public lands along SH 13 and north of I-70. This is an existing corridor and will continue to be made available for new pipelines and utilities rights-of-way. Retention of 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	Major utility corridors are identified for the public lands along SH 13 and north of I-70. This is an existing corridor and will continue to be made available for new pipelines and utilities rights-of-way. Retention of 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. Use authorizations would have to meet the conditions or stipulations of the

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
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.	maintain wilderness characteristics, or the SRMA. Ue authorizations would have to meet conditions or stipulations of the alternative. Potential disposal or exchange of approximately 40 acres adjacent to gun range and bout 80 acres in other isolated parcels. 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 areas managed to protect and maintain wilderness characteristics, protective stipulations, and other management constraints identified by alternative.	would have to meet the conditions or stipulations of the alternative. Potential disposal or exchange of approximately 40 acres adjacent to gun range, along with about 80 acres in other isolated parcels. 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.	would have to meet the conditions or stipulations of the alternative. Potential disposal or exchange of approximately 40 acres adjacent to gun range, along with about 80 acres in other isolated parcels. 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.	alternative. Potential disposal or exchange of approximately 40 acres adjacent to gun range, along with about 80 acres in other isolated parcels. 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.

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
RECREATION				
Recreation Activities				
Provide dispersed recreation activity opportunities	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I
Recreation Setting				
Management direction for dispersed recreational activities would be consistent with the following ROS classes: **Acres** Urban 0 Rural 8,372 Front Country 14,319 Middle Country 24,113 Back Country 20,110 Primitive 0	Management direction for dispersed recreational activities would be consistent with the following ROS classes: **Acres** Urban 0 Rural 8,372 Front Country 36,635 Middle Country 21,345 Back Country 583 Primitive 0	Management direction for dispersed recreational activities would be consistent with the following ROS classes: **Acres** Urban 0 Rural 8,372 Front Country 57,925 Middle Country 684 Back Country 583 Primitive 0	Same as Alternative III	Management direction for dispersed recreational activities would be consistent with the following ROS classes: **Acres** Urban 0 Rural 8,372 Front Country 58,053 Middle Country 9 Back Country 500 Primitive 0
Special Recreation Management Areas (SRMAs)				
No SRMAs; manage as part of Glenwood Springs Extensive Recreation Management Area (ERMA).	Designate Hubbard Mesa SRMA for Off-Highway Vehicles (OHVs) to enhance/manage intensive mechanized/motorized use in the area (2,460 acres).	Same as Alternative II	Designate Hubbard Mesa SRMA for Off-Highway Vehicles (OHVs) to enhance and manage intensive mechanized and motorized use within the	Same as Alternative I

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
	Travel would be limited to designated routes. Remaining lands would be managed under the Glenwood Springs Extensive Management Area. Management objectives for the Hubbard Mesa SRMA are presented in Appendix E.		area (2,460 acres) Travel would not be limited to designated routes. Management objectives for the Hubbard Mesa SRMA are presented in Appendix E.	
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 Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I
Implement rangeland projects (fences, ponds, etc. to direct livestock use) and administrative solutions (season of use revisions, stocking level adjustments, pasture exclusions and utilization stipulations) to meet resource management objectives based on monitoring studies and land health assessment findings.	Emphasize administrative actions (season of use revisions, stocking level adjustments, pasture exclusions and utilization stipulations) as the preferred solution to meet resource management objectives based on monitoring studies and land health assessment findings. Accelerate progress towards meeting	Use a combination of administrative solutions (such as season of use revisions, livestock exclusion, and stocking level adjustments) and rangeland projects (fences, ponds, etc. to direct livestock use) to meet resource objectives while making significant progress towards meeting Land Health Standards.	Same as Alternative III Same as Alternative III	Emphasize rangeland projects (fences, ponds, etc. to direct livestock use) and vegetative treatments as the preferred solution to optimize forage availability and meet resource management objectives in coordination with other land uses. Make significant progress, where practical, towards meeting Land Health Standards.

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
Abandon and rehabilitate projects that do not function to meet management objectives.	Land Health Standards. Abandon and rehabilitate projects that do not function to maintain resource values and meet management objectives.	Abandon and rehabilitate projects that do not function to maintain resource values and meet management objectives.		Abandon and rehabilitate projects that longer meet management objectives and/or are in direct conflict with other land uses.
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 high-priority allotments to determine whether management objectives and Land Health Standards are being achieved. Conduct low-intensity monitoring on other allotments to ensure that livestock grazing is not in conflict with other natural resource processes.	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.	Same as Alternative III	Same as Alternative I
Develop allotment management plans within administrative units that do not meet, or have identified concerns in meeting, Land Health Standards.	Develop allotment management plans for units that do not meet standards or have identified conflicts with wildlife, watershed, wetland/riparian, botanical, or wilderness values.	Same as Alternative II	Same as Alternative II	Develop allotment management plans within administrative units that have identified issues in meeting Land Health Standards.

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
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 will 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 may 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" (Garfield CR 242) 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 will 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.	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
Leasing and Permitting				
Oil and gas leasing will 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 and in accordance with the decisions made through application of FLMPA and other laws applicable to public lands. Regulations governing onshore oil and gas operations can be found at 43 CFR 3160.	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I
BLM will 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. Although well pad densities may vary across the Planning Area, the objective will be to manage lease development to limit	Same as Alternative I	Same as Alternative I, but with a goal to limit average surface spacing density to one well pad per 160 acres. This may include, but is not necessarily limited to, relocation of drilling locations, inventories, special studies, onsite and offsite mitigation, and timing restrictions.	Same as Alternative III	Same as Alternative I

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
surface density consistent with lease rights granted. This will 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.				
Closed to Oil and Gas Leasing: This is the most restrictive prescription.				
44,267 acres (60.1%) (not leased within former NOSR 1 and three parcels)	21, 382 acres (29%) (within three areas managed for the maintenance and protection of wilderness characteristics)	0 acres	0 acres	0 acres

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
Deferred Lease for Oil and Gas: Threshold criterion for leasing and development atop the plateau would be the 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.				
0 acres	0 acres	34,758 acres (47.2%)	0 acres	0 acres
No Surface Occupancy (NSO): Lands available for lease where NSO is the most restrictive stipulation. May overlap with less restrictive stipulations.				
13,912 acres (18.9%) NSO for slopes greater than 50%, threatened, endangered and federal proposed or candidate species, wildlife seclusion areas, raptors, peregrine falcon, bald eagles, I-70 viewshed, Anvil Points cave area, riparian and wetland zones, and major river corridors.	31,200 acres (42.4%) NSO for slopes greater than 50%, special status species (threatened, endangered, federal *proposed* candidate or sensitive species) populations, high risk plants habitat, significant or remnant plant communities, raptors, moderate risk plant habitat/ecological process, bald eagles, I-70 and SH 13 or County Road viewsheds, Class 1 VRM, high visual sensitivity, wildlife seclusion areas, fish high risk habitat, fish moderate risk habitat, fisheries high value watershed, peregrine falcon, Anvil Points cave area, riparian and wetland zones, four ACECs (see ACEC section), WSR eligibility, and major river corridors.	30,928 acres (42%) NSO for slopes greater than 50%, special status species, (threatened, endangered and federal proposed or candidate species, sensitive species) populations, high risk plants habitat, significant or remnant plant community, raptors, bald eagles, I-70 viewshed, Class 1 VRM/high visual sensitivity, fish high risk habitat, peregrine falcon, Anvil Points cave area, riparian and wetland zones, WSR eligibility, and major river corridors. NSO with no modification, waiver, or exceptions for the 9,006 acres with roadless and naturalness values.	Same as Alternative III	21,609 acres (29.4%) NSO for slopes greater than 50%, threatened, endangered and federal proposed or candidate species, raptors, bald eagles, peregrine falcon, Anvil Points cave area, fish high risk habitat, riparian and wetland zones and major river corridors.

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
Controlled Surface Use (CSU): Lands available for lease where CSU is the most restrictive stipulation. No NSO stipulations apply.				
8,256 acres (11.2%) CSU for sensitive species populations, some significant plant communities, erosive soils and slopes, VRM Class II areas, Sharrard Park paleontological resources, and riparian and wetland habitat below the rim.	7,015 acres (9.5%) CSU for sensitive species populations, some significant plant communities, erosive soils and slopes, VRM Class II areas, Sharrard Park paleontological resources, and riparian and wetland habitat below the rim.	29,594 acres (40.2%) CSU for sensitive species populations, some significant plant communities, erosive soils and slopes, VRM Class II areas, Sharrard Park paleontological resources, and riparian and wetland habitat below the rim.	27,486 acres (37.3%) CSU for sensitive species populations, some significant plant communities, erosive soils and slopes, VRM Class II areas, Hubbard Mesa SRMA, Sharrard Park paleontological resources, and riparian and wetland habitat below the rim.	21,517 acres (29.2%) CSU for sensitive species populations, some significant plant communities, erosive soils and slopes, VRM Class II areas, Sharrard Park paleontological resources, and riparian and wetland habitat below the rim.
Timing Limitation (TL): 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. Winter range TL is applied as a lease stipulation under Alternatives I through IV and as a COA under Alternative V. Raptor TL also includes bald eagle winter roosts.				
28,670 acres Big game winter range, raptor nesting, bald eagle, peregrine falcon, waterfowl, and shorebird nesting.	28,670 acres Big game winter range, raptor nesting, bald eagle, peregrine falcon, waterfowl, and shorebird nesting.	28,670 acres Big game winter range, raptor nesting, bald eagle, peregrine falcon, waterfowl, and shorebird nesting.	28,670 acres Big game winter range, raptor nesting, bald eagle, peregrine falcon, waterfowl, and shorebird nesting.	3,692 acres Raptor nesting, bald eagle, peregrine falcon, waterfowl, and shorebird nesting.
Areas with Protective Designations or Management Actions: Lands where exploration and development activities are subject to special mitigation measures. These will be in the form of conditions of approval, and will be developed through the permitting process.				
0 acres	65,449 acres (88.9%) Special mitigation measures to protect wildlife, vegetation, geological, watershed, fisheries, visual, and Hubbard Mesa SRMA values.	69,867 acres (94.9%) Special mitigation measures to protect wildlife, vegetation, geological, watershed, fisheries, visual, and Hubbard Mesa SRMA values.	33,631 acres (45.7%) Special mitigation measures to protect wildlife, vegetation, geological, watershed, fisheries, visual, and Hubbard Mesa SRMA values.	0 acres

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
Standard Terms and Conditions With or Without TLs: Lands where exploration and development activities are subject to standard lease terms and conditions plus a stipulation for the protection of species under the Endangered Species Act. Mitigation measures, which may be in the form of conditions of approval, will be developed through the impact analysis process.				
7,167 acres (9.7%)	14,006 acres (19%)	13,080 acres (17.8%)	15,188 acres (20.6%)	30,746 acres (41.8%)
OTHER MINERALS				
Oil Shale Leasing and Development				
No leasing	No leasing	At the discretion of the Secretary of the Interior, research and development (R&D) lease tracts will be considered in the Planning Area. Approval of research tracts will be based on the merits of the technology proposed. All leases and development (including R&D) will be subject to the NSO, CSU, and other constraints identified for this alternative. The Secretary could also propose research tract development to further the goals of a Federal energy policy. If the research technology demonstrates adequate reserve recovery, the Secretary has the discretion to expand the research tract into a	Same as Alternative III	Same as Alternative III

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
		commercial mineral lease. Additional NEPA analysis may 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 will be based on promulgation of oil shale regulations.		
Coal Leasing and Development				
No leasing	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.	Same as Alternative III	Same as Alternative III
Locatable Minerals				
Under current management, the Oil Shale Withdrawal has closed the transferred lands to mineral entry under the mining law.	Under these alternatives the Oil Shale Withdrawal affecting the transferred lands would be proposed for revocation. All lands would be available for mining claim location.	Same as Alternative II	Same as Alternative II	Same as Alternative II

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
	Exploration/development activities will be subject to 43 CFR 3809 but not the NGD/NSO or SSR/CSU constraints identified by alternative. Rights granted under the mining law cannot be modified by NGD/NSO or SSR/CSU.			
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 Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I
AREAS OF CRITICAL ENVIRONMENTAL CONCERN (ACECS) AND WATERSHED MANAGEMENT AREAS (WMAS)				
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 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	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. Risk of impacts to these significant values would be	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. Risk of impacts to these significant values would be	Same as Alternative I.

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
	minimized through management prescriptions on 36,184 acres. Magpie Gulch: 5,885 acres (visual, wildlife, botanical/ecological) Anvil Points: 10,226 acres (visual, geological, wildlife, botanical/ecological) East Fork Parachute Creek: 9,777 acres (visual, fish/wildlife, botanical/ecological) Trapper/Northwater Creek: 10,296 acres (fish/wildlife, botanical/ecological) See Table 2-2 for detailed ACEC management prescriptions.	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. The Parachute Creek WMA would be designated. Special mitigation to protect watershed values associated with fisheries, botanical resources, and municipal water quality could be applied to 29,073 acres during permitting. See Table 2-3.	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. The Trapper/Northwater Creek WMA would be designated. Special mitigation to protect watershed values associated with fisheries, botanical resources, and municipal water quality could be applied to 14,219 acres during permitting. See Table 2-3.	
AREAS HAVING WILDERNESS CHARACTER				
Management direction would be consistent with that provided by the overall objective for the alternative,	Manage a total of 21,382 acres in three areas (as provided by section 202 of FLPMA) to protect and	Manage 9,006 acres to maintain roadlessness and naturalness within 3 units:	Same as Alternative I	Same as Alternative I

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
and other resources. No special protections would be provided for wilderness characteristics in those areas that have been found to contain them.	maintain wilderness characteristics (naturalness, roadlessness, and outstanding opportunities for solitude and unconfined types of rcreation) within 3 units: Northeast Cliffs: 5,801 acres Southeast Cliffs: 5,192 acres East Fork Parachute Creek: 10,389 acres See Appendix G.	Northeast Cliffs: 2,291 acres Southeast Cliffs: 3,014 acres East Fork Parachute Creek: 4,241 acres		
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 Resource 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.	Same as Alternative II	Same as Alternative II	BLM would allow no surface-disturbing activities that might impair values until a suitability analysis has been completed. For analysis purposes, 0 acres are assumed suitable. No NGD/NSO stipulations are shown. While 7,833 acres would remain eligible and be protected, the analysis does not consider this restriction. BLM would continue to WSR-eligible rivers and corridors.

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
FOREST PRODUCTS				
No special management actions identified. Manage to maintain and promote forest health consistent with other resource objectives.	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I
FIRE				
Provide appropriate management response based on Fire Management Plan and fire management zone (FMZ) classification considering firefighter and public safety and social, economic, and environmental values.	Same as Alternative I	Same as Alternative I	Same as Alternative I	Same as Alternative I
FMZ 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)	Same as Alternative II	Same as Alternative II	Same as Alternative II
CULTURAL RESOURCES				
Proactive Cultural Resources Fieldwork By Alternative				
Least amount	Moderate amount	Same as Alternative II	Same as Alternative II	Low to moderate amount

Table 2-1. Summary of Management Components of Alternatives I through V

Alternative I (No Action)	Alternative II	Alternative III (Preferred)	Alternative IV	Alternative V
Cultural Resources Management Common to All Alternatives				
Comply with the National Historic Preservation Act, National Programmatic Agreement/State Protocol, WO-IB-2002-101, and other applicable laws, regulations, and policies. Goals are as follows: 1. 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).) 2. 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 (Same for All Alternatives)

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
	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 will comply with Section 106 of the National Historic Preservation Act, 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 will 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 will 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 actions.

Table 2-2a. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

ANVIL POINTS	Alternative II	Alternatives III and IV
RELEVANT AND IMPORTANT RESOURCES		
Visual	**Objective:** Preserve the existing character of the landscape to meet Visual Resource Management (VRM) Class I objectives. **Management Action**: Maintain the natural character and scenic quality in the landscape to provide for natural ecological process while restricting anthropogenic (human-caused) landscape modifications. Limited activities may be allowed if the basic landscape elements (line, form, color, and texture) are repeated, are not evident, and appear natural. (NGD/NSO V-1)	No Anvil Points ACEC in Alternatives III or IV
Geological	**Objective:** Protect and preserve the scientific and historic values of the cave and karst system. Allow for no physical disturbance to the cave or karst system surrounding the cave. Restrict activities that could cause direct or indirect impact to the cave or karst system such as collapse or dewatering. **Management Action**: Allow for no physical disturbance to the cave or surrounding karst system. Restrict management activities that could cause direct or indirect impact to the cave and karst system such as collapse or dewatering. (NGD/NSO 19)	No Anvil Points ACEC in Alternatives III or IV
Wildlife	**Objective:** Protect identified raptor nest sites. **Management Actions**: For the protection of raptors, NGD/NSO within 0.125-mile radius of a nest site. Raptors include owls, osprey, golden eagle, buteos, accipiters, and falcons except American kestrel. (NGD/NSO 7) For the protection of peregrine falcon, NGD/NSO within 0.25-mile radius of cliff nesting complex. (NGD/NSO 9) NGD/NSO within the Roan Cliffs wildlife seclusion areas, which provide high wildlife value, including large mammals and raptors. (NGD/NSO 11)	No Anvil Points ACEC in Alternatives III or IV

Table 2-2a. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

ANVIL POINTS	Alternative II	Alternatives III and IV
Wildlife, *continued*	**Objective:** Maintain habitat connectivity and avoid displacement of wildlife. **Management Action**: Allow no new long-term (longer than two growing seasons) human use related ground disturbing activities within the unroaded wildlife habitat located below the rim. (NGD/NSO W-2) **Objective:** Protect and preserve bat habitat values of the Anvil Points caves / karst system. **Management Action**: Special design, construction, implementation, and/or mitigation measures including relocation by more than 200 meters may be required for species listed as sensitive by BLM and for significant natural plant communities. (SSR/CSU W-3) **Objective:** Protect and minimize disturbance to wintering big game, and allow for use of limited winter range habitats during the critical winter months. **Management Action**: Avoid drilling or other high-disturbance activities from December 1 through April 30 within winter habitat which includes big game severe winter range and other high value winter habitat as mapped by the CDOW. (TL-1) **Objective:** Prevent raptor nest abandonment and reductions in nesting productivity. **Management Actions**: Avoid drilling or other high-disturbance activities within a 0.25-mile buffer zone around the nest site from February 1 through August 15. (TL-6) Peregrine falcon: A 0.5-mile buffer area around the cliff-nesting complex from March 16 through July 31 to prevent abandonment and desertion of established territories. (TL-12)	No Anvil Points ACEC in Alternatives III or IV

Table 2-2a. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

ANVIL POINTS	Alternative II	Alternatives III and IV
Botanical / Ecological	**Objective:** Protect occupied habitat and the immediately adjacent ecosystem processes that support special status plants or significant plant communities. **Management Action**: No ground-disturbing activities within occupied habitat or within the immediately adjacent ecosystem processes that support rare plants or significant plant communities. (NGD/NSO P-1) **Objective:** Allow for the long-term viability and recovery of special status species, and protect and maintain potential habitat and the ecosystem processes that support them. **Management Actions**: No long-term ground disturbing activities within potential habitat/ecosystem processes for rare plants and significant communities. (NGD/NSO P-2)	No Anvil Points ACEC in Alternatives III or IV
	<u>Special Management</u> **Objective:** Maintain the current ecological integrity and function of the rare plants and significant plant communities. **Management Action**: Revegetate using locally adapted native species. (SM P-9) **Objective**: Allow natural ecosystem processes such as rockslides to continue. Control wildfire only when human safety or property is at risk. (SM P-10) **Management Action**: Manage significant grassland and shrubland communities to retain mid- to late-seral stage condition. (SM P-11) **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.	No Anvil Points ACEC in Alternatives III or IV

Table 2-2a. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

ANVIL POINTS	Alternative II	Alternatives III and IV
Botanical / Ecological, *continued*	**Management Action**: 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. (SM P-12) **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. (SM P-13) Control noxious weeds using integrated techniques. Limit control in areas with significant plant communities or rare species to avoid damage to non-target species. (SM P-14) **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). (SM P-15)	No Anvil Points ACEC in Alternatives III or IV
OTHER IMPORTANT RESOURCES		
Steep Slopes	**Objective:** Maintain site stability and productivity. **Management Action**: NGD/NSO on slopes greater than 50% to minimize impacts on site productivity, control surface runoff, reduce erosion, and enhance reclamation. (NGD/NSO 15)	No Anvil Points ACEC in Alternatives III or IV

Table 2-2a. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

ANVIL POINTS	Alternative II	Alternatives III and IV
Soils	**Objective:** Maintain site stability and minimize potential for erosion. **Management Action**: On slopes greater than 30%, special design, construction, operation, and reclamation measures will be required. (SSR/CSU 4)	No Anvil Points ACEC in Alternatives III or IV
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. **Management Actions**: Roads, transmission lines, storage facilities and similar human-induced surface disturbances are restricted to an area beyond the outer edge of the riparian vegetation. (NGD/NSO 2) For Colorado River corridor, NGD/NSO within 0.5 mile of either side of the high water mark (bankfull stage) to protect habitat for special-status fish and wildlife species, important riparian values, water quality/filtering values, waterfowl and shorebird production areas, valuable habitat for amphibians, and high scenic and recreation values. (NGD/NSO 3) SSR/CSU within 500 feet of the outer edge of riparian or wetland vegetation. (SSR/CSU 2)	No Anvil Points ACEC in Alternatives III or IV
Paleontologic Resources	**Objective:** Protect and preserve or recover scientific paleontological values within Sharrard Park. **Management Actions**: Within the Sharrard Park area, special survey, design, construction and reclamation measures may be required, including relocation of operation beyond 200 meters. (SSR/CSU 6)	No Anvil Points ACEC in Alternatives III or IV

Table 2-2b. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

MAGPIE GULCH	Alternative II	Alternatives III and IV
Visual	**Objective:** Preserve the existing character of landscape to meet VRM Class I objectives. **Management Action**: Maintain the natural character and scenic quality in the landscape that provides for ecological changes and restricts landscape modifications. Limited activities may be allowed if the basic landscape elements (line, form, color, and texture) are repeated, are not evident, and appear natural. (NGD/NSO V-1)	No Magpie Gulch ACEC in Alternatives III or IV
Wildlife	**Objective:** Protect identified raptor nest sites. **Management Action**: For the protection of raptors, NGD/NSO within 0.125-mile radius of a nest site. Raptors include owls, osprey, golden eagle, buteos, accipiters, and falcons except American kestrel. (NGD/NSO 7) **Objective:** Maintain habitat connectivity and avoid displacement of wildlife.	
	Management Action: Allow no new long-term (longer than two growing seasons) human use related ground disturbing activities within the unroaded wildlife habitat located below the rim. (NGD/NSO W-2) **Objective:** Protect and minimize disturbance to wintering big game and allow for use of limited winter range habitats during the critical winter months. **Management Action**: Avoid drilling or other high-disturbance activities within winter habitat which includes severe big winter range and other high value winter habitat as mapped by the CDOW (December 1 through April 30). (TL-1) **Objective:** Prevent raptor nest abandonment and reductions in nesting productivity. **Management Action**: Avoid drilling or	No Magpie Gulch ACEC in Alternatives III or IV

Table 2-2b. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

MAGPIE GULCH	Alternative II	Alternatives III and IV
	other high-disturbance activities within a 0.25-mile buffer zone around the nest site from February 1 through August 15. (TL-6)	
Botanical / Ecological	**Objective:** Protect the current extent, ecological integrity, and function of the old-growth Douglas-fir community. **Management Action**: NGD/NSO within old-growth Douglas-fir remnant community, including removal of any size-class trees. (NGD/NSO P-3)	No Magpie Gulch ACEC in Alternatives III or IV
	<u>Special Management</u> **Objective:** Maintain the current ecological integrity and function of the rare plants and significant plant communities. **Management Action**: Allow natural ecosystem processes such as rock slides to continue. Control wildfire only when human safety or property is at risk. (SM-P-10) **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. Collection must have no detrimental impact on long-term survival and reproduction of rare plant species or significant plant communities. (SM-P-13) Control noxious weeds using integrated techniques. Limit control in rare plant populations or significant plant communities to avoid damage to non-target species. (SM-P-14)	No Magpie Gulch ACEC in Alternatives III or IV

Table 2-2b. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

MAGPIE GULCH	Alternative II	Alternatives III and IV
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. To allow continued wildlife access and use of these habitats. **Management Actions**: Roads, transmission lines, storage facilities and similar human-induced surface disturbances, are restricted to an area beyond the outer edge of the riparian vegetation. (NGD/NSO 2) SSR/CSU within 500 feet of the outer edge of the riparian or wetland vegetation. (SSR/CSU 2)	No Magpie Gulch ACEC in Alternatives III or IV
Steep Slopes	**Objective:** Maintain site stability and productivity. **Management Action**: NGD/NSO on slopes greater than 50% to minimize impacts on site productivity, adequately control surface runoff, reduce accelerated erosion and increase likelihood of successful reclamation. (NGD/NSO 15)	No Magpie Gulch ACEC in Alternatives III or IV
Soils	**Objective:** Maintain site stability and minimize potential for erosion. **Management Action**: On slopes greater than 30%, special design, construction, operation, and reclamation measures will be required. (SSR/CSU 4)	No Magpie Gulch ACEC in Alternatives III or IV

Table 2-2c. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

EAST FORK PARACHUTE CREEK	**Alternative II**	**Alternatives III and IV**
RELEVANT AND IMPORTANT RESOURCES		
Visual	**Objective**: Preserve the existing character of landscape to meet VRM Class I objectives. **Management Action**: Maintain the natural character and scenic quality of the landscape to provide for ecological changes and restricts 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. (NGD/NSO V-1)	**Objective**: Preserve the existing character of the landscape to meet VRM Class I objectives in areas designated as very high or high visual sensitivity. **Management Action**: Maintain the natural character and scenic quality of the landscape to provide for ecological changes and restrict landscape modifications in East Fork Falls and Box Canyon areas. Limited activities may be allowed if basic landscape elements (line, form, color, and texture) are repeated and changes are not evident and appear natural. (NGD/NSO V-2) **Objective**: In other parts of the ACEC, retain existing character of the landscape to meet VRM Class II objectives. **Management Action**: Manage all other portions of the ACEC to retain the existing character of the landscape and allow only limited changes. Special design, construction, implementation, and/or mitigation measures including relocation of operations more than 200 meters may be required. (SSR/CSU V-2)
Fish and Wildlife	**Objective:** Protect identified raptor nest sites. **Management Action**: NSO within 0.125-mile radius of a nest site for raptors, including owls, osprey, golden eagle, buteos, accipiters, and falcons except American kestrel. (NGD/NSO 7) **Objective:** Protect Colorado River cutthroat trout from direct impacts. **Management Action**: Allow no loss or degradation of high-risk habitat. (NGD/NSO W-4)	**Objective:** Protect identified raptor nest sites. **Management Action**: NSO within 0.125 mile of raptor nest, including owls, osprey, golden eagle, buteos, accipiters, and falcons except American kestrel. (NGD/NSO 7) **Objective:** Protect Colorado River cutthroat trout from direct impacts. **Management Action**: Allow no loss or degradation of high-risk habitat. (NGD/NSO W-4)

Table 2-2c. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

EAST FORK PARACHUTE CREEK	Alternative II	Alternatives III and IV
	Objective: Protect Colorado River cutthroat trout from indirect impacts. **Management Action**: Allow no loss or degradation of fish habitat that supports Colorado River cutthroat trout moderate risk habitat. (NGD/NSO W-5) **Objective:** Protect Colorado River cutthroat trout from both direct and indirect impacts within areas delineated as high value watersheds. **Management Action**: Allow no new long-term (greater than two growing seasons) ground-disturbing activities within the area mapped as high value watershed processes. (NGD/NSO W-6) **Objective:** Prevent raptor nest abandonment and reductions in nesting productivity. **Management Action**: No surface use within 0.25-mile radius of a nest site from February 1 to August 15, excepting operation and maintenance of production facilities. (TL-6)	**Objective:** Protect Colorado River cutthroat trout from most indirect impacts. **Management Action**: Special design, construction and implementation and/or mitigation measures including relocation of operations more than 200 meters may be required to minimize impacts to Colorado River cutthroat trout moderate risk habitat. (SSR/CSU W-7) **Objective:** Prevent raptor nest abandonment and reductions in nesting productivity. **Management Action**: No surface use within a 0.25-mile buffer zone around the nest site from February 1 to August 15. This does not apply to operation and maintenance of production facilities. (TL-6)
Fish and Wildlife, *continued*	<u>**Special Management**</u> **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% of the stream length. (SM-W-9)	**Management Action**: Manage livestock grazing within the ACEC so that streambank damage does not exceed 10% of the stream length. (SM-W-9)
Botanical / Ecological	**Objective:** Protect populations of rare plants and significant plant communities from most direct and some indirect impacts. (Within habitat identified as high risk plant habitat) **Management Action**: Allow no ground-disturbing activities in areas designated as high risk for rare plants or significant plant communities. (NGD/NSO P-4)	**Objective:** Protect populations of rare plants and significant plant communities from most direct and some indirect impacts. (Within habitat identified as high risk plant habitat) **Management Action**: Allow no ground-disturbing activities in areas designated as high risk for rare plants or significant plant communities. (NGD/NSO P-4)

Table 2-2c. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

EAST FORK PARACHUTE CREEK	Alternative II	Alternatives III and IV
	Objective: Protect and maintain the hydrological and ecological processes that support the rare plants and significant plant communities within habitat identified as moderate risk plant habitat. **Management Action**: Allow no ground-disturbing activities within the watershed that would disturb, alter, or interrupt the hydrologic or ecological processes that support rare plant species or significant plant communities (designated as moderate risk hydrologic value). (NGD/NSO P-5)	**Objective:** Allow only activities within the watershed that would not disturb, alter, or interrupt the hydrologic or ecological processes that support rare plant species or significant plant communities (designated as moderate risk hydrologic value). **Management Action**: Allow only activities that would not disturb, alter, or interrupt the hydrologic or ecological processes that support rare plant species or significant plant communities (designated as moderate risk hydrologic value). Special design, construction, implementation, and/or mitigation measures may be required to minimize impacts of disturbances, including relocation of operations more than 200 meters may be required. (SSR/CSU P-7)
Botanical / Ecological, ***continued***	**Special Management** **Objective:** Maintain the current ecological integrity and function of the rare plants and significant plant communities. **Management Actions**: Revegetate any allowed surface disturbance using locally adapted native species. (SM-P-9) Allow natural ecosystem processes such as rockslides to continue. Control wildfire only when human safety or property is at risk. (SM-P-10) Maintain significant riparian plant communities in mid-to-late seral stage to retain current ecological values. (SM-P-16) **Objective:** Minimize habitat fragmentation and risk of invasion by noxious weeds and other aggressive non-native species, which may compromise ecosystem function and long-term viability of rare species and communities. **Management Action**: Where practicable, restore to a naturally functioning state any existing human-caused disturbance that is impairing natural ecosystem processes	**Special Management:** **Objective:** Design subsurface disturbance to protect the hydrologic regime that creates habitat that supports the rare plants and significant plant communities within habitat designated as high value watershed. **Management Action**: Special design, construction, implementation, or mitigation measures may be required to minimize impacts of disturbances within the area mapped as high value watershed processes. (SM-P-8) **Objective:** Maintain the current ecological integrity and function of the rare species and communities. **Management Actions**: Revegetate surface disturbances using locally adapted native species. (SM-P-9) Allow natural ecosystem processes such as rockslides to continue. Control wildfire only when human safety or property is at risk. (SM-P-10) Maintain the significant riparian plant communities in mid-to-

Table 2-2c. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

EAST FORK PARACHUTE CREEK	Alternative II	Alternatives III and IV
	affecting habitat for rare plant species or significant plant communities. (SM-P-12) **Objective:** Ensure the long-term survival and reproductive capability of rare plants and significant plant communities. **Management Action**: 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 plant species or significant plant communities. (SM-P-13)	late seral stage to maintain the current ecological values. (SM-P-16) **Objective:** Minimize habitat fragmentation of risk of invasion by noxious weeds and other aggressive non-native species, which may compromise ecosystem function and long-term viability of rare species and significant plant communities. **Management Action**: 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. (SM-P-12)
Botanical / Ecological, *continued*	**Objective:** Ensure the long-term survival and reproductive capability of rare plants and significant plant communities. **Management Action**: Control noxious weeds using integrated techniques. Limit control in rare plant populations or significant plant communities to avoid damage to non-target species. (SM-P-14) **Objective:** Maintain healthy populations of rare plants and significant plant communities, maintain sufficient residual vegetation to sustain overall watershed functions, and provide forage for wildlife species. **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 watershed functions, as defined in the Colorado Livestock Grazing Management Guidelines (BLM 1997a). (SM-P-15)	**Objective:** Ensure the long-term survival and reproductive capability of rare plants and significant plant communities. **Management Action**: 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 plant species or significant plant communities. (SM-P-13) **Objective:** Ensure the long-term survival and reproductive capability of rare plants and significant plant communities. **Management Action**: Control noxious weeds using integrated techniques. Limit control in rare plant populations or significant plant communities to avoid damage to non-target species. (SM-P-14) **Objective:** Maintain healthy populations of rare plants and significant plant communities, maintain sufficient residual vegetation to sustain overall watershed functions, and provide forage for wildlife species. **Management Action**: Manage livestock grazing within occupied or potential habitat for rare plants or significant plant

Table 2-2c. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

EAST FORK PARACHUTE CREEK	Alternative II	Alternatives III and IV
		communities to promote plant health, maintain sufficient residual vegetation, and sustain watershed functions, as defined in the Colorado Livestock Grazing Management Guidelines (BLM 1997a). (SM-P-15)
OTHER IMPORTANT RESOURCES		
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. To allow continued access and use of these habitats. **Management Actions**: Roads, transmission lines, storage facilities, and similar human-induced surface disturbances, are restricted to an area beyond the outer edge of the riparian vegetation. (NGD/NSO 2)	**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. To allow continued access and use of these habitats. **Management Actions**: Roads, transmission lines, storage facilities, and similar human-induced surface disturbances, are restricted to an area beyond the outer edge of the riparian vegetation. (NGD/NSO 2)
Botanical / Ecological	SSR/CSU within 500 feet of the outer edge of the riparian or wetland vegetation. (SSR/CSU 2)	SSR/CSU within 500 feet of the outer edge of the riparian or wetland vegetation. (SSR/CSU 2)
Steep Slopes	**Objective:** Maintain site stability and site productivity. **Management Action**: NGD/NSO on slopes greater than 50% to minimize impacts on site productivity, control surface runoff, reduce erosion, and enhance reclamation. (NGD/NSO 15)	**Objective:** Maintain site stability and site productivity. **Management Action**: NGD/NSO on slopes greater than 50% to minimize impacts on site productivity, control surface runoff, reduce erosion, and enhance reclamation. (NGD/NSO 15)
Soils	**Objective:** Maintain site stability and minimize erosion. **Management Action**: On slopes greater than 30%, special design, construction, operation, and reclamation measures will be required. (SSR/CSU 4)	**Objective:** Maintain site stability and minimize erosion. **Management Action**: On slopes greater than 30%, special design, construction, operation, and reclamation measures will be required. (SSR/CSU 4)

Table 2-2d. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

TRAPPER / NORTHWATER CREEK	Alternative II	Alternative III
RELEVANT AND IMPORTANT RESOURCES		
Fish and Wildlife	**Objective:** Protect identified raptor nest sites. **Management Action**: NGD/NSO within 0.125-mile radius of a nest site for raptors, including owls, osprey, golden eagle, buteos, accipiters, and falcons except American kestrel. (NGD/NSO 7) **Objective:** Protect Colorado River cutthroat trout from direct impacts. **Management Action**: Allow no loss or degradation of fish habitat that supports Colorado River cutthroat trout high risk habitat. (NGD/NSO W-4) **Objective:** Protect Colorado River cutthroat trout from indirect impacts. **Management Action**: Allow no loss or degradation of fish habitat that supports Colorado River cutthroat trout moderate risk habitat. (NGD/NSO W-5) **Objective:** Protect Colorado River cutthroat trout from both direct and indirect impacts within areas delineated as high value watersheds. **Management Action**: Allow no new long-term (greater than two growing seasons) ground-disturbing activities within the area mapped as high value watershed processes. (NGD/NSO W-6) **Objective:** Prevent raptor nest abandonment and reductions in nesting productivity. **Management Action**: Avoid drilling or similar activity within a 0.25-mile buffer zone around the nest site from February 1 to August 15. This does not apply to operation and maintenance of production facilities. (TL-6)	**Objective:** Protect identified raptor nest sites. **Management Action**: NGD/NSO within 0.125-mile radius of a nest site for raptors, including owls, osprey, golden eagle, buteos, accipiters, and falcons except American kestrel. (NGD/NSO 7) **Objective:** Protect Colorado River cutthroat trout from direct impacts. **Management Action**: Allow no loss or degradation of fish habitat that supports Colorado River cutthroat trout high risk habitat. (NGD/NSO W-5) **Objective:** Protect Colorado River cutthroat trout from most indirect impacts. **Management Action**: Special design, construction and implementation and/or mitigation measures including relocation of operations more than 200 meters may be required to minimize impacts to Colorado River cutthroat trout moderate risk habitat. (SSR/CSU W-8) **Objective:** Prevent raptor nest abandonment and reductions in nesting productivity. **Management Action**: Avoid drilling or similar activity within a 0.25-mile buffer zone around the nest site from February 1 to August 15. This does not apply to operation and maintenance of production facilities. (TL-6)

Table 2-2d. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

TRAPPER / NORTHWATER CREEK	Alternative II	Alternative III
Fish and Wildlife, *continued*	<u>Special Management</u> **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% of the stream length. (SM-W-9)	<u>Special Management</u> **Objective:** Protect Colorado River cutthroat trout from some direct and indirect impacts within the areas delineated as high value watersheds. **Management Action**: Special design, construction, and implementation and/or mitigation measures may be required to minimize impacts of disturbances within the area mapped as high value watershed processes. (SM-W-9) **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% of the stream length. (SM-W-9)
Botanical / Ecological	**Objective:** Protect populations of rare plants and significant plant communities from most direct and some indirect impacts (in habitat identified as high-risk plant habitat). **Management Action**: Allow no ground-disturbing activities in areas designated as high risk for rare plants or significant plant communities. (NSO P-4) **Objective:** Protect and maintain the hydrological and ecological processes that support the rare plants and significant plant communities within habitat identified as moderate risk plant habitat. **Management Action**: Allow no ground-disturbing activities within the watershed that would disturb, alter, or interrupt the hydrologic or ecological processes that support rare plant species or significant plant communities (designated as moderate risk hydrologic value). (NGD/NSO P-5)	**Objective:** Protect populations of rare plants and significant plant communities from most direct and some indirect impacts (in habitat identified as high risk plant habitat). **Management Action**: Allow no ground-disturbing activities in areas designated as high risk for rare plants or significant plant communities. (NSO P-4) **Objective:** Allow only activities within the watershed that would not disturb, alter, or interrupt the hydrologic or ecological processes that support rare plant species or significant plant communities (designated as moderate risk hydrologic value). **Management Action**: Allow only activities within the watershed that would not disturb, alter, or interrupt the hydrologic or ecological processes that support rare plant species or significant plant communities (designated as moderate risk hydrologic value). (SSR/CSU P-7)

Table 2-2d. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

TRAPPER / NORTHWATER CREEK	Alternative II	Alternative III
Botanical / Ecological, *continued*	**Management Action**: Control noxious weeds using integrated techniques. Limit control in areas of rare plants or significant plant communities to protect non-target species. (SM-P-6) **Objective:** Maintain healthy populations of rare plants and significant plant communities, maintain sufficient residual vegetation to sustain overall watershed functions, and provide forage for wildlife species. **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).	**Objective:** Ensure the long-term survival and reproductive capability of rare plants and significant plant communities. **Management Action**: 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 plant species or significant plant communities. (SM-P-5) **Objective:** Ensure the long-term survival and reproductive capability of rare plants and significant plant communities. **Management Action**: Control noxious weeds using integrated techniques. Limit eed control in rare plant populations or significant plant communities to avoid damage to non-target species. (SM-P-6) **Objective:** Maintain healthy populations of rare plants and significant plant communities, maintain sufficient residual vegetation to sustain overall watershed functions, and provide forage for wildlife species. **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).
Visual	**Objective:** Preserve the existing character of landscape to meet VRM Class I objectives. **Management Action**: Maintain the natural character and scenic quality in the landscape that provides for ecological changes and restricts landscape modifications. Limited activities may be allowed if the basic landscape elements (line, form, color, and texture) are repeated, are not evident, and appear natural. (NGD/NSO V-1)	**Objective:** Retain the existing character of the landscape to meet Visual Resource Management Class II objectives. **Management Action**: Manage the ACEC to retain the existing character of the landscape and allow only limited changes. Special design, construction, implementation, and/or mitigation measures including relocation of operations more than 200 meters may be required. (SSR/CSU 5)

Table 2-2d. Proposed Management Prescriptions for Areas of Critical Environmental Concern (ACECs)

TRAPPER / NORTHWATER CREEK	Alternative II	Alternative III
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. To allow continued access and use of these habitats. **Management Actions**: Roads, transmission lines, storage facilities, and similar human-induced surface disturbances are restricted to an area beyond the outer edge of the riparian vegetation. (NGD/NSO 2) SSR/CSU within 500 feet of the outer edge of the riparian or wetland vegetation. (SSR/CSU 2)	**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. To allow continued access and use of these habitats. **Management Actions**: Roads, transmission lines, storage facilities, and similar human-induced surface disturbances are restricted to an area beyond the outer edge of the riparian vegetation. (NGD/NSO 2) SSR/CSU within 500 feet of the outer edge of the riparian or wetland vegetation. (SSR/CSU 2)
Steep Slopes	**Objective:** Maintain site stability and productivity. **Management Action**: NGD/NSO on slopes greater than 50% to minimize impacts on site productivity, control surface runoff, reduce accelerated erosion, and increase likelihood of successful reclamation. (NGD/NSO 15)	**Objective:** Maintain site stability and productivity. **Management Action**: NGD/NSO on slopes greater than 50% to minimize impacts on site productivity, control surface runoff, reduce accelerated erosion, and increase likelihood of successful reclamation. (NGD/NSO 15)

Table 2-3. Proposed Management Goals, Objectives, and Actions for the Parachute Creek Watershed Management Area (Alternative III) and Trapper/Northwater Creek Watershed Management Area (Alternative IV)

Resource	Proposed Management Goal, Objective, and Action
Fisheries	**Goal:** Protect Colorado River cutthroat trout and their habitat by maintaining or improving current water quality and stream ecological function throughout the WMA. **Objective:** Prevent any increases in sedimentation from human activities that would result in direct, indirect, or cumulative adverse impacts to Colorado River cutthroat trout or their habitat. **Management Actions:** • Prior to approval of proposed surface disturbance in the WMA, conduct baseline studies to assess current local hydrological and ecological conditions in 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. • Assess all activities for potential impacts that may increase sedimentation directly, indirectly, or cumulative to existing conditions and other human impacts or otherwise cause degradation of indicators for Public Land Health Standard #2 – Riparian Systems, #3 – Plant and Animal Communities, #4 – Special Status Species, and #5 – Water Quality. • Require project-specific design and mitigation plans prior to approval of proposed actions. Design projects such that proposed actions and site locations will not contribute to sedimentation or other degradation of water quality or stream ecological function for reaches containing cutthroat trout habitat, as well as for reaches upstream from occupied habitat. Required design components may include construction design, implementation of best management practices, mitigation, reclamation, revegetation, monitoring (to guide adaptive management), and erosion control. Project design will incorporate baseline study results. Require that designs and mitigation components be demonstrated effective under similar ecological conditions. • Evaluate and, as appropriate, grant exceptions short-duration, one-time events designed to provide long-term habitat protection, such as culvert or bridge installation or bank stabilization actions. Review project-specific design plans submitted by the proponent before approving proposed exceptions. • Move proposed locations of surface disturbance locations up to 200 meters as needed to minimize impacts.

Table 2-3. Proposed Management Goals, Objectives, and Actions for the Parachute Creek Watershed Management Area (Alternative III) and Trapper/Northwater Creek Watershed Management Area (Alternative IV)

Resource	Proposed Management Goal, Objective, and Action
Fisheries, ***continued***	**Goal:** Protect Colorado River cutthroat trout and their habitat by maintaining natural stream flows in the WMA. **Objective:** Maintain natural stream flows in the watershed for reaches containing cutthroat trout habitat, as well as for reaches upstream from occupied habitat. **Management Actions:** • Prior to approval of proposed surface disturbance in the WMA, conduct baseline studies to assess current local hydrological and ecological conditions in 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. • Assess all activities for potential impacts that may negatively impact natural stream flows directly, indirectly, or cumulative to existing conditions and other human impacts or otherwise cause degradation of indicators for Public Land Health Standards #2 – Riparian Systems, #3 – Plant and Animal Communities, #4 – Special Status Species, and #5 – Water Quality • Require project-specific design and mitigation plans prior to approval of proposed actions. Design projects such that proposed actions and site locations will not contribute to reduction of natural stream flow volume or other degradation of water quality or stream ecological function for stream reaches containing cutthroat trout habitat as well as reaches upstream from occupied habitat. Required design components may include construction design, implementation of best management practices, 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. • Evaluate and, as appropriate, grant exceptions for short-duration, one-time events designed to provide long-term habitat protection, such as culvert or bridge installation or bank stabilization actions. Review project-specific design plans submitted by the proponent before approving an exception. • Move proposed locations of surface disturbances up to 200 meters as needed to minimize adverse impacts to cutthroat trout. • Recognize valid existing water rights and design management actions so these rights are not negatively affected.

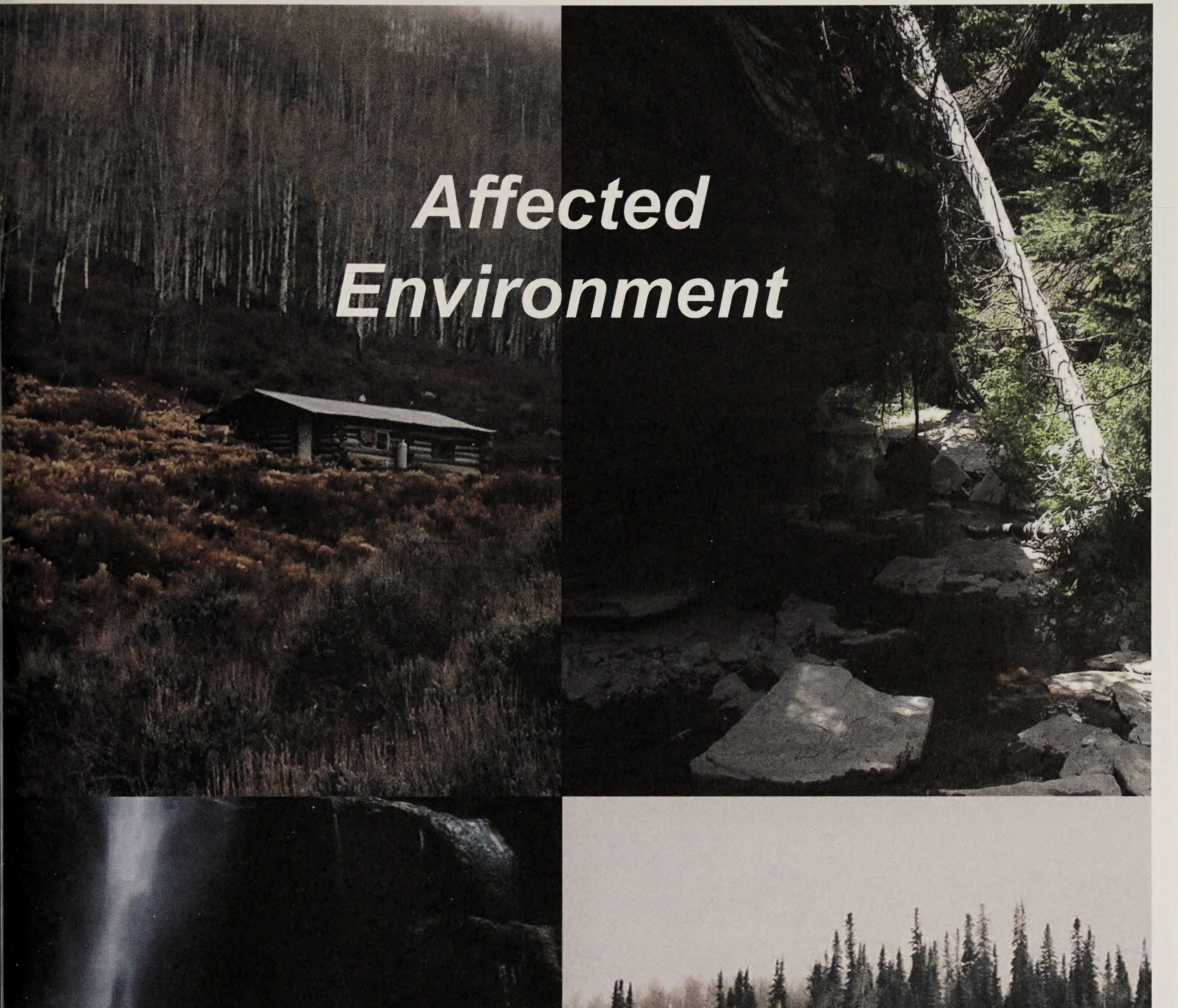
Table 2-3. Proposed Management Goals, Objectives, and Actions for the Parachute Creek Watershed Management Area (Alternative III) and Trapper/Northwater Creek Watershed Management Area (Alternative IV)

Resource	Proposed Management Goal, Objective, and Action
Botanical / Ecological Resources	**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 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. 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 for stream reaches containing cutthroat trout habitat as well as reaches upstream from occupied habitat. Required design components may include construction design, implementation of best management practices, 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. • 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. Review project-specific design plans submitted by the proponent before approving an exception. • Move locations of proposed disturbances up to 200 meters as needed to minimize adverse impacts to rare plant populations and significant plant communities.

Table 2-3. Proposed Management Goals, Objectives, and Actions for the Parachute Creek Watershed Management Area (Alternative III) and Trapper/Northwater Creek Watershed Management Area (Alternative IV)

Resource	Proposed Management Goal, Objective, and Action
Municipal Water Quality	**Goal:** Protect and maintain aspects of the quality and quantity of the current and future water supply of the Town of Parachute that may be affected by conditions in the Parachute Creek WMA. **Objective:** Protect and maintain water quality and quantity in the Parachute Creek watershed in order to preclude any adverse effects on water quality that may measurably degrade the municipal water supply of the Town of Parachute **Management Actions:** • Prior to approval of proposed surface disturbance, and during new surface disturbing activities, conduct baseline studies of local hydrological conditions. Data parameters will include physical, chemical, and biological characteristics. • Require project-specific design and mitigation plans prior to approval of proposed actions that may 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. Design projects such that proposed actions and site locations will not contribute to reduction of natural stream flow volume or other degradation of water quality or stream ecological function for stream reaches containing cutthroat trout habitat as well as reaches upstream from occupied habitat. Required design components may include construction design, implementation of best management practices, 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 hydrologic conditions. Apply more stringent requirements where recommended by Sate of Colorado practices. • Monitor and evaluate mitigation efforts on a regular basis for ground-disturbing activities that disturb, either separately or in combination with other activities, an area greater than 5 acres. • Move locations of proposed disturbances up to 200 meters as needed to minimize adverse impacts.

Affected Environment



Bureau of Land Management
Glenwood Springs Field Office

3 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes the existing environment of the Planning Area, including the physical, biological, human, and resource management environments (Sections 3.2 through 3.5, respectively). The description provides a baseline against which to compare the impacts under each alternative. Figures 1-1 and 1-2 show the location of the Planning Area in relation to the region and the State of Colorado. Figure 1-3 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 areas referred to as "above the rim" versus "below the rim" or "atop the plateau" versus "below the rim." The rim is drawn along the top of the nearly vertical Roan Cliffs.

All of the information used in the following descriptions 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 *Analysis of the Management of the Situation* (AMS)(BLM 2002a) prepared by GSFO staff, and publicly available sources in the published literature. Specific references are cited throughout.

3.2 PHYSICAL ENVIRONMENT

3.2.1 Geology

3.2.1.1 Regional Setting

The Planning Area is located in the Piceance Basin of west-central Colorado, on the northeastern edge of the Colorado Plateau province. The Planning Area lies immediately 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 the Roan Cliffs, located north of the Colorado River, west of Government Creek, and east of Parachute Creek. 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, is found on 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 [now the Natural Resources Conservation Service, 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 Cave

A claystone cave and karst system is located below the rim in the south-central portion of the Planning Area (Map 11). A natural arch feature formed of mudstone 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).

Information concerning the specific location of the cave system will not be made available to the public under 5 USC 522 and as stated under 43 CFR 37. Additionally, the cave is under consideration to be listed as part of this planning process as per the Federal Cave Protection Act of 1988.

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 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 (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 [reverse] Wasatch (DeBeque), Green River, and Uinta Formations (oldest to youngest). Each formation inter-tongues with its overlying neighbor due to fluctuations in depositional environments, creating a stratigraphic challenge when defining the extent of each mappable 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 (County Road [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 National Museum of Natural History. 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. 1989).

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 east 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, prepared by the SCS [NRCS] in 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 SCS (1985) survey mapped 44 map 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 above the rim (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:

- Parachute Rhone Loams, 5 to 30 percent slopes

- Northwater Loam, 15 to 65 percent slopes
- Irigul Channery Loam, 9 to 50 percent slopes
- Rhone Loam, 5 to 30 percent slopes
- Parachute Loam 25 to 65 percent slopes
- Rhone Loam, 30 to 70 percent slopes

Together, these soils comprise 45 percent of the public lands in the Planning Area, or about 30,000 acres.

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°F.

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 (Torriorthents-Rock Outcrop map units in the 1985 Soil Survey). 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 sandstone. 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 on the south and west sides are:

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

These soils are mostly below the rim on the south and west sides of the Planning Area, but they also occur below the rim on the east side. They comprise 28 percent of the study area, or about 19,000 acres.

High natural erosion and elevated salinity are common with these soils. The soils are also considerably drier and warmer than soils above the rim; average annual precipitation is 14 inches, and average annual temperature is 46°F.

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 and occur 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 on the east side are:

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

These soils comprise 20 percent of the Planning Area, about 14,000 acres.

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 the Arvada Loam, 6 to 20 percent slopes; Silas Loam, 3 to 12 percent slopes; and Arvada Loam, 1 to 6 percent slopes. These soils comprise about 3 percent of the Planning Area (2,000 acres).

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 describes the erosion hazard of each map unit in broad terms, BLM's 1999 FSRMPA/EIS assigned each map units to one of four erosion classes based on natural rates of soil loss (Map 12). 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.

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 slope length and steepness, which control water velocity (faster flows are more erosive than slower flows), and by vegetation cover, which protects the soil from raindrop splash, anchors the soil with its roots, and reduces runoff velocity. Management practices such as construction of water bars and use of erosion-control fabrics can substantially reduce erosion loss.

Loss of topsoil is a primary concern in an actively used area such as the Planning Area. The most obvious source of potential soil loss associated with future management and resource use of the Planning Area is likely to be the construction of new roads, drill pads, and pipelines during oil and gas development.

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

Erosion Class	Soil Loss (tons/acre/year)	Acres in Planning Area (±)	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

Soil losses from causes described above represent a minor portion of the Planning Area in terms of area, and standard mitigation practices for oil and gas development include salvaging and replacing topsoil during reclamation. Less obvious but more ubiquitous sources of soil loss include grazing, range management, recreational travel (on designated routes as well as cross-country), and fire management. Impacts from these activities result from direct disturbance of the soil; reduced plant vigor from trampling, soil compaction, removal of biomass; and changes in soil moisture.

The other major impact from soil erosion is the transport of soil particles into aquatic systems (streams and ponds) where they reduce water quality and physical habitat quality.

3.2.3.7 Land Health Standards

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 16 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 Land Health Standard #1 for soils (see Appendix F). Other allotments (Webster Park, Doodlebug, Magpie Creek, and Rees) are in good condition and meet Land Health Standard 1 (BLM 2002a).

No land health assessment has been performed for the area below the rim in the southern and western portions of the Planning Area. Much of this area is badlands with poorly developed soils, low precipitation, poor vegetation cover, and severe erosion rates. Some oil and gas development currently occurs in this area.

3.2.4 Water Resources

3.2.4.1 Surface Water

Planning Objectives

Various Federal and State laws regulate surface water quality and yield, including the Federal Clean Water Act, BLM Land Health Standards, the Colorado Water Quality Control Act, and the regulations set forth by the Colorado Oil and Gas Conservation Commission (COGCC).

Surface water in the Planning Area is currently being managed under guidance from several planning documents and other agreements. These documents, which identify planning objectives and criteria for water quality specific to the Planning Area, include:

1. 1988 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 over 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 south of the cliffs 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 runoff. Intense summer cloudbursts are common and can lead to substantial stream flows, 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 classifications based on categories of use and accompanying water quality standards for drainage reaches within or adjacent to the Planning Area are provided in Table 3-2. Discharge and water quality data are provided in Tables 3-3 through 3-6.

Table 3-2. 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	D.O. = 6.0 mg/L D.O. (sp) = 7.0 mg/L pH = 6.5-9.0 Fecal Coliform = 200/100 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 D.O. (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 D.O. (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 D.O. (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 D.O. (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

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

Station Name/ Location	Station Number	Period of Record	Elevation (MSL) and Basin Area	Average Annual Mean Flow	Average Maximum and Maximum Measured Daily Flow	Average Minimum and Minimum Measured Daily Flow	Average Annual Yield
Middle East Fork Parachute Creek	09092850	2/76 – 7/83	7,400 ft 22.1 sq. mi.	6.2 cfs	170 cfs, 645 cfs	0.80 cfs, 0.18 cfs	4,490 ac-ft
Ben Good Creek	09092980	11/76 – 9/83	6,520 ft 4.0 sq. mi.	0.5 cfs	7 cfs, 13 cfs	0.04 cfs, 0 cfs	360 ac-ft
East Fork Parachute Creek (above Falls)	09092960	2/76 – 9/83	7,860 ft 14.5 sq. mi.	6.7 cfs	139 cfs, 364 cfs	0.89 cfs, 0.07 cfs	4,850 ac-ft
East Fork Parachute Creek (below Falls)	09092970	4/77 – 9/83	6,880 ft 20.4 sq. mi.	6.5 cfs	146 cfs, 462 cfs	0.42 cfs, 0 cfs	4,710 ac-ft
Northwater Creek	09092830	2/76 – 5/83	unknown 12.6 sq. mi.	4.1 cfs	84 cfs, 225 cfs	0.64 cfs, 0.03 cfs	2,970 ac-ft
Parachute Creek below East and West Forks	09093000	9/64 – 9/86	5,770 ft 141 sq. mi.	33.3 cfs	464 cfs, 2,310 cfs	5.05 cfs, 0 cfs	24,110 ac-ft
Parachute Creek at Parachute	09093500	11/74 – 10/82	5,100 ft 198 sq. mi.	31.9 cfs	606 cfs, 2,600 cfs	12.3 cfs, 0 cfs	23,090 cfs

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

Station Name/ Location	Station Number	Period of Record	Temperature (°C)	pH	Conductivity (µS/cm)	Suspended Sediment Conc. (mg/L)	Suspended Sediment Load (tons/day)
Middle East 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 3-4. DOE Discharge and Water Quality Data for NOSR 1

Stream Name	Date	Flow (cfs)	Temperature (°C)	Conductivity (uS/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 – 2550	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 3-5. BLM Discharge and Water Quality Data for Some Streams atop the Plateau

Stream Name	Date	Flow (cfs)	Temperature (°C)	Conductivity (uS/cm)	pH	Salinity (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 3-6. BLM Discharge and Water Quality Data for Some Streams Below the Rim

Stream Name	Date	Flow (cfs)	Temperature (°C)	Conductivity (uS/cm)	pH	Salinity (ppt)
Doodlebug Gulch	5/7/01	0.001	11.50	1630	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	1100	8.4	1.00
Government Creek near 32 Mesa Rd	5/7/01	1.60	20.00	1305	8.6	1.00
Thirty-Two Mile Gulch – upper reach	5/7/01	0.07	15.00	1080	8.5	0.80
Thirty-Two Mile Gulch above SH 13	5/8/01	0.001	27.00	1750	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	1150	7.6	0.80
Government Creek near Magpie Gulch	5/23/01	0.26	11.00	1730	8.6	1.20
Government Creek below Magpie Gulch	5/23/01	0.53	12.00	1400	8.6	1.10

Source: BLM (2001d)

Parachute Creek Tributaries — The Parachute Creek basin covers approximately 200 square miles and includes essentially all of the area on top of the plateau. Elevations of more than 9,000 feet and dissected topography with 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).

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. 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.

Based on their monitoring data, TRW (1982) concluded that East Fork Parachute Creek and East Middle Fork Parachute Creek provided approximately 50 and 45 percent, respectively, of the total annual runoff from NOSR 1. Annual peak flows recorded from April to June are a combination of snowmelt and spring rainfall. After the completion of spring and early summer runoff, flows are more sporadic, depending on the frequency and intensity of summer thunderstorms. Baseflow in perennial reaches atop the plateau is provided by numerous springs. For some streams, periods of no flow are recorded at gaging stations in late summer and fall.

The streams listed in Table 3-3a gradually become more persistent and carry more flow in the downstream direction due to a combination of runoff from adjacent slopes, inflow from smaller tributaries, and recharge from springs and groundwater (see Section 3.2.4.2). However, this trend does not extend where the streams drop off the plateau to lower elevations below the rim east of Parachute Creek. For example, compare East Fork Parachute Creek above and below the falls (second and third rows of data in Table 3-3a). The lower baseflow below the rim is the result of warmer temperatures; deeper bedrock causes the streams to lose flow.

From the perspective of aquatic life, the presence of a resident population of genetically pure Colorado River cutthroat trout and (in some streams) introduced brook trout further reflects that substantial portions are perennial. The perennial segments are typically in lower reaches of the streams but may also occur in middle reaches due to numerous old beaver dams that act as small impoundments.

Both the East Fork and East Middle Fork Parachute Creek drainages are narrow, straight to sinuous, and have moderate valley relief above their respective falls, and high relief below the falls. Channel gradients for both of these tributaries are between 2 and 4 percent. The mainstem of Parachute Creek is wider, sinuous to meandering, and has a gradient of approximately 2 percent.

Government Creek Tributaries — 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. These streams are sustained by some snowmelt, but the lower elevations and more exposed terrain than that atop the plateau result in only sporadic snowpack. Most snowfall melts within a few days. Therefore, peak discharge in these streams occurs earlier in the spring and summer, although minor snowpack in shaded gulches and seepage from talus tend to delay or protract these flows somewhat. Channel stability of these streams is generally poor due to poor vegetation cover and flashy flow conditions. Natural flow characteristics are affected by some irrigation withdrawals.

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, but is more meandering and has a slope of 2 to 3 percent along most of the site.

Colorado River Tributaries — Gulches draining the Roan Cliffs and adjacent terrain below the rim to the Colorado River are similar to the Government Creek tributaries in having steep headwater reaches that gradually flatten and broaden as they enter the topography south of the cliffs. 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. These drainages are straight to sinuous and have gradients of 3 to 7 percent.

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, in areas at lower elevations below the rim, 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 3-2 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 (Aq life cold) 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.

Aquatic Life Coldwater 1 streams have physical characteristics to support a variety of coldwater biota, usually including trout. Aquatic Life Coldwater 2 streams are not capable of sustaining as wide a variety of coldwater biota, including sensitive species, due to physical habitat, water flows, or uncorrectable water quality conditions that result in substantial impairment of the abundance and diversity of species. Recreation 1 waters are used for activities with primary water contact in which ingestion of small quantities is likely to occur. Examples include swimming, kayaking, or rafting. The classification of the Colorado River as Recreation 1a denotes these as current uses. 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 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. Agricultural waters are classified for livestock watering or crop irrigation.

The 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. Additionally, none of these streams is included on the 303(d) list or 305(b) report for Colorado. These documents include impaired streams — i.e., those that do not meet water quality standards for the designated uses.

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 the bottom three rows of Table 3-3a. Water quality and discharge data collected at USGS gauging stations from 1976 through 1983 (Table 3-3b) and during studies by DOE (TRW 1992; Table 3-4) and during the 1999 land health assessment (BLM 2001d; Table 3-5) show the variable flows and low minimum temperatures characteristic of small streams in areas of substantial snow accumulation. 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 3-5) 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 snow- and spring-sourced streams in Parachute Creek on top of the plateau, the streams that originate along and below the Roan Cliffs are warmer (compare May temperatures for these streams [Table 3-6] with July and August temperatures for higher elevation streams [Table 3-5]). The lower elevation streams also have higher conductivity, salinity, and pH, 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 rim are included in the second row in Table 3-2 as 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 3-2 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 rim reported in Table 3-3b.

Despite the lower quality of surface waters in streams below the rim, 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 confluences 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.

A spent oil shale disposal pile generated during the operation of the Anvil Points Research and Development facility lies within the area south of the cliffs. The spent oil shale was deposited 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 developing plans to remediate the spent oil shale pile.

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. 1988 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 Colorado River Basin.
   - Ensure the integrity of aquifer systems in both quantity and quality.

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 above the rim, 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 water zones. The uppermost zone (Zone 1) includes the Uinta and upper Parachute Creek Member. The other water zones (Zones 2 through 4) are located just above and below the oil shale-rich Mahogany zone. The combined thickness of these four zones 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 zones (Zones 2 through 4) are confined, while 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 it is included in stream flow. TRW (1982) describes 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 the bedrock associated with Zones 2, 3, and 4.

Preliminary analysis of groundwater within NOSRs 1 and 3 indicates that the quality is generally good. 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 for the four water zones is 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 – 695 µmhos/cm @ 25°C (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, and they noted that the "high concentration of carbonate species helps explain the travertine-like deposits often found near springs on NOSR 1."

Estimated groundwater storage on NOSR 1 was calculated at between 110,000 and 560,000 acre-feet (TRW 1982).

Lands below the Rim — The surficial geology of NOSR 3 (along and below the rim) 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 water-bearing zones in the lenticular sandstones of the Wasatch. Hydrologic information from the Garfield County landfill studies indicates that no usable water zones exist within the landfill area.

Nearly all of the water wells below the rim 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 largely located on the slopes and benches south of the Colorado River and south of the Planning Area.

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]

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) [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).*

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. 1988 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

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 groundwater 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. 1988 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

Region 4, the focus of the 1999 FSEIS, lies along the Colorado River drainage between the communities of New Castle to the east and DeBeque to the west, with the mountainous White River National Forest to the north and the Grand Mesa National Forest to the south. Because of the broad variations in elevation and topography within the study area, climatic conditions vary considerably. Along the Colorado River drainage, average daily temperatures typically range between 12 (low) and 40 (high) degrees Fahrenheit (F) in mid-winter and between 50F (low) and 95F (high) in mid-summer. The frost-free period (i.e., during which temperatures do not dip below 32F) generally is 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 generally cooler, frost-free periods shorter, and both precipitation and snowfall greater than at lower elevations. 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

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 Air Pollution Control Division (APCD), concentrations of particulate matter less than 10 microns (μ) in effective diameter (PM_{10}) measured at Rifle (24 $\mu g/m^3$ 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 and National Ambient Air Quality Standards (CAAQS 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 Prevention of Significant Deterioration (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	n/a
8 hours	4,444	10,000		na	n/a
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	n/a
Annual	7	15		na	n/a
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

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 1991, Colorado Natural Heritage Program [CNHP] 1997a and 2001). Current conditions and trends for each resource are summarized in the Analysis of the Management Situation (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 vegetation communities, riparian/ wetlands, and noxious weeds are described in Section 3.3.1.2. Botanical nomenclature used in this report 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.

3.3.1.1 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 on the plateau above or below the rim (Map 15).

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 cool north-facing slopes of the deeper canyons and valleys. In lower reaches of these drainages, the opposite slopes support scattered individuals of 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* ssp. *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 Douglas-fir, some of which are considered remnant old-growth communities.

Just below the steepest cliffs, a mixed mountain shrubland with isolated aspen and Douglas-fir stands 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 (*Seraphidium 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.

3.3.1.2 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.

Portions of the Planning Area were assessed for land health in 1999 and 2001 and upland plant community health was deemed to be in generally good to excellent condition, in terms of Colorado Public Land Health Standard #3 (Appendix F) (BLM 2001d, 2002b). For most sites, it was noted that (1) distribution of native plant communities appeared sufficient to ensure sustainability, and (2) most communities appear to have mixed age classes in sufficient numbers to sustain recruitment. Exceptions are discussed below.

Some aspen stands on top of the plateau appear to be beyond late-seral stage and some mature trees are becoming decadent. However, numerous sprouts and saplings were noted at several sites, suggesting that these are climax communities.

In pinyon/juniper areas below the rim, community condition is variable. Areas at higher elevations and on steeper and north-facing slopes tend 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. Lower stands and those on south-facing slopes often comprise old to mature trees with little understory. Shrubs tend to be old and decadent, with little or no recruitment.

Semi-desert shrublands at the lowest elevations are in poor to fair condition. The shrub stands are even-aged with little evidence of new recruitment. In the Cottonwood Gulch grazing allotments, monitoring data from 2001 indicated these areas had an understory comprising mostly annual grasses and forbs, where cheat grass (*Anisantha tectorum*) was a dominant forage species. Monitoring data from the mid-1990s noted that there were few perennial grasses in shrub interspaces in the Webster Park allotment and that a large amount of cheatgrass was present. In other areas within this community, the herbaceous understory is 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 Colorado Land Health Standard #3.

Riparian/Wetland Vegetation

Several types of wetlands are found within the Planning Area. These communities all occur as narrow strips along the edges of streams and seep flow areas. Wetland types include moist meadows, riparian shrublands, riparian woodlands, and canyon wall seeps.

Wetland areas have characteristic soils, hydrology, and plant associations that develop in response to persistent soil saturation during at least a portion of the growing season. BLM defines riparian areas as plant communities within a zone that is influenced hydrologically by a stream, river, or at times a lake or reservoir (BLM 1998a). Riparian areas may or may not include wetlands. However, both types of areas are important because of the presence of water and the diversity and structure of the associated plant communities. Healthy riparian systems are recognized for habitat requirements for many species of wildlife, including mammals, birds, and fish. These areas are also known for their ability to filter sediments, contribute to groundwater recharge, reduce flood energy, extend seasonal stream flows, and improve water quality and provide recreational and scenic values (BLM 1998a). While these areas represent less than 1 percent of the total Planning Area (Table 3-11), they are considered an important resource.

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

Community Type	Acres	Percent	General Condition [1]
Agricultural land	119	<0.2	NI
Aspen woodlands	11,108	15.1	Good
Coniferous forest	2,809	3.8	Healthy
Mountain grasslands	2,412	3.3	Good
Mixed mountain shrublands	18,332	24.9	Healthy, diverse, and productive
Pinyon-juniper woodlands	17,643	24.0	Variable
Riparian wetlands	363	<0.5	Variable
Sagebrush shrublands	11,570	15.7	Healthy, diverse, and productive above rim; poor to fair below
Semi-desert shrublands	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.*

Riparian function and value throughout the Planning Area has been impacted by previous and ongoing road construction, informal stream crossings, livestock grazing, and noxious weeds. Proper Functioning Condition 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 in Proper Functioning Condition (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 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 rim were assessed for Proper Functioning Condition in 2001. Of these, almost 60 percent (5.3 miles) were rated as PFC, and 42 (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 Cottonwood, Webster Park, and Hayes Gulches have not received PFC evaluation but were visually assessed in 1995. Riparian zones in Cottonwood Gulch were considered to be in stable condition, with areas of heavy grazing and weeds. Hayes Gulch was considered to be improving in condition as compared to previous observations. Webster Park Gulch was considered to be declining.

Noxious Weeds

Noxious weeds are aggressive, exotic plant species. These invasive plants pose an ever-increasing threat to native plant communities, wildlife habitat, croplands, rangelands, and human recreation throughout the world (Temple 1990). Many are known to displace native plants and disrupt the structure and function of local ecosystems (Vitousek 1990). As noxious weed populations increase in size and frequency, they tend to reduce the diversity of surrounding native plant communities, altering the composition and community structure, the habitat quality in the infested area, and the aesthetic quality of the landscape. They can also displace desirable plant species in rangeland (USFS 1998, Usher 1988, Weiss and Murphy 1998, CNHP 2000).

To date, no systematic surveys or mapping projects for noxious weeds have occurred on the Planning Area. However, land health assessments in 1999 and 2001 (BLM 2001d, BLM 2002b) noted the presence of introduced, invasive plant species, many of which are on the Colorado noxious weed list (Colorado Noxious Weed Act 1996) and the BLM national list of non-native invasive species (BLM 2002c). Noxious weed species found in the Planning Area are listed in Table 3-12.

Houndstongue (*Cynoglossum officinale*) was noted in almost 66 percent of the assessment sites. Canada thistle (*Breea arvense*) and dandelion (*Taraxacum officinale*) 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 rim. These were often closely associated with activities that result in surface disturbance to vegetation such as roads and woodcutting. Additional noxious weeds such as burdock (*Arctium minus*), knapweeds (*Centaurea* or *Acosta* spp.), yellow toadflax (*Linaria vulgaris*) and salt-cedar or tamarisk (*Tamarix ramosissima*) were noted to occur in variable population sizes throughout the Planning Area.

One species, 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 noxious weed list (Table 3-12), it is a non-native species that out-competes native cool-season grasses under heavy grazing pressures (Rutledge and McLendon) and therefore is an indicator of decline in rangeland or riparian areas.

Table 3-12. Noxious Weeds and Other Invasive Exotic 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*	√	√

Field observations by BLM personnel have noted other weed species in the Planning Area. Many of these have been mapped, but it should not be considered a comprehensive list. These include bull thistle (*Cirsium vulgare*), musk thistle (*Carduus nutans*), plumeless thistle (*Carduus acanthoides*), and Russian-thistle (*Salsola iberica*). 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.

Noxious weed management is an ever-increasing issue throughout BLM lands. Regardless of population size, the presence of these weeds indicates favorable conditions for weed invasion within the Planning Area. As all of the weed species are listed, in part, due to their ability to establish large populations rapidly, it is not reasonable to expect that even the small patches will remain static in terms of their size for any length of time. The expected trend, therefore, is increasing sizes of noxious weed populations as well as increased numbers of incipient populations. Noxious weed populations are a threat to land health and multiple use land management as they contribute to loss of rangeland productivity, increased soil erosion, reduced species richness, reduced wildlife habitat quality, and reduced aesthetic quality.

3.3.1.3 Current Management and Desired Future Conditions

Upland Vegetation

The 1988 GSRA RMP contains no objective for upland vegetation management. Upland vegetation within the Planning Area is currently managed to meet or exceed Colorado 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 (DPC) 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 by communities to enhance and maintain sustainable ecological condition. Upland vegetation is inventoried and ecological status is determined using BLM site inventory procedures. This vegetation is protected in accordance with the RMP objectives.

Riparian/Wetland Vegetation

The 1988 GSRA RMP contains no objective 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 Colorado 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 and CSU 2
- Major River Corridors (Colorado River) – NSO 3

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*, 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 1988 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

Introduction

In general, distribution, abundance, patterns of movement, and seasonal use by wildlife are related to habitat type, quality, size, 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” habitats at higher elevations above the rim. In addition to these major types are relatively narrow but ecologically important riparian corridors 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 land 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.

3.3.2.1 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. Although some shrubs, including sagebrush and mountain-mahogany, are associated with pinyon/juniper, the relative lack of shrubs and sparse herbaceous forage make this area of value to deer primarily in severe winters. However, the presence of trees for hiding cover and thermal cover is an important habitat quality and adds to its value as winter range.

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. 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, shading, or reduced exposure to wind. The mesic conditions, lush forage, and dense thermal and hiding cover make aspen 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. Douglas-fir forest, in some places classified as old-growth Douglas-fir, 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 Forest

Communities of narrowleaf cottonwood, box-elder, associated wetland shrubs (willows and alders), 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, 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 forests 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 corridor, 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, and 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 hiding 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 ichthyofauna, 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 breeding habitat for amphibians and nesting or feeding habitat for water birds.

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 rim 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.

3.3.2.2 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 (Kingery 1998), and mammals (Armstrong 1972; Fitzgerald et al. 1999). In addition to these sources, information on special-interest species — including ungulates, 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) geographic information system (GIS) database, organized by County. This information is incorporated with data from the Colorado Natural Heritage Program (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 1998), and observations by BLM personnel. The 1999 FSEIS and 1988 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 16) and American elk (Map 17). 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 few hundred acres on the northern edge in GMU 22. These are two of nine GMUs that constitute CDOW Region 4. GMU 32 covers approximately 309 square miles, of which approximately 39 percent is public land and 61 percent private land. Most of the private land — approximately 190 square miles — is in the Parachute Creek drainage and I-70 corridor. The parcels of private land are typically large tracts (>15,000 acres) acquired by energy companies during exploration and research related to potential oil shale development.

Major energy companies with holdings in GMU 32 include Exxon-Mobil and UNOCAL.

Within the Planning Area, deer and elk migrate seasonally from summer range atop the plateau to winter range at lower elevations, although some deer are year-round residents along the major drainages. Throughout most of western Colorado, the availability of winter range is the limiting factor to big game populations (i.e., the factor that most strongly influences numbers in a given area) and is generally considered by CDOW to be "critical." This means that reductions in the amount, quality, or accessibility of winter range result in reductions in deer and elk populations. For purposes of this RMPA/EIS, the CDOW term "critical" is replaced by the term "crucial" to avoid confusion with critical habitat designated by USFWS for Federally listed threatened or endangered species. Crucial ("critical") habitat is used by CDOW to describe habitat which, if lost (in whole or in part) would adversely affect that species. Crucial habitat is roughly equivalent to "limiting" habitat. Table 3-13 presents data on the amount of crucial deer and elk winter range in the Planning Area, GMU 32, and surrounding region.

Table 3-13. Deer and Elk Winter Range in Planning Area, GMU 32, and Region 4

Portion of Planning Area or Region	Total Area	Mule Deer		American Elk	
Planning Area	**127,007 ac**	**58,584 ac**	**46 %**	**17,893 ac**	**14 %**
Federal Minerals	73,602 ac	24,978 ac	34 %	3,522 ac	5 %
Private Minerals	53,405 ac	33,606 ac	63 %	14,371 ac	27 %
GMU 32	**154,952 ac**	**81,516 ac**	**53 %**	**108,800 ac**	**70 %**
Region 4	**568,548 ac**	**276,462 ac**	**49 %**	**261,789 ac**	**46 %**
Public Lands	341,072 ac	115,294 ac	34 %	123,654 ac	36 %
Private Lands	227,476 ac	161,168 ac	71 %	138,135 ac	61 %

During winter, deer and elk prefer south-, southeast-, or southwest-facing aspects, where temperatures are warmer and snow cover is both less deep and less persistent than at higher elevations or on north-facing aspects. 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; the period December through April is 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), consisting of sagebrush shrubland, pinyon/juniper woodland, and mountain shrub habitats. In severe winters, colder temperatures and deeper, more persistent snow at these middle elevations force the animals to areas that are warmer and drier but often provide poor forage. Severe winter range includes semi-desert scrub and low-elevation sagebrush.

Throughout much of the region, private lands along drainages have been converted to agricultural use in the form of irrigated pastures and hay fields. This has resulted in some loss of native winter range, but the pastures receive heavy use by deer and elk during spring and fall, when the introduced grasses are greener and more palatable and nutritious than the dormant vegetation on nearby native hillsides. The proximity to water also makes the agricultural areas attractive to ungulates.

Other crucial habitats for deer and elk include fawning and calving areas and seclusion areas. The latter include rugged, heavily wooded terrain that provide access points through the otherwise sheer cliff barrier. Seclusion areas provide refuge for animals during the hunting season and, during mild winters, routes for moving between higher and lower elevations.

Mule Deer — Mule deer occur throughout the mountains and valleys of western Colorado. Populations have fluctuated historically due to periodic drought and severe winter weather. Local populations in the Planning Area and throughout Colorado have followed that trend, but in recent years their numbers have not rebounded as quickly as in the past. For example, the population estimate in Data Analysis Unit (DAU) 41, which includes GMU 32 and adjoining GMU 31, decreased by more than 50 percent from 1990 to 1996 (22,300 to 11,000), but had rebounded only 21 percent (to 13,300) as of 2001. Many theories have been suggested for this long-term decline of mule deer in western Colorado, including over-harvest, increased predator populations, increased habitat competition with elk, persistently poor habitat conditions, ecological succession due to lack of fire, and increased human populations and related development. Actual causes probably include a combination of some or all of these factors.

The large elk population in DAU 41 (approximately twice CDOW's long-term population goals) probably also affect deer populations. CDOW's long-term objective for the mule deer population in DAU 41 is 16,700 animals, indicating that additional recovery is needed to reach this objective. A crippling neurological disorder, chronic wasting disease (CWD), has spread throughout much of Colorado in recent years and further exacerbates the situation.

Although some populations of mule deer are essentially resident — in the same location year-round — herds in mountainous areas generally exhibit an elevational migration due to dramatically different weather conditions (temperature and snow cover) and forage conditions (type and quality) at higher and lower elevations. In the Planning Area, the general seasonal movement of mule deer is between summer range above the rim and winter range below. A portion of the mule deer summering on the plateau winters north of the Planning Area in the Piceance Basin, but the extent of this use is unknown.

A typical annual use pattern for mule deer in the Planning Area begins with deer moving onto irrigated hay fields and sagebrush flats during green-up in early spring. As green-up 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 throughout the top of the plateau, including aspen stands with dense shrub and a lush herbaceous understory. Aspen and stands of conifer provide ideal hiding and thermal cover for fawns.

Site-specific studies indicate that Gambel's oak and mountain sagebrush communities receive the heaviest use by deer, although aspen and conifer forests are important for providing thermal and hiding cover. Other shrubs among the sagebrush and oak, such as bitterbrush and serviceberry, receive preferential use when present due to higher palatability and nutritive value. This selective use of bitterbrush and serviceberry is exhibited by extreme clipping (hedging, pruning) of the branches. These shrub species are also present in some winter habitats, although not in the lowest and most xeric 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. These high value 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, 34 percent of the entire BLM portion of the Planning Area is mapped by CDOW as crucial deer winter range. This includes nearly two-thirds 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 comprising this use. Crucial winter range on BLM land represents 43 percent of the total winter range in the Planning Area, while the total area of BLM land is 58 percent of the Planning Area. This disparity reflects the large area of summer range. In absolute terms, however, the nearly 25,000 acres of crucial winter range on BLM lands subject to this RMPA/EIS are very significant to herd size and viability at both local and regional levels.

Of particular importance in the Planning Area 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 occur within the Planning Area, as shown on Maps 16 and 17. The migration passages are generally collocated with habitat mapped as wildlife seclusion areas. These areas have been mapped by CDOW because of their importance in providing refuge for deer as well as for elk (as discussed below) during the hunting season. The dense cover and steep terrain of the seclusion areas is usable by wildlife including myriad non-game species, but mostly too steep and rugged for use by people and inaccessible to OHV use.

The mule deer harvest reported by CDOW for GMU 32 in the 1990s varied from 1,163 animals at the start of the period to 117 animals at the end. The overall downward trend reflects the mule deer population decrease and the resultantly more restrictive hunting season regulations set by CDOW. Since 1999, hunting licenses have been on a lottery basis, and no antlerless (female or young) permits have been issued in an attempt to aid recovery. These restrictions are reflected by a marked decline in hunter use, from 2,440 hunters and 10,379 hunter-days in 1990 to only 236 hunters and 966 hunter-days in 2001. These restrictions contributed to the recent increase in the deer population, although still far short of full recovery. In comparison to the recent low harvests, the average annual harvest between 1958 and 1968 was approximately 3,269 animals.

American Elk — This large ungulate has not shown the same population cycles and trends as deer. Instead, the population has grown more or less steadily in DAU 41 from only 75 in 1972 to the current level of approximately 6,000 animals. The current population is twice the DAU objective of 3,000 animals. Factors that seem to have affected mule deer do not appear to have had the same effect on elk; moreover, some of the changes may make conditions more favorable for elk. The population of elk has been relatively stable over the past decade, as has hunting success. The number of elk harvest in GMU 32 was 221 in 1990 and 227 in the year 2000. Use by hunters has also been relatively stable during this period because of the reliable elk population and lack of need for CDOW to impose stricter hunting regulations to protect the species.

Elk have several competitive advantages over mule deer in areas of sympatry (geographic overlap): (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, moving readily onto private property to graze alongside cattle during fall and thus avoiding hunters.

Unlike the pattern shown by 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. A few elk winter on slopes along Parachute Creek and Government Creek near the western and northeastern edges of the Planning Area, respectively, but this limited use results in little competition between deer and elk for the habitat south of the cliffs. Further, while much of the lower elevation habitat south of the cliffs is 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 these special designations. This is reflected in Table 3-13. For example, the Planning Area represents 82 percent of the total area of GMU 32, but the elk winter range in the Planning Area is only 16 percent of the amount in the GMU. Compared to Region 4, the Planning Area provides 7 percent of the elk winter range but 22 percent of the total area.

Summer range is considered crucial for elk in Region 4 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 Region 4, the high-quality summer range atop the plateau appears to provide a disproportionately large area of summer range in these areas. More extensive summer range occurs at the generally higher elevations of nearby mountainous portions of the White River National Forest.

CDOW has not mapped specific calving areas in the Planning Area. However, the mosaic of aspen and conifers for cover, meadows and sagebrush shrublands for forage, relatively gentle topography, and ample surface water throughout areas above the rim essentially make the entire area high-quality calving habitat. Birthing and rearing of young are dispersed throughout the highland areas.

As described above for mule deer, the six passages through the steep Roan Cliffs (see Map 16) are especially crucial because they provide the only points where elk can move between winter range below the rim and the extensive summer range atop the plateau. The location of these passages in areas also mapped by CDOW as wildlife seclusion areas makes them doubly important; they not only accommodate seasonal vertical migration but also provide areas where elk can find refuge from intensive human activity during hunting season. Seclusion areas are generally heavily wooded, rugged, and steep, precluding OHV travel and most other human use.

Large Carnivores

Mountain Lion — The mountain lion and the 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 zones 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 for hibernating. 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, a forest mustelid (member of the weasel family) listed as a sensitive species by USFS. These and other special status species are discussed in Section 3.3.4.

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 CDOW Region 4 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 1996) 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.

Birds

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. Known raptors are shown on Map 18. Three of these (the peregrine falcon, ferruginous hawk, and northern goshawk) are BLM sensitive species, and one (the bald eagle) is Federally listed as threatened. A Federally listed threatened subspecies, the Mexican spotted owl, could also occur in the Planning Area based on habitats present, although the site is not within its known geographic range. The five 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 rim.

Gallinaceous Birds — Upland fowl (upland gamebids) 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 are along Parachute Creek and Government Creek (Map 18). Mountain shrub habitats that contain oakbrush are critical during fall and winter, when the acorn crop is a major food source for turkeys.

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 occur 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. Band-tailed pigeon occur 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. 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, a candidate for Federal listing and listed by CDOW as endangered in Colorado (Section 3.3.4), occurs in subalpine 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 the 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 rim. The only pit viper (rattlesnake) known to occur is the western rattlesnake, found in all habitats below the rim except riparian corridors. The midget faded rattlesnake, listed as a BLM sensitive species (Section 3.3.4) is actually 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 or adjacent to the Planning Area 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. Brook trout have proliferated and now dominate much of the East Fork system. 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) drainages. This continues to be the case, 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 the true trout. This gives the young brook trout a competitive advantage over young cutthroat trout in terms of size for a given reproduction class.

In much of Colorado, brook trout are able to thrive in low-flow streams that are below the normal flow requirements for the other widely introduced coldwater gamefish such as rainbow trout and brown trout. Therefore, in terms of competition among these non-natives, the ability of brook trout to occupy streams that otherwise might not support a fishery is recreationally beneficial. The problem arises when brook trout compete with, and potentially displace, native cutthroat trout subspecies, including the Colorado River cutthroat trout in the Planning

Area. 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.

3.3.2.3 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 rim 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 — A land health assessment of portions of the Planning Area above the rim (BLM 2001d) concluded that, overall, these lands were meeting health standards.

Standard #1 (Upland Soils). This standard was being met at all of the sites assessed.

Standard #2 (Riparian Systems). This standard was either meeting the standard (PFC) or, for sites rated as FAR in 1994, all but one was showing an upward trend in 1999. 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 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. Measures to reduce or eliminate the brook trout were discussed in the land health assessment report (BLM 2001d). Alternative approaches would either be very slow (selective angling regulations) 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 is 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.

The lands below the rim to the west have not been reviewed through a land health assessment. However, existing conditions noted for this area by BLM (2002) 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.

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 Seclusion 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, American 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 the fact 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 ATVs. This has resulted in a loss of seclusion, increased wildlife harassment, soil disturbance, creation of additional trails, loss of vegetation, or microbiotic 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. Big game hunting pressure and length of the hunting season have increased, as has the fishing pressure of area streams. This results in greater stress on wildlife, generally larger "harvests," increased revenues to local communities, and increased job opportunities. 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 secluded areas that also offer lower quality habitat.

Grazing — Livestock grazing management practices have adversely affected fish and wildlife populations by degrading important riparian corridors, decreasing plant cover and diversity, increasing the potential for sediment transport into streams, damaging banks, creating conditions favorable for invasion by weeds, and impeding natural succession in some areas by selectively feeding on young shrubs or trees that are trying to become established. In some areas winter livestock grazing still occurs in habitats that provide important winter range for deer, thus 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.

3.3.2.4 Current Management and Desired Future Conditions

Management Plans and Documents

The terrestrial habitat management objective in the 1988 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 meeting 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 State-established 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." Although this OMP is no longer in effect, it set the stage for management over the past decade.

Management Direction

The wildlife and fisheries management direction for the Planning Area must meet or exceed Colorado 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 mitigation measures as identified in the 1999 ROD and RMP Amendment. 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:

- Major Rivers – Establish a 0.5-mile buffer along either side of the Colorado River (NSO 3 – 80 acres).
- Raptors – Avoid a 0.125-mile buffer around nest sites (NSO 7 – 258 acres), with seasonal avoidance of active nest sites from February 1 through August 15 (TL 6 – 2,878 acres).
- Wildlife Seclusion Areas – Avoid areas that provide important seclusion (security) for wildlife, especially deer and elk, in high value habitats along and below the base of the Roan Cliffs (NSO 11 – 4,105 acres).
- Big game Crucial Winter Habitat – Ensure continued use of crucial winter habitat for big game, including severe winter range and other high value winter-use areas, by avoiding construction activities from December 1 through April 30 (TL 1 – 24,978 acres).
- Waterfowl and Shorebird Nesting Areas – Establish a 0.25-mile seasonal-avoidance buffer around the nesting and production (brood-rearing) area of Fravert Reservoir (TL 13 – 40 acres).

Additional NSO, TL, and CSU stipulations apply specifically to special status wildlife (Section 3.3.4) but also provide benefits to other wildlife. These include NSO 8 and TLs 10 and 22 for bald eagles, NSO 9 and TL 12 for peregrine falcons, NSO 12 for threatened or endangered species, and CSU 3 for BLM sensitive species. Some stipulations aimed at protecting vegetation resources also benefit wildlife: viz., NSO 2 and CSU 2 for riparian and wetland zones. 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 ROD and RMP Amendment for the GSRA, TL 2, requires seasonal avoidance of critical elk 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, TL 2 is not incorporated into the RMPA/EIS for the Planning Area under any of the five alternatives.

For the portion of the Planning Area within the WRRA, specific wildlife-related use restrictions include an NSO and TL for non-special status raptors, TLs for elk production and deer/elk summer 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 16,700 deer based on current amount and quality of habitat. The post-hunt population in 2002 was approximately 13,400 animals, indicating that continued rebound from the population decline of the early 1990s would be required to meet the objective. In contrast, the current elk population in DAU 41 is approximately 6,000 animals, twice the population goal of 3,000 animals based on current habitat quality and extent.

Future Management

Future management will focus on maintaining or improving areas rated as PFC in the 1999 land health assessment and 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. Working 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 (2002) 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

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 occurr 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 (see 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 19 and 20, 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.

3.3.3.1 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. Known locations of these resources are mapped on Maps 19 and 20.

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. This outcrop occurs below the rim and extends from the vicinity of DeBeque to Sharrard Park (approximately 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, Southwest stickleaf, 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).

Table 3-14. Threatened or Endangered Plants Species and Other Plant Species Considered Potentially Sensitive 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. Threatened or Endangered Plants Species and Other Plant Species Considered Potentially Sensitive 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
Southwest Stickleaf (Arapien Stickleaf)	*Nuttallia argillosa* *(Mentzelia argillosa)* *(Mentzelia rhizomata)*	BLM Sensitive	G3/S2	Restricted to steep talus or scree slopes derived from the Green River Formation: 5,800 to 9,000 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 Vactus	*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 Gescue)	*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 Known to Occur in the Planning Area (species synonymies in parentheses)

Community	Scientific Name	CNHP Rank [1]	Notes	Status in Planning Area
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		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] *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*

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 and is considered critically imperiled (G1S1) 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 1997).

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 Shale Formation (CNAP 1997). It is finely adapted to existence on 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 pas,t 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 10 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 Southwest stickleaf and Utah fescue in the same vicinity.

Research on the biology of Parachute penstemon (McMullen 1998) has found that it requires a pollinator; however, there is no indication that pollination biology limits the reproduction of this species. 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 erosional 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 19 and 20). 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 these 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 Shale 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.

Southwest Stickleaf (*Nuttallia argillosa*) — This is an oil shale endemic that frequently co-occurs with other such species. This plant is known from two distinct regions: one in central Utah and the other in Garfield County, which includes 33 known occurrences. 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.

If such areas eventually stabilize and other species enter the area, the Southwest stickleaf may be locally exterminated (CNHP 1997a).

Populations of Southwest stickleaf 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 Rim 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 Forest Service 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, Southwest stickleaf, and Utah fescue (O'Kane 1987). 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 is a perennial grass and 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; 6,500-9,300. 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, 8 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 19 and 20. 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. However, noxious weeds in adjacent areas pose a concern for the continuing health of this community.

Great Basin Grassland (*Pseudoroegneria spicata* ssp. *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 zones in the Planning Area and can outcompete 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, 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 species combination 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.

3.3.3.2 Current Management and Desired Future Conditions

The 1988 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 the following mitigation measures identified in the ROD:

- Federally Listed Threatened or Endangered Species – NSO 12
- BLM Sensitive Species and Significant Natural Plant Communities – CSU 3

Special status plant species within the Planning Area should be managed to meet or exceed Colorado Public 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 mitigation measures and NSO, TL, and CSU stipulations.

3.3.4 Special Status Fish and Wildlife

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."

3.3.4.1 Current Conditions and Trends

Current conditions and trends for most special status fish and wildlife species are summarized in the Analysis of the Management Situation (BLM 2002a). The discussion below and information presented in Table 3-16 address Federally listed or candidate threatened or endangered fish and wildlife species and BLM sensitive species that are known to occur, or that could occur, in the Planning Area and vicinity.

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

Common Name [2]	Scientific Name	Status [3]	Listing Agency [4]	Primary Habitat or Location in Area
INVERTEBRATES				
Great Basin Silverspot	*Speyeria nokomis nokomis*	Sensitive	USFS	wet medows, seeps
FISHES				
Bluehead Sucker	*Catostomus discobolus*	Sensitive	BLM	Colorado River
Flannelmouth Sucker	*Catostomus latipinnis*	Sensitive	BLM	Colorado River
Razorback Sucker	*Xyrauchen texanus*	Endangered	USFWS	Colorado River
Humpback Chub	*Gila cypha*	Endangered	USFWS	Colorado River, not in GSRA
Bonytail Chub	*Gila elegans*	Endangered	USFWS	Colorado River, not in GSRA
Roundtail Chub	*Gila robusta*	Sensitive	BLM	Colorado River
Colorado Pikeminnow	*Ptychocheilus lucius*	Endangered	USFWS	Colorado River
Colorado River Cutthroat Trout	*Oncorhynchus clarki pleuriticus*	Sensitive	BLM, USFS	Parachute Creek tributaries
AMPHIBIANS				
Great Basin Spadefoot	*Spea intermontana*	Sensitive	BLM	seasonal pools
Boreal Toad	*Bufo boreas*	Candidate	USFWS	ponds, marshes
Northern Leopard Frog	*Rana pipiens*	Sensitive	BLM	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	BLM	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 pergrinum anatum*	Sensitive	BLM	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	rivers, lakes
Ferruginous Hawk	*Buteo regalis*	Sensitive	BLM	cliffs, open land
Swainson's Hawk	*Buteo swansonii*	BCC	USFWS	woods, grassland
Golden Eagle	*Aquila chrysaetos*	BCC	USFWS	cliffs, grassland
Northern Goshawk	*Accipiter gentilis*	Sensitive	BLM, USFS	aspen, spruce/fir
Gunnison Sage-Grouse	*Centrocerchus minimus*	Candidate	USFWS	sagebrush
Greater Sage-Grouse	*Centrocerchus urophasianus*	Sensitive	BLM, USFS	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 cunicularia*	Sensitive Threatened	BLM, USFS CDOW	prairie dog towns

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

Common Name [2]	Scientific Name	Status [3]	Listing Agency [4]	Primary Habitat or Location in Area
		BIRDS, CONTINUED		
Mexican Spotted Owl	*Strix occidentalis*	Threatened	USFWS	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	USFWS	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
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 maculate*	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
Wolverine	*Gulo gulo*	Sensitive Endangered	USFS CDOW	conifer forest
Lynx	*Lynx canadensis*	Threatened	USFWS	conifer forest

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

[2] *Species in **bold** letters are Federally listed, proposed, candidate, or petitioned as threatened or endangered.*

[3] *BCC = Birds of Conservation Concern (USFWS 2002).*

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

The potential for occurrence of species not presently known to occur is based on the types of habitats present and proximity to the known geographic range. Species with only a very 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.

Numerous additional species 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 resources such as food, space, cover, and physical habitat, and may prey on young stages of the native fishes.

High value habitats for these fishes include stream reaches with well-developed riparian vegetation, low erosion potential, watershed stability, and suitable water quality, including spawning habitat. Measures designed to reduce soil erosion and sedimentation of streams or damage to riparian vegetation (NSO 2, NSO 3, CSU 2) would also benefit the Colorado river fishes. However, greater potential threats include the introduction of pollutants during oil and gas development and depletion of water volume by consumptive uses such as stockponds or use of surface water or tributary groundwater in oil and gas drilling.

Boreal Toad (Candidate) — The boreal or western toad *(Bufo boreas boreas)* is considered eligible for listing under ESA and is listed by CDOW as endangered in Colorado, but Federal listing has been delayed pending evaluation of State-directed recovery programs. This species was formerly widespread in beaver ponds, oxbows, and isolated ponds at elevations between approximately 8,500 and 11,500 feet. The species is not known to occur in the

Planning Area, but potentially suitable habitat occurs along drainages at higher elevations. Historically, the disjunct nature of the upper montane/lower subalpine habitats of the Planning Area may have prevented colonization from more extensive habitat.

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. It is not known to occur in the Planning Area, and the site may be outside its geographic range. 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 1996, 1998) have not resulted in observations of this secretive owl.

Gunnison Sage-grouse (Candidate) — 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 near Gunnison, Colorado, and the southwestern part of the State. This species is therefore not considered further in this RMPA/EIS.

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 species is not known to occur in the project vicinity and is 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, and it is 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 dog towns. Black-footed ferrets have not been documented within the Planning Area, and it is likely that this species was never common due to a lack of suitable habitat and prey. The only known ferret population in Colorado was recently introduced in Moffat County. Ferrets have also been introduced into 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 200 acres (USFWS 1989). These conditions do not occur in the Planning Area vicinity, and the black-footed ferret is not considered further in this RMPA/EIS.

Lynx (Threatened) — This species (*Lynx [Felis] canadensis*), also known as the Canada lynx, has recently been reintroduced in Colorado as part of a recovery program. Although the 2,600 acres of mixed aspen/conifer habitat atop the plateau appears suitable in terms of plant species composition and community structure, and although the Planning Area is known to support a population of the favorite prey of the lynx — the snowshoe hare — the lynx is not thought to inhabit the area. The potential for dispersal of one or more lynx into the Planning Area from other areas is reduced by the relative isolation of potentially suitable habitat atop the plateau from more extensive habitat in the White River National Forest.

BLM and USFS Sensitive Species

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 has concluded that listing is not currently 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 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 1992) but has shown a continued decline in distribution and abundance. Less than 1 percent of its historical range being 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 Colorado River 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 18). 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 10 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).

Amphibians — The Great Basin spadefoot (*Spea intermontana*) and northern leopard frog (*Rana pipiens*) occupy different types of aquatic habitats, but few suitable sites are present for either species and these are vulnerable to loss or disturbance. The Great Basin spadefoot, like other members of its genus in the region (a specialized genus of toads) breeds in seasonal pools and spends most of the year buried in the mud. The genus has 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 been found within the Planning Area. This is a true 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 the widely introduced, non-native bullfrog 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 Region 4 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 rim, and in expanses of xeric shrubland on ridge tops above the rim. 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 cunicularia*) 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 not to 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.

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 the group referred to as "neotropical migrant songbirds," are known to occur or likely to occur within the Planning Area. Among these are a number of "birds of conservation concern (BCC)" identified by USFWS (2002) and the subject of a Memorandum of Understanding (MOU) between UFWS, BLM, and USFS. Species that are included on the USFWS (2002) list of BCC species for the Southern Rockies/Colorado Plateau (the region that includes the Planning Area) or listed as sensitive by USFS and that are known or likely to occur in the Planning Area are included in Table 3-16.

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. yumaensis*). 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 karst 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. 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 is probably too small and isolated to support this species.

3.3.4.2 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 1988 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 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).

The 1997 WRRA RMP listed the following management 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."

To help meet these objectives, the WRRA portion of the Planning Area may apply its existing NSO, TL, and CSU stipulations for the protection of raptor nests, bald eagles nests, roosts, or concentration areas, and the Colorado River cutthroat trout (BLM 2002a).

The introduction to the USFWS (2002) list of birds of conservation concern states, "A primary goal of the USFWS is to conserve avian diversity in North America (USFWS 1990). This goal includes reducing or removing threats that may necessitate consideration for listing under the ESA.... [P]roactive conservation clearly is more cost-effective than the extensive recovery efforts required once a species is Federally listed under the ESA. ...Bird species assemblages, guilds, or communities [are] indicators of ecosystem integrity in a variety of habitats... and at-risk bird species are good measures of ecosystem threats." 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." While BLM has not yet developed specific management measures targeting these species, all native birds (excluding upland fowl species that are hunted) are protected by the Federal Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712, as amended), which prohibits destruction of an active nest (one that contains eggs or young or is being attended by the adults in preparation for nesting); direct mortality, injury, or harassment of the birds; or any activity that results in failure of a nest due to abandonment or reduced nest attentiveness by one or both adults.

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 1988 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 rim. Land use modifications from management activities have been moderate. To date most modifications are the result of livestock developments, which includes roads, 4 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 digital elevation model (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 will be 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 28). 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 29). 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 30). 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 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 Visual Resource Management (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 1988 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 24. 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 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 the fact that they were done for the two resources areas (GSRA and WRRA) 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 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 NSO 18 (I-70 Viewshed) and CSU 15 (VRM Class II Areas).

Within 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, the following stipulations would apply to all surface-use activities: NSO 1 (Landslide Areas) and CSU 1 (Fragile Soils).

3.4.2 Cultural Resources

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).

3.4.2.1 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 2000 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.

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 latter part of the Paleoindian era is best described as the Foothill-Mountain tradition. In this tradition, later Paleoindian groups in the foothills and mountain ecological zones employed a different subsistence strategy than Plains-oriented, bison-hunting late Paleoindian groups. Settlement areas were more restricted. Projectile point styles became more diverse and were often made of local raw materials. Bison were hunted, but so were many other game animals. Foothill-Mountain groups also exploited a wider range of plants than did Plains 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 becomes more common and hunting shifted from the large Pleistocene megafauna to a wide variety of animals. Other Archaic era attributes include use of pit and basin structures for habitation, subsistence practices that include a greater use of lower caloric return foods, and greater material culture variability.

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 begins 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. Union Oil Company, in conjunction with Bureau of Mines, built an experimental plant at Anvil Points in 1944.

The Anvil Points plant was used periodically into the 1970s. In the early 1980s, Exxon began 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.

3.4.2.2 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 36CFR60.4. 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.

3.4.2.3 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).

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**

3.4.2.4 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.

3.4.2.5 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 [1]

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	0	3	28	3	0	1	0	1	0	0	0	0	1	**36**
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	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 36 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. No specific sites have 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 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.

3.4.2.6 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 generated by 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 along I-70 from New Castle on the east to the Garfield – Mesa County line on the west, and north 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, a rate that 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.

Table 3-22. Population Change in the Planning Area Vicinity, 1990 to 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%**
Mesa County	**93,145**	**116,255**	**24.8%**	**2.2%**
Colorado	**3,294,000**	**4,301,000**	**30.6%**	**2.7%**

Source: U.S. Department of Commerce, Census Bureau, 1990 and 2000

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 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 single factor in population growth in the Colorado River Valley.

The Colorado State Demography Section anticipates that the recent high rate of growth will continue in Garfield County (Colorado Department of Local Affairs [CoLA] 2003a). Population projections for the County are 58,558 in 2010 (a 34 percent increase) and 76,705 in 2020 (another 31 percent increase). Therefore, population over the 20-year period is expected to grow by 75 percent. If the population of the region were to grow at the same rate, almost 31,000 people would be expected to reside in the area in 2010, and over 40,000 in 2020.

3.4.3.3 Environmental Justice

The requirements for an environmental justice review during an environmental analysis 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 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 Colorado figure for the same group, 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), which makes up over 28 percent. These are followed by construction and government, with 19 and 14 percent shares, 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.

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 & 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)

Employment projections over the next two decades place Garfield County employment at 35,421 in the year 2010 (an increase of 28 percent) and 42,408 in the year 2020 (an additional 20 percent). Over the 20-year period, employment is expected to grow by 53 percent.

With almost 69,000 jobs, Mesa County's employment is 2.5 times as large as Garfield County but is also dominated by the trade and service sectors. As in Garfield County, agriculture and mining make up relatively small portions of the economy, although there is some amount of manufacturing.

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 (Bureau of Economic Analysis 2002).

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 3.4.3.6.

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, by itself, a cattle or sheep operation could not support a family. The price of land, cost of labor and forage, distance to markets, and the 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 Animal Unit Months (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 Other 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). The number of drilling rigs operating in the area continues to increase, with as many as 1,000 oil and gas workers expected by the end of 2003 (*Daily Sentinel* 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 former 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 former 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 former 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 to be greater that $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 Colorado Water Conservation Board. Royalty payments to jurisdictions in Garfield County for the last 2 years are shown in Table 3-24.

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 (2003)

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.

In recent years, property tax revenue from oil and gas development has become the single most important 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 3.4.6.4, preparation for analysis of socioeconomic impacts for this RMPA/EIS included discussions with a number of community leaders, public land users, and other residents of the Roan Plateau area. These discussions were a follow-up to the scoping effort that BLM has pursued since the fall of 2000. Most of the people involved in the discussions had already participated in BLM's scoping by commenting during one of the scoping periods or by attending the focus group meetings in October 2000. The reason for the more recent contacts was to revisit some of the scoping comments pertaining to social and economic issues. The interview process had three objectives:

1. Gain insight into the economic impact of some traditional public land activities, including hunting and ranching, and clarify the social context surrounding these activities.
2. Assist in the required environmental justice review by determining the extent to which minority or low-income populations are affected by BLM land management decisions.
3. Explore perceptions of local residents about their lifestyle and their quality of life and how public lands are involved in these perceptions.

Some of the information gained from the interviews has already been referenced in the discussions on environmental justice and on the place of hunting and grazing in the local economy. This section summarizes the perceptions of the interviewees about their lifestyles and quality of life and those of their neighbors and constituents.

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 discussants 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 tortuous drive to Anvil Points to enjoy the view 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 seemed to be the greatest fear 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. [Since the interviews were completed, BLM has determined not to seek designation of WSAs under any of the alternatives but to protect all or some wilderness characteristics under Alternatives II and III, respectively.] 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.

3.4.4 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 southeast 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 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.

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 the 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. Nearly all of the traffic on JQS and Cow Creek Roads is for recreation or ranching, except for some local traffic at the bottom of the JQS Road.

Table 3-25 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.

Table 3-25. Average Annual Daily Traffic (AADT) on I-70 and Other Roads

Highway or Road Segment	Average Daily Traffic	
	Current	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

The traffic counts for I-70 and SH 13 are from 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.

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 the fact 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 Fall 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 (1996) 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 3-26).

Table 3-26. 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

Introduction

The land tenure objective in the 1988 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 1988 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 adjustements 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 withdrawals 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) was transferred from the jurisdiction of DOE in 1998. Table 3-27 describes land ownership in the Planning Area.

Table 3-27. 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.

3.5.1.1 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).

3.5.1.2 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 1988 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.

3.5.1.3 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 R&PP Act. The Rifle Sportsmen's Club currently has expressed an interest in an R&PP 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 1988 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 1988 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 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. Both routes become impassable when wet and 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 2000f). 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.

3.5.3.2 Administrative Framework

The recreation resource management objective in the 1988 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 1988 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 1988 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 Special Recreation Management Area (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 Public Land Health Standards (BLM 2000a)(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 1988 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 2002). Map 39 illustrates the current ROS physical setting inventory, and Appendix E describes the ROS classes.

During the recreation capability analysis for the 1988 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 below the rim contrast sharply with the steep Roan Plateau sidehills. 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 oil and gas production area, 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 rim 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.

Regional Recreation Providers

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 1988 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 Animal Unit Months (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 Colorado 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 37. Table 3-28 summarizes allotments within the Planning Area in terms of size, current livestock use, and management categories.

Table 3-28. Current Livestock Use on Grazing Allotments in the Planning Area

AllotmentNumber	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			23
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) = one adult + one young (cow-calf or ewe-lamb) 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 16 allotments, including a portion of the Government Creek Common Allotment east of SH 13. Most of these are small family operations. The area is grazed by approximately 3,550 cattle and 4,700 sheep with a total of 10,816 AUMs (8706 cattle, and 2,110 sheep) available for grazing. The amount of revenues received varies from year to year depending upon the grazing fee and the amount of active use. They average 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 rim, the allotments serve as spring, early summer, fall, and winter ranges for livestock operations. Livestock grazing allotments are administered under three selective 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.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 zones along the streams. The 1984 Allotment Management Plan (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 proper functioning condition (PFC) or functioning at risk (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 PNC [Potential Natural Community]).

The riparian zones 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 zones 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 on riparian zones 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 zones evaluated as static in 1998 were Middle Trapper Creek, Golden Castle Gulch, and Upper JQS Gulch. No riparian zones 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 health standard, 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 Colorado 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 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 public 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. Public 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 1988 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. A land health assessment has not been completed for this allotment, and no other monitoring data are available to indicate range condition. The 1981 SVIM and 1988 GSRA RMP indicate the allotment is in poor to fair condition (early to mid-seral stage).

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 1988 GSRA RMP indicates that 8 AUMs are an appropriate stocking level for this allotment due to suitability factors such as forage condition and terrain available for grazing. A land health assessment has not been completed. Available monitoring data plus the 1981 SVIM inventory indicate the allotment is in early to mid-seral stage (poor to fair condition).

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. 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. Available monitoring data indicate that range condition is moving toward good to excellent.

Webster Park — Utilization data collected in 1996 and 2001 indicate 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 but has not been completed in the remainder of the allotment. 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.

3.5.5 Oil and Gas

3.5.5.1 Existing Management Plans and Guidance

The objective for management of fluid minerals on public lands in the GSRA, as stated in the 1999 FSEIS, is "to facilitate orderly, economic, and environmentally sound exploration and development of oil and gas resources using balanced multiple-use management." The oil and gas objective for management of fluid minerals in the WRRA, as described in the 1996 RMP, is to "make Federal oil and gas resources available for leasing and development in a manner that provides reasonable protection for other resource values." The 1988 GSRA RMPestablishes those same objectives for the lands transferred from DOE to BLM (NOSRs 1 and 3).

3.5.5.2 Oil and Gas Resource

The Planning Area lies entirely within an area referred to by the GSFO as Region 4 (see Figure 1-2). The name describes a geologically defined area with high natural gas and oil potential in central Garfield County that is generally considered the southernmost extent of the Piceance Basin. The geology of the Planning Area is described in detail in Section 3.2.1. Within Region 4, 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 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. 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.

3.5.5.3 Drilling and Production

The rate of drilling and production in Region 4 has increased rapidly in recent decades, from fewer than two wells per year from 1957 to 1988, to about nine per year over the next 10 years, to the current rate of approximately 100 wells per year. As of June 2001, the Planning Area included 109 completed or proposed well bores, including 76 producing gas wells, 3 wells being drilled, 26 notices of stakings or APDs, four abandoned wells, and one dual completion.

The recent increase in drilling is also reflected in a rapid increase in gas production. Cumulative production in the Planning Area over the 25 months from May 1, 1999, to June 1, 2001 increased from 124 billion cubic feet (BCF) to 173 BCF, with an associated increase in oil production from 188 to 260 million barrels (BLM 2003a). These increases are due to aggressive development of the total stack of lenticular sands that compose the Williams Fork Formation. A typical well bore may encounter 10 to 25 or more of these lenses. This approach requires completing the well in multiple zones, increasing the size of the proppant load used in hydraulic fracturing, and employing sophisticated fracturing fluids and procedures. Much of this 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 more than 1,200 wells that have been drilled in Region 4, approximately 524 are in the Planning Area, including approximately 106 in areas of Federal mineral estate. Of the existing 106 wells on Federal mineral estate, 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. 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 current producer, Williams Production, had 740 gas wells in the region as of January 2003 and is currently developing on Federal and private lands in the southern portion of the Planning Area at an approved downhole spacing of 20 acres. They also operate a pilot project for 10-acre subsurface well densities and recently submitted an application for 10-acre downhole spacing on 11,000 acres of private land in the southern part of the Planning Area. [This RMPA/EIS assumes that 80 percent of the lands below the rim in the Planning Area would be developed at 10-acre downhole spacing and 20 percent at 20-acre spacing.]

Little gas development has occurred in the WRRA portion of the Planning Area. Tom Brown, Inc., 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. No oil and gas operations are located in the 12 to 18 miles between those activities and the Planning Area.

3.5.5.4 Recoverable Resources

The Planning Area contains 73,602 acres of Federal mineral estate (including split estate) and 53,405 acres of private mineral estate. Approximately 18,670 acres (25 percent) of Federal mineral estate is leased. Technically recoverable gas resources in Federal mineral estate in the Planning Area are estimated at 8.9 trillion cubic feet (TCF), including 8.6 TCF in the Mesaverde Group and 0.3 TCF in the Wasatch Formation. The estimate for both Federal and private mineral estates is 15.4 TCF. The RFD (Appendix H) estimates actual producible reserves in the Federal mineral estate at 5.8 TCF. Estimated oil reserves for the Planning Area are 28,133 MBO, of which approximately 16,351 MBO are Federal.

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 production of 5.8 TCF of gas from Federal mineral estate during the operational life of the field, the 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 would be equivalent to the amount needed to serve 3.1 million households for 20 years.

3.5.5.5 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 Region 4, 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 PL 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. Table 3-29 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 3-29. 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**

3.5.5.6 Coalbed Natural Gas

The entire Roan Plateau area is considered to have a high potential for coalbed natural gas (i.e., more than 400 cubic feet of gas per ton of coal)(CGS 1984). However, with the primary coal-bearing stratum (the Cameo Coal Zone) at depths in excess of 6,000 feet, this energy source is not considered economically recoverable given current technologies and prices.

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 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 hydrocarbon 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. Recently, 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 500° to 600°F, 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.

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)

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 1988 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 Colorado Natural Heritage Program, CDOW species-of-concern, and nominations from the Colorado Wilderness Network. The complete evaluation of these areas is reported in the *Roan Plateau RMP Amendment Evaluation of Proposed Areas of Critical Environmental Concern* (BLM 2002c).

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 are included in this RMPA/EIS process. A summary of the evaluation of these four areas follows. A complete evaluation of all ten areas is included in Roan Plateau RMP Amendment Evaluation of Areas of Critical Environmental Concern (BLM 2002d).

3.5.7.1 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 3). 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 geologic 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 Migratory Bird Treaty Act. 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 Seclusion Area in the 1999 FSEIS. In addition, the Colorado Natural Heritage Program 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 (see 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 a seclusion/security component 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 where migration corridors 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 as it contains crucial habitat for peregrine falcons, golden eagles, and Townsend's big-eared bat. In addition, the lands below the rim contain unroaded, unfragmented habitats that are rare 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 are 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 rare plants and significant plant communities and provides a level of habitat protection to sustain key ecosystem processes on which they depend.

Plants

- 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 wild rye)

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.

3.5.7.2 Magpie Gulch ACEC

The proposed ACEC is situated on the east and northeast-facing slopes below the Roan Plateau (Map 3). 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 Book 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 corridors 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 change which would cause habitat fragmentation and result in 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 19 and 20), 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.

3.5.7.3 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 19 and 20). 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 1988 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 (see 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 hanging garden 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 1997). 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 19 and 20 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.

3.5.7.4 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 (CRCT), 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 CRCT 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 1997), 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 former Naval Oil Shale Reserve (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). 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 4 inventory units: East Fork Parachute Creek, Trapper Creek, Northeast Cliffs, and Southeast Cliffs (Table 3-30). The following subsections describe the wilderness qualities of each of the 4 inventory units.

Table 3-30. 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 llivestock 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 seclusion 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 seclusion areas, aesthetic and scenic qualities, and geological and paleontological values are found there.

3.5.9 Wild and Scenic Rivers

Overview

The Wild and Scenic Rivers Act of 1968 (WSRA) 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 former 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.

3.5.9.1 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 can be described as "free-flowing" and an assessment of "outstandingly remarkable values" (ORVs) the stream segments may possess. These are the criteria for eligibility.

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 14 displays those streams; Table 3-31 lists the stream segments and summarizes the team's findings. 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, rip-rapping, 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.

3.5.9.2 Eligibility Findings

Of the original list of 31 streams evaluated, 8 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 3-31). ORVs fell into three categories: scenic, fisheries, and botanical/ecological.

Table 3-31. 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	2.2
Forked Gulch	no	--	no	
Golden Castle Creek	yes	B, F	yes	1.0
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	3.2
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 Value

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 notably distinctive. Few canyons in the region contain a scenic feature of this scale or quality.

Fisheries

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 (see 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.

While once common in most of the larger rivers of the region, including the White, Yampa, Colorado, Gunnison, and the San Juan and its tributaries, remaining populations are 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 has been so little used by recreationists (due to its isolation and remoteness) that no pressure is brought to bear on fish and wildlife agencies to stock gamefish, which inevitably would have included non-native species and other 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 other species and subspecies onto the plateau.

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 a combined 15.5 miles of habitat for the Colorado River cutthroat trout. In addition, 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 Value

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 (see Section 3.2.4). Nearly two-thirds (62 percent) of the known populations of this species occur in the Planning Area (see 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.

3.5.9.3 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 2002) 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 8 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 8 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 1988 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 1988 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 NOSR. 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* (FHMS 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. FMPs define a strategy for managing and prioritizing wildland fires and prescribing vegetation treatments for fuel hazard reduction and resource benefit. Table 3-32 is an overview of FMZs.

Table 3-32. Fire Management Zone 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.*

The 1988 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."

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, exotic species such as cheatgrass, musk and other thistles, houndstongue, and tamarisk that are adapted to shorter fire intervals than the native species and increase the fire intervals over the natural situation. These non-native plants also readily resprout following fires and may out-compete native species.

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 3-32) are based on BLM Instruction Memorandum No. 2002-034 (BLM 2001c) and Clarification of Fire Management Categories and RMP-Level Decisions in BLM Handbook H-1601-1 (BLM 2001a).

Top of the Plateau

The top of the plateau is managed as FMZ D. 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 (CWP) designation.

Northeast Cliffs and Southeast Cliffs

The Fire Management Plan 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, and the old-growth Douglas-fir community. 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 CWP areas.

Lower Elevations along the I-70 Corridor

The lower elevation terrain below the rim is managed as FMZ B. 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 CWP 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 Exploration and Production Materials

In 1988, EPA determined that the control of wastes associated with oil and gas exploration and production did not warrant regulation as hazardous wastes under Subtitle C (hazardous materials) of the Resource Conservation and Recovery Act (RCRA) of 1976, although these materials remain subject to both State and less stringent RCRA Subtitle D (solid waste) 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. The exemption does not apply to 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.

Oil and gas wells are drilled primarily with rotary drilling rigs. In the rotary method, a hole is drilled by means of a rotating bit to which a downward force is applied. The bit is attached to and rotated by a drill string, composed of drill pipe and drill collars, with new sections of pipe being added as drilling progresses. Drill cuttings are lifted from the hole by the drilling mud, which is continuously pumped down the drill string through nozzles in the bit and upward through the annular space between the drill pipe and the hole. At the surface, the drilling mud is diverted to tanks or pits for cleaning and treatment.

Water-based mud is generally used during drilling of Wasatch and Mesaverde wells in the Planning Area. Water requirements range from 5,000 to 15,000 gallons per day. This water is delivered to the site by truck. Operators in Region 4 typically reuse water from the drilling mud to reduce water 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

A typical drilling mud report from Williams Production shows a list of additives used in the Planning Area as including 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 not typically removed from the site. Approximately 100 cubic yards of cuttings are typically generated for each well drilled in the Roan Plateau area. The cuttings are buried in pits 8 to 10 feet deep within the drill pad disturbance area, backfilled with soil and subsoil removed during excavation, and then 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 Production does not use onsite pits for evaporation but instead trucks the produced water offsite for disposal.

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 the Colorado Department of Public Health and Environment (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 3-33. The water quality standards shown include secondary (non-health-based) and primary (health-based) drinking water standards (maximum contaminant concentrations, 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 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.

Table 3-33. Summary of 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.*

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.

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.

Releases that exceed certain criteria must also be reported to the EPA. Spill reports received by the EPA regarding hazardous substance incidents are maintained in an online database called the Emergency Response Notification System (ERNS). When a reportable quantity of a hazardous substance is released, the National Response Center must be notified within 24 hours. Although no reporting thresholds have been established for crude oil, natural gas, or produced waters at oil and gas production facilities, the ERNS database contains some reports of such releases. A review of the online database on January 26, 2003, revealed four releases associated with oil and gas production in Garfield County.

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 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 (Oil and Public Safety regulations) include:

> (13) "Regulated substance" means: (a) Any substance defined in section 101 (14) of the Federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, but not including any substance regulated as a hazardous waste under Subtitle (C) of the Federal Resource Conservation and Recovery Act of 1976, as amended; or (b) Petroleum, including crude oil, and any fraction thereof that is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit 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 the Federal "Comprehensive Environmental Response, Compensation, and Liability Act of 1980," as amended, 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 or 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. 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.

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. The Colorado Department of Public Health and Environment (CDPHE) and BLM 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. According to CDPHE, these findings indicate the presence of threats to human health and the environment from the pile that warrant remedial action, along with remediation of ancillary facilities such as open adits, sheds, and gravel roads. BLM is currently developing a remedial action plan for the spent oil shale pile and ancillary facilities.

CERCLA Sites and Superfund Sites (National Priorities List, NPL)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) provides a system for prioritizing existing areas of known contamination for remediation. The U.S. Environmental Protection Agency (EPA) ranks the CERCLA Information System (CERCLIS) sites according to risk based on the Hazard Ranking Score. Higher risk sites are placed on the National Priority List (NPL) and these sites are then considered Superfund sites. A review of CERCLIS, dated January 2003, indicates that no CERCLA sites are located within one mile of the Planning Area.

RCRA/Hazardous Waste Notifiers

The Resource Conservation and Recovery Act (RCRA) Notifiers List (Table 3-34) is an inventory of transporters; burner/blenders; and large-, small-, and very small-quantity generators of hazardous wastes. 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 LQG were found in the RCRIS database within 0.5 mile and no other facilities were located within 0.25 mile of the study area.

Table 3-34. 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 west 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 north of Parachute, CR 215	CESQG	COD000651539
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	TSD, CESQG, CAS	COD980718902

The Enforcement and Compliance History Online (ECHO) List (EPA 2003a) was reviewed for the above facilities. The Unocal facility had several RCRA inspections during 2001 and 2002, none of which resulted in an enforcement action. None of the other facilities had enforcement or compliance inspections or actions listed on the ECHO list.

Emergency Response Notification System

Spill reports received by the EPA regarding hazardous substance incidents are maintained in the ERNS on-line database. When a reportable quantity of a hazardous substance is released, the National Response Center must be notified within 24 hours and these reports are also included in ERNS. Some of the ERNS sites are non-locatable due to insufficient data provided to the EPA. Known releases that may affect the study area include the following:

1. An incident at the Unocal Oil Shale Facility at 2717 CR 215 near Parachute released 100 pounds of anhydrous ammonia on August 28, 1991. The release occurred while flushing containers with water. No remedial actions were taken, as the ammonia reportedly evaporated.
2. On February 23, 1994, a release occurred at the Unocal Oil Shale Facility at 2717 CR 215 near Parachute. Thirty gallons of treated process water was released when a pipe ruptured at the petroleum refinery. The pipe was repaired and the materials were recovered.
3. A release occurred on August 8, 2002, at the American Soda facility located at 2717 CR 215 near Parachute. A pump hose failure resulted in 40,000 gallons of sodium carbonate brine being released to Parachute Creek at a rate of 500 gallons per minute. Berms were reportedly constructed to minimize impacts to the waterway, and the CDPHE was notified of the incident.
4. The release of an unknown quantity of unknown material was reported at 431 CR 246 on May 4, 2000. A witness reported tanker trucks releasing materials into a pond. The material was reported as having a strong “chemical” odor.
5. 10 gallons of polyamines (epoxy hardener) were released near Exit 175 on I-70 at Parachute on October 16, 2001 when the load shifted in a trailer. The released materials and soils were removed and disposed of.

6. A possible sulfur dioxide odor was reported in the air at CR 215 in Parachute on August 31, 2001. No known release volume, constituents, or remedial actions were documented.
7. A strong solvent odor was reported on May 8, 2001, near the Texaco Gas Station in Parachute (intersection of I-70 and CR 215). The odor was reported as coming from a 20-foot by 30-foot section of ground with dead grass near it. The Grand Valley Fire Protection District barricaded the area, and was advised to call EPA.
8. Twenty gallons of oil and diesel were released by W. C. Spriegel Inc. in the West Fork of Parachute Creek when a truck slid down a slope and ruptured its fuel tank. Sorbent pads and booms were used to recover the free phase petroleum products. Affected soils were excavated.
9. An unknown quantity of volatile organic compounds and heavy metals was reported on October 28, 1998, coming from groundwater percolating through a spent shale pile. The release location is in Section 17, Township 6 South, Range 94 West. No other information was given in the NRC report.

Environmental Covenants

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: the Old Rifle Mill site located in portions of Sections 15 and 18, Township 6 South, Range 93 West. Use restrictions are as follows:

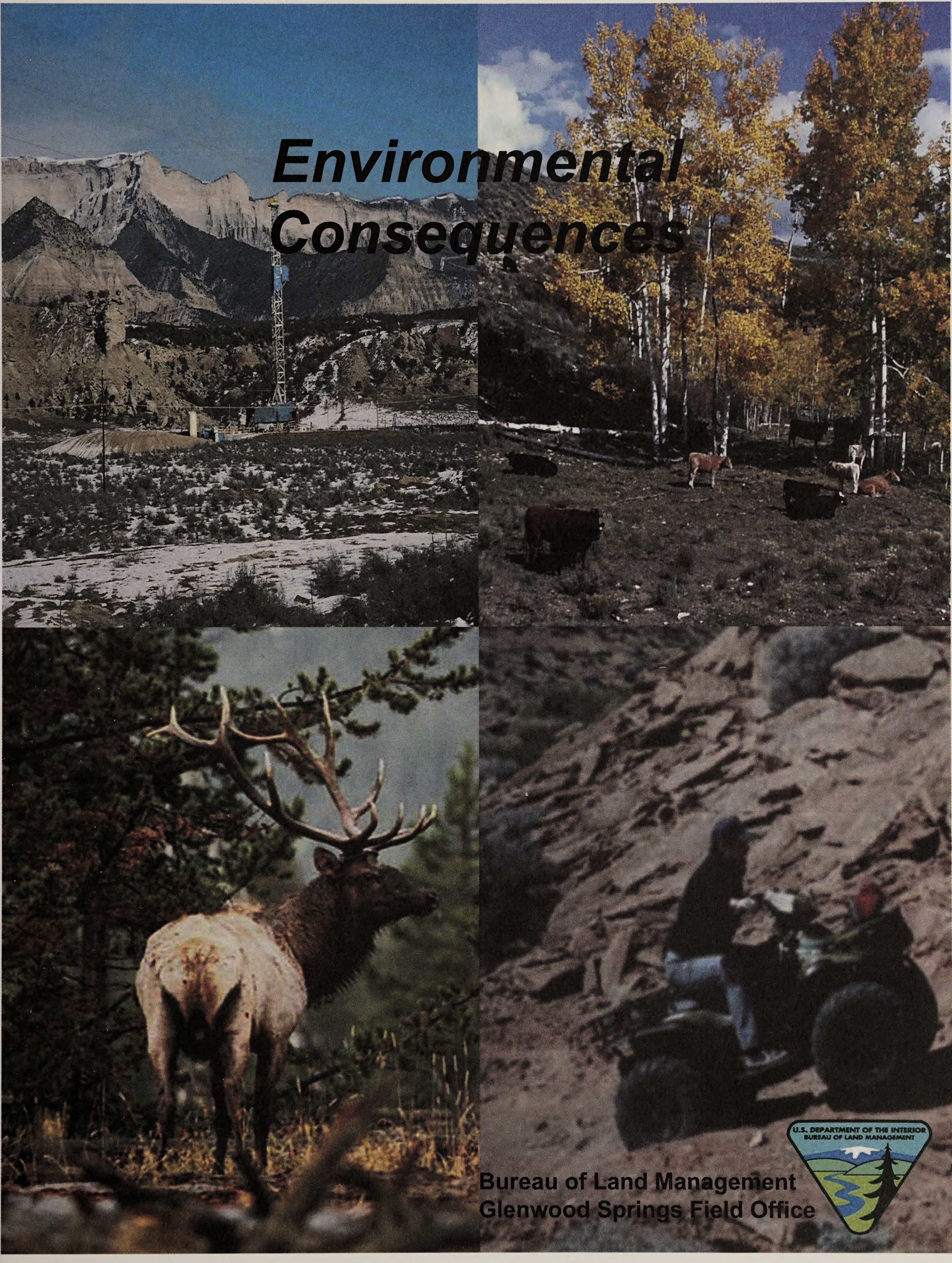
- No habitable structure may be constructed on the property without properly designed radon mitigation as approved by the Department.
- Wells completed in the alluvial aquifer or the Estrada Formation may not be used for domestic or potable water supplies.
- No tilling, excavation, grading, construction, 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 issued a report identifying public lands most suitable for increased development of renewable energy (DOE 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 experts in the industries 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.

Environmental Consequences



Bureau of Land Management
Glenwood Springs Field Office

4 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

4.1.1 Impact Analysis Process

Chapter 4 describes the impacts of management and resource development actions on the physical, biological, human, and management environments of the five alternatives evaluated as part of this RMPA/EIS process. Impacts are described in terms of intensity and duration. The analysis focuses on direct and indirect impacts to specific resources on BLM lands in the Planning Area. Additional discussion of offsite and cumulative impacts is also provided and addresses both the private portion of the Planning Area and, as appropriate, nearby offsite resources. The resources are presented in the same order as described in Chapter 3, Affected Environment.

The five alternatives analyzed are described in Section 2.3. They range from continuation of current management (Alternative I, No Action), through intermediate levels of resource protection and oil and gas development (Alternatives II through IV), to a greater focus on oil and gas development with lower levels of natural resource protection (Alternative V).

For purposes of this RMPA/EIS, Alternative III has been designated as the preferred alternative. As described in Chapter 2, Alternative III differs from the other alternatives in that leasing and drilling for oil and gas would be deferred on the 34,758 acres of Federal mineral estate atop the plateau until at least 80 percent of anticipated wells below the rim under that alternative have been effectively completed to total depth and a production test performed. The point at which this threshold would be met cannot be predicted with certainty, but 16 years is a reasonable estimate. Section 4.5.5.3 provides more details on the development deferral atop the plateau.

The five alternatives were constructed to represent a reasonable range of land uses and management actions for the Planning Area. While BLM believes that the combinations of components represented by these alternatives are reasonable and implementable in their current configuration, BLM also recognizes that the selected alternative arising from this process may be different from any of the current four. Although the analyses presented in this chapter address all resources and currently anticipated management actions and uses, emphasis is placed on resources, actions, and uses identified during the scoping process (Chapter 1) as being of special importance. These include scenic quality, recreational use, ranching, and special status ecological resources, among others (see Table 1-1). Of the potential impacts associated with future management of the Planning Area, the most marked in terms of direct physical change and indirect consequences of change would be the anticipated development of oil and gas resources. Therefore, much of the analysis emphasizes the direct, indirect, and cumulative impacts resulting from the construction of roads and well pads and associated human activity.

The starting point for analysis of the five alternatives was the Reasonable Foreseeable Development (RFD) for oil and gas development in the Planning Area, prepared by BLM as part of the planning process. The RFD is presented in 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. Rather, they are intended to allow flexibility during resource development while providing sufficient specificity to support the impact analysis and alternative selection processes.

The RFD estimates the level of oil and gas development that might reasonably be expected to occur over a specified range of time given applicable well surface and subsurface (downhole) spacing densities, the potential for multiple wells at a site, the potential for directional drilling in addition to vertical drilling, an assumed average per-year drilling rate, and obvious environmental constraints (e.g., assuming no drilling on slopes greater than 50 percent). That is, the RFD describes the anticipated level of oil and gas development within the Planning Area given state-of-the-art economic and technical feasibility, and major land use and landform constraints at the time of the analysis.

The assumed drilling rate, based on existing leases in the Planning Area, is completion of one well per 30 days per drill rig (Appendix H). The RFD also assumes that the average drilling season on top of the plateau would be 5 months per year, based on snow accumulation at these higher elevations. The drilling season in areas below the rim is assumed in the RFD to be 12 months although some alternatives include seasonal restrictions that prohibit drilling during the 4 months of crucial winter range by deer and elk (viz., December 1 through April 30). The RFD also presents assumptions on the surface and downhole spacing of wells, as follows:

- 40-acre surface spacing throughout the Planning Area for Mesaverde wells, except for 20-acre spacing on wells drilled directionally beneath the rim
- 40-acre downhole spacing for Mesaverde wells atop the plateau.
- 20-acre downhole spacing for Mesaverde wells on 20 percent of the area below the rim and all of the developable area atop the plateau
- 10-acre downhole spacing for Mesaverde wells on 80 percent of the area below the rim
- 160-acre surface and downhole spacing for Wasatch wells, collocated with Mesaverde well pads

Areas of surface impact of oil and gas development assumed in the RFD include:

- 1.9 acres for long-term impacts for single-well pads, including the drill pad itself and associated pipelines and roadways within the 40-acre or 20-acre surface locations
- 2.5 acres of long-term impacts for multiple-well pads, including the same components as single-well pads
- 1.5 acres of temporary impacts for all pads, comprising areas revegetated within 2 years
- 0.6 miles of access road per pad, including construction of new roads and widening/improving existing roads

As described in Chapter 2, the impact analyses for each alternative are also based on an assumed number of new wells, derived by subtracting existing wells from potential wells given assumed spacings, drilling rates, and surface-use restrictions. Since some oil and gas development is ongoing in existing leases below the cliffs, the number of potential future wells decreases as new wells are drilled.

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 five alternatives, assumptions used in the RFD were subjected to various "screens" or "filters" representing restrictions designed to protect specific resource values and meet the multiple use and sustainability objectives. 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)** – No long-term (>2 years) ground-disturbing activities would be permitted, unless qualifying for an exception as defined by specific criteria in a particular NGD. In terms of oil and gas, 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, bald eagle winter roosting, and mule deer winter-use seasons. It is important to note that TL restrictions can apply to NGD/NSO and SSR/CSU areas, as well as to areas with otherwise standard restrictions and limitations.

In addition to these restrictions and limitations on surface uses and management activities, BLM may require special mitigation measures in some situations to ensure adequate protection of specific resource values. Special mitigation may be required in all NGD/NSO and SSR/CSU areas, as well as special management areas (ACECs, WMAs, WSRs, SRMAs, and areas having wilderness character). The requirement for special mitigation could be applied as an LN for oil and gas leases, as a COA during permitting of specific oil and gas activities, or at the time of permitting for other uses and activities such as range improvements, forest management, travel management, etc.

Examples of potential special mitigation requirements include the required use of:

- culverts at stream crossings
- special road design or dust suppression techniques to reduce particulate generation and impacts to 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 selected alternative arising from this RMPA/EIS process, 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 five 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.

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 resulting from this RMPA/EIS. However, many of the proposed new stipulations are based on, and in most cases essentially identical to, existing stipulations. In an attempt to minimize confusion, this RMPA/EIS uses the numbering system for existing stipulations when describing analogous new stipulations.

Table 4-1. Areas of Surface Use Restrictions in Planning Area

Category [1]	Alternative				
	I	II	III	IV	V
BLM Lands Atop the Plateau = 34,758 Acres					
No Lease for Oil and Gas [2]	33,355 ac (96.0%)	10,382 ac (29.9%)	0	0	0
Deferred Lease for Oil and Gas [3]	0	0	34,758 ac (100%)	0	0
No Ground Disturbance (NGD) [2]	221 ac (0.6%)	15,365 ac (44.2%)	11,364 ac (32.7%)	11,364 ac (32.7%)	7,408 ac (21.3%)
Site-Specific Relocation (SSR) [2]	525 ac (1.5%)	1,572 ac (4.5%)	15,179 ac (43.7%)	15,179 ac (43.7%)	10,750 ac (30.9%)
Standard Restrictions and Limitations [2]	657 ac (1.9%)	7,440 ac (21.4%)	8,215 ac (23.6%)	8,215 ac (23.6%)	16,600 ac (47.8%)
BLM Lands Below the Rim (including the Cliffs) = 38,844 Acres					
No Lease for Oil and Gas [2]	10,912 ac (28.1%)	11,000 ac (28.3%)[3]	0	0	0
Deferred Lease for Oil and Gas [3]	0	0	0	0	0
No Ground Disturbance (NGD) [2]	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%)
Site-Specific Relocation (SSR) [2]	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%)
Standard Restrictions and Limitations [2]	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%)
Total BLM Lands in the Planning Area = 73,602 Acres					
No Lease (for Oil and Gas) [2]	44,267 ac (60.1%)	21,382 ac (29.1%)[3]	0	0	0
Deferred Lease (for Oil and Gas) [2]	0	0	34,758 ac (47.2%)	0	0
No Ground Disturbance (NGD) [2]	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%)
Site-Specific Relocation (SSR) [2]	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%)
Standard Restrictions and Limitations [2]	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%)

[1] *Does not include seasonal restrictions (Timing Limitations, TL) for the protection of raptor nesting, bald eagle winter roosting, and waterfowl nesting (3,692 acres) deer/elk winter range (24,978 acres). TLs overlap with other designations, including standard restrictions and limitations.*

[2] *See text for definitions.*

[3] *Leasing and drilling deferred until 80% of anticipated total wells (Federal and private, new and existing) pr below the rim under Alternative III have been effectively completed to total depth and a production test performed, estimated at 16 years. It is assumed that drilling would commence 1 year thereafter.*

Throughout Chapter 4, reference is made to the application, extension, retention, or deletion of existing stipulations vis-à-vis new leases under the five alternatives. 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.

New stipulations not based on existing stipulations are indicated with a "P" for plants, "V" for visual resources, "W" for wildlife, or "WSR" for Wild and Scenic Rivers to differentiate them from those based on existing stipulations.

Gaps in the numbering system used in this RMPA/EIS when discussing new stipulations are an artifact of the plan development process and will be rectified by renumbering all stipulations sequentially in preparing the RMP Amendment arising from this process.

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 overall 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 described below employ specific definitions for negligible, minor, moderate, and major which, while consistent with the terms above, are better suited to the specific resource.

Also note that the period of analysis for this RMPA/EIS is 20 years, which is the anticipated life of the RMP Amendment that will result from this process. Continued oil and gas development is likely to extend to 40 years or more, based on the typical life of wells in the region. It is impossible to predict how development would look in the 20-year to 40-year timeframe and beyond due to unknowns such as exact surface and downhole spacing densities in various parts of the Planning Area, changes in resources, land uses, and management over time, and changes in the economics and demand for oil and gas production in the region. However, the cumulative impact analyses for individual resources, land uses, and management actions in Chapter 4 assume that oil and gas development would continue to 40 years at a scale comparable to that analyzed during the first 20 years.

Tables 4-2 and 4-3 summarize the assumed level of oil and gas development and associated surface impacts under the five alternatives. Information is presented for the 20-year period of analysis of this RMPA/EIS and for full field development. 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 that incorporate development on private land as well as BLM land within the Planning Area. Actual numbers of oil and gas pads, miles of access roads, and acres of long-term or temporary disturbance could vary due to a variety of circumstances that may change either prior to or during the term of this RMPA/EIS, including technical, economic, and political considerations.

A notable discrepancy in Tables 4-2 and 4-3 is the smaller (1.9X) increase in the number of new pads atop the plateau when comparing Alternative II to Alternative IV versus the larger (2.6X) increase in surface area available for oil and gas development. This difference reflects the fact that most of the additional available areas would be above the rim, where the annual drilling rate is assumed to be lower due to a combination of more difficult access, a snow-shortened drilling season, lower downhole densities, thicker overburden, and more restrictions related to environmental protection. Note also that Alternative III is estimated to result in a smaller number of wells atop the plateau than Alternative II, despite a 2.6-fold increase in available area. As described elsewhere, this reflects the deferral of drilling above the rim until 80 percent of the anticipated wells below the rim have been completed. In looking beyond the 20-year period of analysis of this RMPA/EIS, BLM anticipates that construction of additional wells needed to recover the natural gas resource fully can be accomplished in many cases by collocation with wells developed in the first 20 years. The exception to this generalization is the area above the rim under Alternative III, since only an estimated 3 years of drilling would occur during the first 20 years.

It should be pointed out that the Planning Area contains some additional leasable mineral resources: oil shale, coal, and coalbed natural gas. Oil shale is not currently considered economically viable but could be leased and developed in the future. Coal occurs at depths too great for economic recovery at current prices or with current technology. Coalbed natural gas is a type of natural gas that, like coal, is present at depths too great to be considered economically viable with current technology.

Because of the current infeasibility of recovering these leasable mineral resources, this RMPA/EIS assumes that the Planning Area would not be subject to entry under the Mineral Leasing Act for the purpose of developing them during the 20-year period of analysis. 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 Mineral Estate in 20 Years

Component	Alternative				
	I	II	III	IV	V
Atop the Plateau = 34,758 Acres					
Total Area Available for Oil and Gas Surface Facilities[1]	1,182 ac (3.4%)	9,011 ac (25.9%)	23,394 ac (67.3%)	23,394 ac (67.3%)	27,350 ac (78.7%)
Estimated New Wells (Pads) in 20 Years [1]	10 (7)	87 (66)	51 (39)	168 (126)	234 (175)
20-yr Long-term Disturbance for Pads and Associated Facilities [2]	20 ac	135 ac	104 ac	180 ac	244 ac
20-yr Long-term Disturbance from New or Widened Access Roads [3]	4 mi (11 ac)	40 mi (108 ac)	23 mi (62 ac)	76 mi (203 ac)	105 mi (280 ac)
20-yr 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%)
20-yr Temporary Disturbance [4]	20 ac	196 ac	114 ac	373 ac	518 ac
Below the Rim = 38,844 Acres					
Total Area Available for Oil and Gas Surface Facilities [1]	14,241 ac (36.6%)	12,009 ac (30.9%)	19,280 ac (49.6%)	19,280 ac (49.6%)	24,643 ac (63.4%)
Additional Pads for Drilling under Cliffs	112	112	112	112	112
Estimated New Wells (Pads) in 20 Years [5]	845 (247)	818 (244)	1,273 (363)	1,156 (323)	1,348 (409)
20-yr Long-term Disturbance for Pads and Associated Facilities [2]	618 ac	610 ac	840 ac	808 ac	1,022 ac
20-yr Long-term Disturbance from New or Widened Access Roads [3]	148 mi (502 ac)	146 mi (495 ac)	218 mi (755 ac)	194 mi (658 ac)	245 mi (832 ac)
20-yr Long-term Disturbance [2, 3]	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%)
20-yr Temporary Disturbance [4]	730 ac	720 ac	1,073 ac	956 ac	1,208 ac

[1] *Area of Federal mineral estate after subtracting No-Lease areas and No Surface Occupancy (NSO) stipulations. For Alternative III, entire area atop the plateau would be open to leasing after 80% of the total wells anticipated below the rim under Alternative III have drilled (see text). Estimated time to reach threshold is 16 years. Drilling is assumed to commence 1 year thereafter.*

[2] *Includes area of pad, pipeline, and associated facilities within each 40-acre surface location. Assumes total disturbance of 1.9 acres for single-well pads and 2.5 acres for multi-well pads.*

[3] *Average of 0.6 miles of access road per pad. Atop the plateau: assumes 20% new roads 30 feet wide and 80% existing roads widened by 20 feet. Below the rim: assumes 80% new roads 30 feet wide and 20% existing roads widened by 20 feet.*

[4] *Includes 1.5 acres at each pad site and 10 feet on each side of new or widened roads.*

[5] *For Alternative III, ssumes that entire annual drilling would be applied below the rim during the deferral period atop the plateau.*

Table 4-3. Surface Impacts of Oil and Gas Development on Federal and Private Mineral Estates in the Planning Area in 20 Years

Component	Alternative				
	I	II	III	IV	V
Federal Minerals = 73,602 Acres					
Total Area Available for Oil and Gas Surface Facilities[1]	15,423 ac (21.0%)	21,021 ac (28.6%)	42,674 ac (58.0%)	42,674 ac (58.0%)	51,993 ac (70.6%)
Estimated New Wells (Pads) in 20 Years	855 (254)	905 (310)	1,324 (402)	1,324 (449)	1,582 (584)
Net Surface Spacing (available area ÷ no. pads)	61 ac	68 ac	106 ac	95 ac	89 ac
Gross Surface Spacing (total area ÷ no. pads)	290 ac	237 ac	183 ac	164 ac	126 ac
20-yr Long-term Disturbance[2,3]	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%)
20-yr Temporary Disturbance[4]	750 ac	916 ac	1,187 ac	1,329 ac	1,726 ac
Private Minerals = 53,405 Acres					
Total Area Available for Oil and Gas Surface Facilities[1]	39,720 ac (74.4%)	39,720 ac (74.4%)	39,720 ac (74.4%)	39,720 ac (74.4%)	39,720 ac (74.4%)
Estimated New Wells (Pads) in 20 Years	1,473 (502)	1,473 (502)	1,473 (502)	1,473 (502)	1,473 (502)
Net Surface Spacing (available area ÷ no. pads)	79 ac	79 ac	79 ac	79 ac	79 ac
Gross Surface Spacing (total area ÷ no. pads)	106 ac	106 ac	106 ac	106 ac	106 ac
20-yr Long-term Disturbance[2,3]	2,168 ac (4.1%)	2,168 ac (4.1%)	2,168 ac (4.1%)	2,168ac (4.1%)	2,168ac (4.1%)
20-yr Temporary Disturbance[4]	1,483 ac	1,483 ac	1,483 ac	1,483 ac	1,483 ac
Cumulative (Federal + Private Minerals) = 127,007 Acres					
Total Area Available for Oil and Gas Surface Facilities[1]	55,133 ac (43.4%)	61,454 ac (48.4%)	82,150 ac (64.7%)	82,150 ac (64.7%)	91,723 ac (72.2%)
Estimated New Wells (Pads) in 20 Years[4]	2,328 (756)	2,378 (812)	2,761 (902)	2,761 (951)	3,019 (1,086)
Cumulative 20-Year Long-term Disturbance[4]	3,319 ac (2.6%)	3,516 ac (2.8%)	3,923 ac (3.1%)	4,104 ac (3.2%)	4,653 ac (3.7%)
Cumulative 20-Year Temporary Disturbance[4]	2,223 ac	2,399 ac	2,668 ac	2,812 ac	3,209 ac

[1] *Total area minus No-Lease and NSO areas (Federal minerals); excludes slopes steeper than 50% (Federal and private); surface facilities include wells, pads, pipelines, roads, compressor stations, tanks, etc. Alternative III would defer leasing and development on Federal lands atop the plateau until 80% of total wells anticipated below the rim under that alternative have been drilled. Estimated duration of deferral is 16 years. Drilling is assumed to commence 1 year thereafter.*

[2] *Assumes 1.9 acres for single-well pads and 2.5 acres for multi-well pads).*

[3] *Assumes 0.6 miles of new roads 30 feet wide (or existing roads widened by 20 feet) per pad.*

[4] *Includes 1.5 acres at each pad and 10 feet on each side of new or widened roads.*

4.2 PHYSICAL ENVIRONMENT

4.2.1 Geological Resources

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 the five 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.

Geologic hazards in the Planning Area 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 four 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.

4.2.1.1 Alternative I

The rockfall hazard for potential oil and gas development and other uses of the Planning Area is greater under Alternative I than the other alternatives because the NSO stipulation for slopes steeper than 50 percent applies to 8,722 acres, compared to 16,550 acres under the other alternatives. This occurs because the stipulation under Alternative I applies only to areas that were available to oil and gas leasing under the 1999 FSEIS, while for the other alternatives it applies throughout the Planning Area.

Viewed from the opposite perspective, Alternative I would protect only about half as much of the area of steep slopes from excessive erosion due to construction of roads and drill pads as the other four alternatives. However, because road construction and other ground-disturbing activities would presumably avoid areas of obvious rockfall hazard, the impact of this lesser extent of the NSO for steep slopes under Alternative I is still expected to be negligible.

The claystone cave and karst system and associated natural arch are located within an existing oil and gas lease protected by NSO 19, which prohibits surface disturbances from oil and gas activities within 0.25 mile of the identified values (Map 11). Under Alternative I, some lands around the cave are also protected by an NSO stipulation-associated VRM Class I. Therefore, negligible negative impacts to these resources are expected from any ground-disturbing actions associated with resource management. However, risk of damage from recreational use continues.

4.2.1.2 Alternatives II through V

Impacts under these alternatives would be similar to those under Alternative I, except that portions of the steep cliffs within the no-lease area of Alternative I would instead by protected by an NGD/NSO stipulation for slopes steeper than 50 percent. Therefore, the anticipated negligible impact from rockfall hazard would be no greater than the negligible level estimated for Alternative I.

The claystone cave and karst system and associated natural arch are located within an existing oil and gas lease with NSO 19 to protect these resources from surface disturbances. Similar protection would be applied to other land uses and management activities under an analogous NGD stipulation. Lands with other SSR/CSU stipulations include areas managed for VRM Class II protection (CSU 5) and areas with slopes greater than 30 percent and erosive soils

(CSU 4). Negligible negative impacts to these resources are expected from ground-disturbing land uses or management actions in this area. The proposed Anvil Points ACEC under Alternative II (Tables 2-2a-d) provide some additional protection. However, the cave and karst system remains vulnerable to damage from unregulated recreation, and the potential for moderate to major impacts remains.

The deferral of leasing and drilling for oil and gas on top of the plateau under Alternative III, BLM's preferred alternative, would not affect the type and extent of impacts to geologic resources. For the purposes of this RMPA/EIS, it is assumed that the total number of wells and other surface facilities would not be affected by the deferral.

4.2.2 Paleontological Resources

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 1998c) 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 will 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 aeolian 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 in the Planning Area would be considered Condition 2.

Impacts to paleontological resources under the five alternatives are described in the following subsections. Some of the impacts may represent an irreversible and irretrievable commitment of natural resources (see Section 4.6).

4.2.2.1 Alternative I

The Condition 1 paleontological unit within existing lease areas consists of the Wasatch Formation and includes the Sharrard Park Paleontological Area (Map 11). Although current data are inadequate to quantify the extent or magnitude of the loss of scientifically significant fossil resources, areas covered by existing NSO, CSU, and LN stipulations would provide protection for the resource. However, because the Sharrard Park Paleontological Area has been specifically identified in public documents, but without the increased policing of the area that would be provided by an SRMA, an increased potential for vandalism and unauthorized fossil collecting may exist. Like CSU stipulations, all lease areas require paleontological surveys and monitoring prior to ground-disturbing activities. This minimizes the potential for moderate and major impacts to paleontological resources and benefits the paleontological resources by actively gathering scientific data.

Much of the paleontologically sensitive Wasatch Formation exists as steep slopes and bases (roughly 20 feet) within the areas of existing leases. NSO restrictions on slopes over 50 percent and in the I-70 viewshed and wildlife seclusion areas under this alternative prevent most ground-disturbing activities, although exception criteria would allow some impacts, especially in the short term. Ongoing negligible to moderate impacts on fossils could occur in the Hubbard Mesa OHV area due to the high density of routes and cross-country travel. Impacts could result not only from direct damage to fossils or to fossil-bearing rocks, but also from unauthorized collection by numerous visitors in an area with considerable bare ground and accelerated erosion.

Condition 1 paleontological units within the no-lease areas of the former NOSRs 1 and 3 consist of exposures of the Wasatch Formation on the east side of the area and the A-B groove of the Parachute Creek Member of the Green River Formation along the Roan Cliffs. The A-B horizon is also exposed in the East Fork Parachute Creek near the southwestern corner of the no-lease area. The paleontological resources of the Condition 1 units are protected from human impacts under Alternative I by the no-lease designation and the inaccessibility provided by the steep slopes where they occur.

4.2.2.2 Alternative II

Impacts under this alterative would be similar to those under Alternative I, except that Alternative II includes the larger extent of NSO stipulations for slopes steeper than 50 percent (i.e., 16,550 versus 8,722 acres). The CSU for the Sharrard Park Paleontological Area applies equally under all alternatives.

Additionally, restricting motorized or mechanized travel to designated routes throughout the Planning Area under this alternative would improve the level of protection compared to current use (Alternative I), especially in the Hubbard Mesa OHV area. Construction of any new routes should be preceded by a paleontological survey to minimize the potential for damaging a high-quality outcrop. The Hubbard Mesa SRMA could also include placement of educational signage to help minimize vandalism, although highlighting the fossil resource of the area could have the opposite effect by encouraging unauthorized collections.

Condition 1 paleontological units of the Wasatch Formation occur on the eastern side of the Northeast Cliffs and Southeast Cliffs wilderness inventory units, while those of the A-B groove of the Parachute Creek Member occur along the western edge of these units and the southwestern corner of the East Fork inventory unit. The WSR designation along East Fork Parachute Creek also adds a level of protection for Condition 1 paleontological resources under this alternative. These resource areas are protected from direct and indirect impacts associated with ground-disturbing activities by NSO stipulations and the inaccessibility from the steep slopes where they occur. However, unless special provisions can be made, the NSO stipulations hinder scientific access to paleontological resources.

Overall, Alternative II is the most restrictive due to the large areas of NSOs coincident with outcrops of Condition 1 units and designation of the Hubbard Mesa SRMA. The result would be negligible to minor impacts to paleontological resources despite greater oil and gas development than under Alternative I. The relatively small amount of land with CSU stipulations provides some additional protection, because CSU areas require a paleontological survey prior to ground-disturbing activities and monitoring during construction. Thus, CSU areas provide opportunities not only to protect the fossil resources but, just as important, to catalog and study them. Designation of the Hubbard Mesa SRMA would minimize impacts of cross-country OHV use by restricting travel to designated routes and otherwise regulating recreational activities.

4.2.2.3 Alternative III – Preferred Alternative

The Sharrard Park Paleontological area would continue to be protected under Alternative III, and all motorized or mechanized travel would be limited to designated routes, except for cross-country travel by snowmobile. The elimination of travel by OHVs would eliminate one of the most potentially serious threats to paleontological resources. This threat would be further minimized by the requirement for a fossil survey prior to ground-disturbing activities, with mitigation as required. Because the Sharrard Park area has been specifically identified in public documents, increased vandalism and illegal fossil collecting is possible.

While Alternative III provides less protection from surface disturbance than Alternatives I or II, it is generally more beneficial for fossil resources because of the large area of CSU stipulations and the accompanying requirement for paleontological clearance surveys. Consequently, Alternative III would have moderate beneficial impacts on fossil resources of the Planning Area.

The deferral of leasing and drilling for oil and gas on top of the plateau under Alternative III would not affect the type and extent of impacts to fossil resources, except to the degree that it could affect the location of wells and other facilities during the 20-year period of analysis. For the purposes of this RMPA/EIS, it is assumed that the total number of wells would not be affected.

4.2.2.4 Alternative IV

The Sharrard Park Paleontological area would continue to be protected under Alternative IV, and motorized or mechanized travel would be limited to designated routes throughout the Planning Area, except for over-snow travel by snowmobile. The restriction to designated routes would eliminate one of the most serious threats to fossil resources. This threat would be further minimized by the requirement for a fossil survey prior to ground-disturbing activities, with mitigation as required. Because the Sharrard Park area has been specifically identified in public documents, increased vandalism and illegal fossil collecting is possible.

While Alternative IV provides less protection from surface disturbance than Alternatives I or II, it is generally more beneficial for fossil resources because of the large area of CSU stipulations and the accompanying requirement for paleontological clearance surveys. Consequently, Alternative IV would have moderate beneficial impacts on fossil resources of the Planning Area.

4.2.2.5 Alternative V

This alternative would also protect the Sharrard Park Paleontological area, and OHV travel would be limited to designated routes throughout the Planning Area (except for over-snow travel by snowmobile). However, not designating the Hubbard Mesa area as an SRMA would reduce the level of restrictions imposed by BLM, such as requiring pre-disturbance fossil inventories and mitigation.

Overall, however, the large area of SSR/CSU stipulations, with the associated requirement for pre-disturbance surveys, would generally benefit paleontological resources more than the large areas of no-lease or NGD/NSO stipulations under Alternatives I and II. As described above, opening more lands to oil and gas is, perhaps ironically, paleontologically beneficial because of the lease requirements for inventorying and monitoring development in Condition 1 areas. This allows for the greatest potential for recovery of paleontological data. Thus, except for potential impacts in the Hubbard Mesa OHV area, the overall effect of Alternative V would be negligible adverse impacts on fossil resources and potentially moderate beneficial impacts.

4.2.2.6 Indirect, Offsite, and Cumulative Impacts

Indirect Impacts

As noted throughout the discussion above, decreasing levels of no-lease and NGD/NSO protection and increasing levels of oil and gas development and SSR/CSU designations from Alternatives I through V result in progressively more beneficial impacts on fossil resources by requiring paleontological surveying, monitoring, and mitigation.

Fossils are of general interest and scientific value only if discovered. Unlike plants and animals, which reside on or near the surface of an area, fossil resources extend throughout the entire volume of underlying fossiliferous rock. Thus, the paleontological value of an area is potentially greater if it is accessible and inventoried, even if subject to greater erosion, than if it is completely off limits to ground-disturbing activities. Certainly some of the most dramatic fossil discoveries throughout the U.S. have been associated with quarries or other construction projects that unearthed the remains of an ancient organism that otherwise would remain hidden.

The lone exception to this generally positive trend among the five alternatives is the lack of an SRMA designation for the Hubbard Mesa OHV area under Alternatives I and V. Keeping this area unregulated could ultimately cause problematic levels of erosion, direct and indirect damage to fossils, and an increase in unauthorized collecting due to increased levels of human activity.

Offsite Impacts

Differing levels of paleontological resource protection or discovery under the five alternatives would not be expected to have demonstrable offsite 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 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.

Cumulative Impacts

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

Introduction

Direct soil impacts of concern in the study area include soil erosion, compaction, mixing of horizons, changes in infiltration from fire, and chemical contamination. Some or all of these impacts can occur from recreation, OHV travel, grazing, range management, fire management, oil and gas development, and ground-disturbing activities associated with rights-of-way such as roads, pipelines, and electric transmission corridors. The physical, biological, and chemical properties of the soils can be impacted and 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 will 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, topsoils have been removed and stockpiled, and subsoils are exposed to rainfall and snowmelt, compared to undisturbed conditions. 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 (see 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, with up to 40 years estimated for full development of the Planning Area, 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 reduces the amount of bare soil and as compaction gradually reduces erosion loss. Runoff and erosion are likely to be greater on roads, although smaller in total area than 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.

Because of the importance of reducing soil loss and protecting sensitive ecological resources on Federal lands in the Planning Area, BLM has established NSO 15 for areas steeper than 50 percent due to the high potential for erosion and the difficulty of rehabilitating these areas. CSU stipulations have been established for areas steeper than 30 percent having soils with a severe or very severe erosion hazard (Map 13). The application of these protective stipulations to the five 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. This conclusion is based on the fact that oil and gas well pads themselves will be level but will have cut-and-fill slopes proportional to the surrounding slope of the land, as well as the use of the NSO and CSU stipulations and selected special mitigation measures to avoid problematic areas and protect sensitive resources. Erosion impacts could be greatest in the areas above the rim due to the small size and limited flows in the headwater reaches of streams. However, these are also the areas with the lowest overall erosion hazard based on soils present, the best vegetation cover, and the most stringent application of protective stipulations. Below the rim, the large areas of soils that are naturally eroding at severe and very severe rates and the large size of the receiving streams (Parachute Creek and the Colorado River) may make sediment transport from oil and gas development indistinguishable from background levels.

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 five 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.

4.2.3.1 Alternative I

This alternative would allow the least amount of oil and gas development on BLM lands in the Planning Area. An area of 44,267 acres would be unavailable for oil and gas leasing, and NSO 15 would protect the soil resource in 8,772 acres containing slopes greater than 50 percent. An additional 6,695 acres with slopes steeper than 30 percent and erosive soils (i.e., in the severe and very severe erosion classes; see Table 3-1) would be protected by CSU 4. Notwithstanding the no-lease and NSO restrictions, an estimated 254 new pads would be developed during the 20-year period of analysis, resulting in 1,151 acres of long-term soil disturbance and 750 acres of temporary disturbance. The combined short- and long-term soil impacts from pads, roads, and pipelines represent 2.6 percent of BLM land in the Planning Area.

Although the limited oil and gas development under Alternative I would have negligible soil impacts overall, impacts would 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. Mitigation measures to minimize these impacts include requirements for salvaging and replacing topsoil.

Alternative I would allow the most unrestricted travel throughout the Planning Area, with cross-country travel permitted throughout the area and no closure of existing routes to motorized or mechanized travel. Based on current levels of OHV use in the Hubbard Mesa area and expected increases in recreational travel throughout the Planning Area, this alternative could result in increasing numbers of pioneered roads, potentially causing major localized direct impacts to soils from physical disturbance and compaction and damage to vegetation. Soil impacts could in turn result in increased sedimentation of streams.

Continuation of grazing rangeland projects (e.g., use of fences and ponds to control or direct livestock use) and administrative solutions (season-of-use revisions, stock level adjustments, pasture exclusions, and utilization stipulations) under this alternative are expected to result in gradual, minor, long-term improvements in soil conditions.

Fire management would be generally the same under all five alternatives. 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 "glazed" surface. Because of higher temperatures and occurrence during less favorable seasons (during summer when vegetation is drought-stressed), uncontrolled wildfires typically have a greater impact than lower-intensity prescribed fires. The latter may be used to manage forest or range health and reduce potential wildfire severity.

Overall, soil impacts under Alternative I would be minor because the limited amount of new oil and gas development and measures to improve range condition would offset the lack of restrictions on cross-country OHV travel.

4.2.3.2 Alternative II

This is the only alternative that would include designation of four ACECs: Magpie Gulch, Anvil Points, East Fork Parachute Creek, and Trapper/Northwater Creek. These ACECs are variously focused on the protection of botanical/ecological, fisheries, or visual resources, which in turn are related to some extent to soil stability and condition. Thus, measures to reduce soil (sediment) transport to streams and riparian corridors, restore areas degraded by livestock or other disturbance, minimize soil erosion in areas with sensitive plants, or avoid visual scars all involve protection of the soil resource to some degree.

Under Alternative II, the amount of no-lease land (i.e., unavailable for oil and gas leasing) would be reduced to 21,382 acres and limited to areas having wilderness character. While the remainder of the area would be open to oil and gas leasing, NGD/NSO 15 stipulation for steep slopes and other NGD stipulations would reduce the amount of surface available for oil and gas development to 21,020 acres. This would include 7,015 acres with SSR/CSU stipulations (including SSR/CSU 4 for slopes greater than 30 percent with erosive soils). The estimated new development on BLM land under this alternative would result in approximately 310 new oil and gas pads, 1,348 acres of long-term disturbance, and 916 acres of short-term disturbance. The combined disturbance area of 2,264 acres represents 3.1 percent of BLM surface or mineral estate in the Planning Area.

In the 7,015 acres of SSR/CSU stipulations and areas with special management designations (ACECs and areas having wilderness character), ground-disturbing activities may be subject to special mitigation measures to further reduce the potential for soil damage or loss in specific locations. Examples 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

Travel management under this alternative would restrict OHV use to designated routes and prohibit cross-country travel, including snowmobiles. This would reduce or halt the expansion of travel routes and the soil impacts resulting from compaction, physical disturbance, and loss of vegetation. A total of 43 miles of existing routes would be closed except to administrative use, and another 43 miles would be closed to all motorized and mechanized use.

Range improvement projects would be limited to administrative actions (reduced stocking rates, pasture exclusions, season-of-use revisions, etc.). This reliance on passive processes to allow recovery of degraded sites is generally not as beneficial as active management, which can often hasten recovery. Thus, implementation of Alternative II could result in less rapid improvements to soils than the other alternatives; however, fewer structures and other anthropogenic (human-caused) features would be evident to detract from relatively pristine areas, or those having wilderness character.

Fire management would be generally the same as described for Alternative I.

Overall, soil impacts under Alternative II would be minor, based on closures and restrictions on cross-country OHV travel and relatively limited oil and gas development. Range improvement, although relying primarily on administrative solutions, would also help offset any new ground-disturbing activities.

4.2.3.3 Alternative III – Preferred Alternative

Unlike Alternatives I and II, Alternatives III, IV and V would make all of the Federal lands in the Planning Area available for oil and gas leasing. However, under Alternative III leasing and drilling on Federal lands atop the plateau would be deferred until at least 80 percent of the total wells anticipated below the rim have been drilled.

Most of the NGD/NSO stipulations applied under Alternative II would also be applied under this alternative, with a combined total area of 30,928 acres having this restriction. Much of the land made available for leasing would be protected by SSR/CSU stipulations (29,594 acres). Permit-level special mitigation (see Alternative II) could be required for specific portions of the ACECs, the Parachute Creek WMA.

The developable areas would allow an estimated 402 new oil and gas pads, resulting in 1,761 acres of long-term and 1,187 acres of temporary soil disturbance (see Table 4-2). The combined soil disturbance of 2,948 acres represents 4.0 percent of lands with BLM surface or mineral estate in the Planning Area. Fortuitously, soils in the additional lands available for oil and gas leasing under Alternative III (compared to the two previous alternatives) tend to have low to moderate erosion hazard and good reclamation potential. Overall, impacts of oil and gas development on soils under Alternative III are expected to be negligible due to the small total area of soil disturbance and implementation of supplemental mitigation in some areas (see discussion under Alternative II).

Travel management would limit OHV use to designated routes throughout the Planning Area, except for over-snow travel by snowmobile. The Hubbard Mesa OHV area would also be designated as an SRMA under this alternative. A total of 24 miles of existing routes would be closed except to administrative use, and an additional 26 miles would be closed to all motorized or mechanized travel. These closures, and especially the prohibition against cross-country travel, would reduce the potential for soil loss associated with OHV-related disturbance.

Both range improvement projects and administrative solutions to address grazing impacts would be implemented under this alternative. The combination of tools to improve range condition is expected to result in more rapid long-term improvement to soil condition than Alternatives I and II but less than Alternative V, which also includes vegetation treatments.

Fire management would be generally the same as described for Alternative I.

Overall, soil impacts under Alternative III would be minor. This conclusion is based on the road closures, prohibition against cross-country OHV travel, and emphasis on range improvement offsetting much of the impact from oil and gas development. Additionally, the deferral of leasing and drilling for oil and gas on top of the plateau under Alternative III would result in a proportionally larger number of wells being below the rim, where more multi-well pads and reduced road lengths would reduce the total impacts.

4.2.3.4 Alternative IV

The major difference between Alternative IV and Alternative III in terms of oil and gas development is that Alternative IV would not defer development on top of the plateau. The NGD/NSO stipulations applied under Alternative III would also be applied under this alternative, with a combined total area of 30,928 acres having this restriction. Much of the land made available for leasing under this alternative would be protected by SSR/CSU stipulations (27,486 acres). These areas, as wells as the ACECs and the Trapper/Northwater Creek WMA, would be subject to permit-level special mitigation (Table 2-3).

The developable areas would allow an estimated 449 new oil and gas pads, resulting in 1,940 acres of long-term and 1,329 acres of short-term soil disturbance. The combined soil disturbance of 3,269 acres represents 4.4 percent of the BLM surface or mineral estate in the Planning Area. Fortuitously, soils in the large area of additional land available for oil and gas leasing under Alternative IV tend to have low to moderate erosion hazard and good reclamation potential. Overall, impacts of oil and gas development on soils under Alternative IV are expected to be minor due to the small total area of soil disturbance and implementation of supplemental mitigation in some areas (see discussion under Alternative II).

Travel management would limit OHV use to designated routes throughout the Planning Area, including the Hubbard Mesa SRMA but excluding over-snow travel by snowmobile. A total of 24 miles of existing routes would be closed except to administrative use, and an additional 26 miles would be closed to all motorized or mechanized travel. These closures, and especially the prohibition against cross-country travel, would reduce the potential for soil loss associated with OHV-related disturbance.

Both range improvement projects and administrative solutions would be implemented to address grazing impacts under this alternative. The combination of tools to improve range condition is expected to result in more rapid long-term improvement to soil condition than Alternatives I and II, but less than Alternative V, which also includes vegetation treatments.

Fire management would be generally the same as described for Alternative I.

Overall, soil impacts under Alternative IV would be minor due to the combination of road closures, prohibition against cross-country OHV travel except within the Hubbard Mesa SRMA, and rangeland improvements offsetting much of the impact from increased oil and gas development.

4.2.3.5 Alternative V

Alternative V would continue to include NGD/NSO stipulations along portions of sensitive streams atop the plateau, but the protected zones would be narrower than under Alternatives II through IV (compare Map 10 with Maps 4, 6, and 8). A narrower area of NGD/NSO stipulations could increase sediment delivery to the streams (see Section 4.2.4). Similarly, areas with SSR/CSU stipulations would also be reduced, giving BLM less area in which it could require that a proposed activity to be shifted by more than 200 meters.

The anticipated number of new oil and gas pads on BLM lands under this alternative is 584. Total surface disturbance during the 20-year analysis period would be 4,211 acres, of which 2,495 acres would be long-term impacts (3.4 percent of the BLM surface or mineral estate).

Travel would be restricted to designated routes, except over-snow travel by snowmobile. The prohibition of cross-country travel would reduce the incidental creation of new routes and thereby minimize the associated soil impacts, especially in comparison to full access for cross-country travel under Alternative I. The Hubbard Mesa OHV area would not be designated an SRMA but would limit travel to designated routes.

Grazing rangeland projects as well as active vegetation treatments would be emphasized to improve range condition under this alternative. These actions are expected to result in more rapid benefit than the other four alternatives for grazing areas that remain free from ground-disturbing activities associated with oil and gas development.

Fire management would be generally the same as described for Alternative I.

Overall, soil impacts under Alternative V are expected to be minor, because the road closures, restriction of travel to designated routes, and more active range improvement would offset much of the impact resulting from increased oil and gas development.

4.2.3.6 Indirect, Offsite, and Cumulative Impacts

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 (Alternative I only), 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.

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. These indirect impacts are discussed in other sections of this RMPA/EIS.

Offsite impacts would mostly be limited to offsite transport of sediments and, to a lesser degree, offsite impacts on air quality. Considering the current conditions of sparse vegetation across much of the lower portion of the Planning Area, naturally high rates of soil erosion that would continue without changes in management and use, stipulations to reduce soil erosion loss, and the naturally high sediment load during high flow in major offsite streams and other receiving waters (including the Colorado River), these offsite impacts are expected to be negligible under all alternatives.

Private lands with private mineral rights in the Planning Area comprise 53,405 acres, with an estimated potential for long-term impacts of 2,168 acres from oil and gas development. This represents 4.1 percent of private land, a higher percentage than Federal lands under the five alternatives (1.6 to 3.4 percent), because it is assumed that resource protection would be less stringent on private lands. The exception would be slopes steeper than 50 percent, which are likely to be avoided on private as well as public lands. Combining the areas of private and Federal minerals yields potential cumulative long-term impacts to soils ranging from 3,319 acres for Alternative I to 4,653 acres for Alternative V during the 20-year period of analysis. These cumulative impact totals range from 2.6 percent to 3.7 percent of the total Planning Area of 127,007 acres.

Cumulative onsite impacts would be minor, because although the proportion of the area disturbed would be increased substantially, the number of affected acres would remain a relatively small percentage of the total area. Cumulative impacts are potentially higher if the substantial portion of total development on private land has less stringent protection in the form of avoidance of problematic areas, protection of sensitive resources, and measures to minimize long-term disturbance. Failure to avoid operations on slopes steeper than 50 percent or to implement other appropriate erosion-control practices could result in moderate cumulative impacts in portions of the Planning Area.

Assessing the potential for cumulative impacts of soil erosion assumes that urbanization of private land 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 of the Planning Area. Nonetheless, the combination of increased roads and access to the Planning Area, continued population growth and resultant increase in off-road recreation, and increasing amounts of long-term disturbance associated with oil and gas development under Alternatives II through V, could result in observable negative impacts on erosion and sediment transport to streams unless applicable mitigation measures are implemented (see Section 2.4).

4.2.4 Water Resources

Introduction

This section evaluates the changes to water resources in the Planning Area from implementation of management actions for each alternative. The potential for each of the alternatives to impair water resources is discussed, as well as mitigation measures if required. The discussions for Alternatives II through V build on the information presented for Alternative I. Indirect, offsite, and cumulative impacts are identified at the end of the section.

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 used in this RMPA/EIS include:

- **None** – Not likely to affect the resource.
- **Negligible** – No detectable or measurable changes to water resource quality or quantity. No exceedance of regulatory standards.
- **Minor** – Degradation of water quality, exceedance of regulatory standards, or discernible change in water quantity could occur but would last less than 48 hours (e.g., in response to a pulsatile event) and limited to the immediate area of the causal activity or discharge.

- **Moderate** – Any degradation of water quality, exceedance of regulatory standards, or discernible change in water quantity would last less than one month and be limited to the general vicinity of the causal activity or discharge.
- **Major** – Water quality would be degraded by an ongoing exceedance of regulatory standards. Changes in water quantity would be long-term and/or widespread.

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 five alternatives. 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 (see Section 4.6). However, the potential for contamination of usable water zones and domestic groundwater, or for 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 1998b). 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.

4.2.4.1 Alternative I

Alternative I would continue present management direction and activities. An estimated 855 new oil and gas wells would be developed on 254 pads, with 1,151 acres of long-term surface disturbance (1.6 percent of BLM lands in the Planning Area). All but ten of these wells would be below the rim in the current "production area" of NOSR 3. Atop the plateau, no oil and gas leasing would be allowed in NOSR 1, but small areas of existing leases in the northwestern and northeastern corners would permit new wells (Figure 1-2). A total of 44,267 acres would be closed to further leasing for oil and gas development (Table 4-1).

Onsite Impacts on Water Quality

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 Alternative I, a 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 roads, and accumulate in streambeds.

In the Planning Area, streams would be protected by setback restrictions and imposition of other special mitigation measures. Nonetheless, construction of well pads, roads, pipelines, and related facilities will 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 portion of the Planning Area available to oil and gas development under Alternative I, 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. Avoidance of, or setbacks from, streams within the Planning Area under continuation of existing NSO and CSU restrictions would reduce sediment delivery rates because of the intervening distance, intervening plant cover, and (in many areas) relatively flat run-out between the toe of slope and stream channel.

Because of the limited amount of potential oil and gas development and continuation of current management for grazing and OHV travel under Alternative I, impacts to water quality as a result of sedimentation are considered minor overall, compared to existing conditions. However, some more severe (moderate) localized impacts could occur under continuation of existing management, particularly in places where roads or pipelines cross drainages and where concentrated livestock grazing or cross-country OHV travel reduce vegetation cover on adjacent slopes.

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

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 typically those 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 (see 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 3-33 (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 Maximum Contamination Levels (MCLs) for drinking water and groundwater by a factor of 10 or more. The reported analyte concentrations presented in Table 3-33 are conservative in relation to actual 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.

Although the potential for new oil and gas development would be limited under Alternative I, 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.

Overall, adverse impacts on surface water quality under Alternative I are expected to be negligible, assuming that the recommended mitigation measures are applied. However, more severe (minor) localized impacts could occur.

Onsite Impacts on 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, recreational potential, the availability of drinking water and water for other uses, and groundwater quality and quantity (EPA 1999). Discernible reductions in flow associated with oil and gas development are not anticipated because of a planned LN (lease notice) requiring that all water used for drilling or other purposes (e.g., dust suppression on roads) be trucked in from outside the drainage basins of the Planning Area.

Some minor additional 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 trivial 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 of 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 1988 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.

Changes to water quantity under Alternative I are considered negligible.

4.2.4.2 Alternative II

Alternative II would increase the amount of oil and gas development, with an estimated 905 wells on 310 pads and an associated 1,348 acres of long-term surface disturbance (1.8 percent of BLM lands in the Planning Area). The increased drilling would be associated with new wells on top of the plateau (87, versus 10 under Alternative I). The three areas having wilderness character would be closed to oil and gas leasing under this alternative, and the WSR-eligible streams and other important resource areas would be protected by NGD/NSO stipulations. Other watershed areas would have SSR/CSU stipulations or be designated as special mitigation areas. The special mitigation measures, which would also be applicable in SSR/CSU areas, could include culverting of stream crossings, use of biodegradable erosion mats in areas of disturbed soil, and enhanced revegetation requirements.

No areas would remain open to cross-country travel, and 86 miles of existing routes would be closed to all motorized or mechanized travel or limited to administrative use. Administrative measures such as stock level adjustments, pasture exclusions, and reduced utilization rates would be used to improve areas not currently meeting land health standards.

Onsite Impacts on Water Quality

Designating East Fork Parachute Creek and Trapper/Northwater Creek ACECs under this alternative would benefit water quality by protecting watershed function and condition in these ecologically, visually, and recreationally important areas. The establishment of NGD/NSO stipulations for WSR-eligible streams and the no-lease designation for areas having wilderness character would further protect the important streams and associated basins atop the plateau. Because these designations and protections are beyond the current levels of protection, Alternative II would have beneficial impacts on water quality.

Sedimentation — Alternative II establishes extensive NGD/NSOs and special mitigation areas to protect the watersheds and associated resources for physical disturbance of stream channels and transport of eroded soils from adjacent slopes. Alternative II also restricts OHV use to designated routes, thereby causing less direct disturbance to soils and damage to vegetation cover during cross-country travel, and includes measures to improve range condition.

Impacts to water quality as a result of sedimentation under Alternative II are considered minor overall due to a combination of the factors described above, mitigation measures to be required throughout the area atop the plateau (e.g., use of culverts for all stream crossings), and supplemental mitigation requirements that may be applied in SSR/CSU and special management areas (e.g., the entire top of the plateau is in a WMA to protect the watersheds for direct and indirectd impacts). Examples of supplemental mitigation measures include use of a biodegradable erosion mat to stabilize disturbed soil and requirements for enhanced revegetation. Thus, while some localized sedimentation impacts could occur, these are expected to be less than under current management (Alternative I).

Chemical Pollution — Additional oil and gas development would increase the likelihood of spills or discharges of contaminated drilling mud, produced water, or other pollutants by approximately 6 percent (based on the number of wells under Alternative II versus Alternative I), although the impacts from such an occurrence would remain the same as under Alternative I. An exception to this generalization is for activities on top of the plateau. Because of the ecological and visual/recreational importance of these streams (many segments of which support genetically pure populations of the Colorado River cutthroat trout), consequences of a spill or other release, such as from a ruptured tanker truck, could be locally catastrophic until remedial measures are implemented and have sufficient time to become effective (e.g., removing contaminated sediment, replanting damaged vegetation, restocking trout killed by physical or chemical trauma).

As in Alternative I, the potential for contamination of usable groundwater zones from oil and gas drilling on BLM lands is considered to be negligible 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 1998b). Groundwater atop the plateau is more abundant but has not been significantly developed for domestic uses due to its depth and the lack of permanent residents.

Overall, adverse impacts on water quality are expected to be negligible, assuming that the recommended mitigation measures are applied. However, more severe (minor) localized impacts could occur.

Onsite Impacts on Water Quantity

Protective measures to be established under this alternative — including extensive areas of NGD/NSOs, SSR/CSUs, and special mitigation requirements — would generally protect water yield as well as water quality. The restriction against using water collected onsite for drilling operations or dust suppression on roads would also be applied under this alternative.

As described for Alternative I, successful enhancement of areas degraded by livestock use could decrease runoff due to increased vegetation cover. However, the result of this impact is generally beneficial, because contributions of runoff as shallow subsurface flow following infiltration into a vegetated hillside occur more gradually and are more protracted, even if actual flow to the stream is reduced. Although minor additional stockponds or water sources for wildlife are possible as management tools, the overall impact of these measures on water quantity would be negligible.

Although Alternative II would result in more oil and gas development atop the plateau than Alternative I, the increase in amount of long-term barren areas associated with roads and well pads would represent only 0.7 percent of the upper area. Therefore, impacts to water quantity are considered negligible under this alternative.

4.2.4.3 Alternative III – Preferred Alternative

Alternative III would allow a higher level of oil and gas development than either Alternatives I or II, with an estimated 1,324 new wells on 402 new pads and an associated 1,761 acres of long-term surface disturbance (2.4 percent of BLM lands in the Planning Area). Of the new wells, 51 would be on top of the plateau. WSR-eligible streams would continue to have NGD/NSO stipulations, but other stream segments and portions of the watershed would have more limited amounts of SSR/CSUs and special mitigation protection. However, special mitigation and other management prescriptions related to protection of streams would be applied throughout the Trapper/Northwater Creek WMA (see Table 2-3).

No areas would be open to cross-country travel, and 50 miles of existing routes would be closed or restricted to administrative use. Livestock management would use a combination of administrative and more active range management tools to reduce grazing impacts and help meet land health standards.

Onsite Impacts on Water Quality

Designating the East Fork Parachute Creek and Trapper/Northwater Creek ACECs under this alternative, including the Trapper/Northwater Creek WMA, would benefit water quality by reducing the potential for adverse impacts in these ecologically, visually, and recreationally important areas. Retention of the WSR-eligible stream segments would also benefit water quality in these stream segments and downstream reaches. .

Sedimentation — Impacts of sedimentation in surface waters as a result of soil erosion are expected to be minor under Alternative III due to the extensive NGD/NSO, SSR/CSU, and special mitigation areas — including the Trapper/Northwater Creek WMA — to protect area streams from ground-disturbing activities and transport of eroded soil. Some localized more severe (moderate) impacts could occur during episodes of severe runoff.

Cross-country OHV travel throuthgout the Planning Area (except for snowmobiles) and active range management measures to improve areas degraded by livestock would help redcue sediment transport associated with these recreation and grazing.

Impacts to water quality as a result of sedimentation under Alternative III are considered minor overall due to a combination of the factors described above, mitigation measures to be required throughout the area atop the plateau (e.g., use of culverts for all stream crossings), and supplemental mitigation requirements that may be applied in SSR/CSU and special management areas (e.g., the WMA). Examples of supplemental mitigation measures include use of a biodegradable erosion mat to stabilize disturbed soil and requirements for enhanced revegetation. Thus, while some localized sedimentation impacts could occur, these are expected to be less than under current management (Alternative I).

Chemical Pollution — Additional oil and gas development would increase the potential for accidental spills or other discharges of contaminated drilling mud or produced water over time, but the impacts from such an occurrence would remain the same as under Alternatives I and II. With 55 percent more wells than Alternative I, the potential for a pollutant spill would increase proportionately but remain low.

In the case of small or one-time discharges of contaminated drilling mud, produced water, or other pollutants, direct adverse impacts are considered minor overall. However, as described for Alternative II, 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).

As in Alternatives I and II, the potential for contamination of usable groundwater zones from oil and gas operations is negligible. This conclusion is based on the requirement that operators isolate and protect usable water zones, the relatively few domestic water wells on or near public lands, and the limited amount of water-bearing zones on public lands below the rim (TRW 1982, BLM 1998b). Although four significant water-bearing zones occur on top of the plateau, these have not been developed for domestic use due to their depth and the lack of permanent residents.

Onsite Impacts on Water Quantity

Under Alternative III, no areas would be closed to oil and gas leasing. However, previously described stipulations and mitigation measures would specifically address protection of aquatic and riparian resources, including large portions of watersheds. These measures would tend to reduce impacts to water quantity as well as to water quality.

Although the greater amount of long-term barren area associated with the road and well pad construction under this alternative would tend to increase runoff and hence water yield, any increases are likely to be imperceptible due to the required setback distance from streams. Furthermore, the amount of long-term surface disturbance represents only 2.4 percent of BLM lands in the Planning Area, of which 1.6 percent would also occur under Alternative I. Overall, therefore, impacts to water quantity under Alternative III are considered negligible.

The deferral of leasing and drilling for oil and gas on top of the plateau under Alternative III would not affect water resources, except to the degree that it affects the location of wells and other facilities during the 20-year period of analysis. For the purposes of this RMPA/EIS, it is assumed that the total number of wells would not be affected.

4.2.4.4 Alternative IV

Alternative IV would allow a higher level of oil and gas development than either Alternatives I or II, with an estimated 1,324 new wells on 449 new pads and an associated 1,940 acres of long-term surface disturbance (2.6 percent of BLM lands in the Planning Area). Of the new wells, 168 would be on top of the plateau. WSR-eligible streams would continue to have NGD/NSO stipulations, but other stream segments and portions of the watershed would have a more limited area of SSR/CSUs protection. However, special mitigation and other management prescriptions related to protection of streams could be applied throughout the Trapper/Northwater Creek WMA (see Table 2-3).

No areas would be open to cross-country travel, and 50 miles of existing routes would be closed or restricted to administrative use. Livestock management would use a combination of administrative and more active range management tools to reduce grazing impacts and help meet land health standards.

Onsite Impacts on Water Quality

Designating the East Fork Parachute Creek and Trapper/Northwater Creek ACECs under this alternative, including the Trapper/Northwater Creek WMA, would benefit water quality by reducing the potential for adverse impacts in these ecologically, visually, and recreationally important areas. Retention of the WSR-eligible stream segments would also benefit water quality in these stream segments and downstream reaches. .

Sedimentation — Impacts of sedimentation in surface waters as a result of soil erosion is expected to be minor under Alternative IV due to the extensive NGD/NSO, SSR/CSU, and special mitigation designations — including the Trapper/Northwater Creek WMA — to protect area streams from ground-disturbing activities and transport of eroded soil. However, some localized more severe (moderate) impacts could occur during episodes of severe runoff.

Cross-country OHV travel would be restricted to the Hubbard Mesa area, and active range management measures would be implemented to improve areas degraded by livestock.

Impacts to water quality as a result of sedimentation under Alternative III are considered minor overall due to a combination of the factors described above, mitigation measures to be required throughout the area atop the plateau (e.g., use of culverts for all stream crossings), and supplemental mitigation requirements that may be applied in SSR/CSU and special management areas (e.g., the WSR areas). Examples of supplemental mitigation measures include use of a biodegradable erosion mat to stabilize disturbed soil and requirements for enhanced revegetation. Thus, while some localized sedimentation impacts could occur, these are expected to be less than under current management (Alternative I).

Chemical Pollution — Additional oil and gas development would increase the potential for accidental spills or other discharges of contaminated drilling mud or produced water over time, but the impacts from such an occurrence would remain the same as under Alternatives I through III. With 55 percent more wells than Alternative I, the potential for a pollutant spill would increase proportionately but remain low.

In the case of small or one-time discharges of contaminated drilling mud, produced water, or other pollutants, direct adverse impacts are considered minor overall. However, as described for Alternatives II and III, 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).

As in the previous alternatives, the potential for contamination of usable groundwater zones from oil and gas operations is negligible. This conclusion is based on the requirement that operators isolate and protect usable water zones, the relatively few domestic water wells on or near public lands, and the limited amount of water-bearing zones on public lands below the rim (TRW 1982, BLM 1998b). Although four significant water-bearing zones occur on top of the plateau, these have not been developed for domestic use due to their depth and the lack of permanent residents.

Onsite Impacts on Water Quantity

Under Alternative IV, no areas would be closed to oil and gas leasing. However, previously described stipulations and mitigation measures would specifically address protection of aquatic and riparian resources, including large portions of watersheds. These measures would tend to reduce impacts to water quantity as well as to water quality.

Although the greater amount of long-term barren area associated with the road and well pad construction under this alternative would tend to increase runoff and hence water yield, any increases are likely to be imperceptible due to the required setback distances from streams. Furthermore, the amount of long-term surface disturbance represents only 2.6 percent of BLM lands in the Planning Area, of which 1.6 percent would also occur under Alternative I. Overall, therefore, impacts to water quantity under Alternative IV are considered negligible.

4.2.4.5 Alternative V

Alternative V would allow the highest degree of oil and gas development of the five alternatives analyzed, with an estimated 1,582 wells on 584 pads and 2,495 acres of long-term surface disturbance (3.4 percent of BLM lands the Planning Area). Of this total, 234 wells would be on top of the plateau. No special resource use or management designations focused on protecting water resources or associated values are included, except for an NGD/NSO stipulation for stream segments designated as WSR-eligible under Alternatives II through IV (but without the actual designation) and some areas of SSR/CSU on lower sideslopes along these and other stream segments.

OHV travel would be limited to designated routes throughout the Planning Area, but no existing routes would be closed. Livestock management would emphasize land treatments and rangeland management to improve areas degraded by grazing.

Onsite Impacts on Water Quality

The reduced level of protection for streams and watersheds compared to Alternatives II through IV would be expected to increase the potential for adverse impacts on water quality. However, the retained stipulations are sufficient to protect most of the significant streams from impacts associated with ground-disturbing activities on adjacent hillsides of the watershed. Use of some of the key mitigation measures proposed for Alternatives II through IV (including a requirement for culverted road crossings and use of a biodegradable erosion mat and enhanced revegetation in areas of erodible soil) would further reduce the impact potential.

Chemical Pollution — Because of the higher degree of oil and gas development, this alternative would increase the potential for an accidental spill or other discharge of contaminated drilling mud, produced water, or other pollutant. Based on the number of anticipated wells, the risk of a pollutant release is approximately 85 percent greater than for Alternative I, although still low. Actual impacts from such an occurrence remain the same for the other alternatives.

While overall impacts from a small or one-time discharge of a chemical pollutant would be negligible, the localized impacts at and downstream from the discharge could be major, depending on the chemical's volume, release rate, toxicity, and dispersal characteristics and the volume and velocity, channel morphology, and other characteristics of the receiving stream. Requiring a culvert at all stream crossing points would reduce this hazard by creating a safer condition for trucks.

As in the previous alternatives, the potential for contamination of usable groundwater zones from oil and gas development is negligible based on the requirement that operators isolate and protect usable water zones, the relatively few domestic water wells on or near public lands, and the limited amount of water-bearing zones on public lands below the rim (TRW 1982, BLM 1998b). While water-bearing zones are present on top of the plateau, they have not been developed due to their depth and the lack of permanent residents.

Sedimentation — The combination of increased roads and access to the Planning Area, increased population and the resulting increase in off-road recreation, and the significant increase in long-term disturbed areas is likely to have observable, direct, and adverse impacts on sediment delivered to surface streams under this alternative.

Offsetting this to some extent is the more aggressive range improvement under Alternative V and the restriction of OHV travel to designated routes throughout the Planning Area. Nonetheless, the smaller areas of NGD/NSO and SSR/CSU stipulations and other special resource management designations and the increased area of long-term disturbance are expected to result in moderate impacts from sedimentation rather than minor impacts as under the previous alternatives discussed. More severe (major) localized impacts could also occur, with potentially more such events due to the greater amount of oil and gas development.

Onsite Impacts on Water Quantity

Under Alternative V, no lands would be closed to oil and gas leasing. NGD/NSO and SSR/CSU stipulations would be applied to smaller areas than under the other alternatives, and no areas would be designated for special management. However, management objectives for this and the other alternatives include a provision for BLM to meet all land health standards. This includes a requirement that all water bodies achieve the quality standards set by the State of Colorado.

While this standard does not address water quantity specifically, management activities to reduce sedimentation and maintain healthy vegetation and/or riparian habitat to help meet this goal will indirectly aid in maintaining water yield. Areas of good vegetation cover are typically characterized by retardation of overland flow and infiltration of precipitation, resulting in a more protracted surface and subsurface contribution to streams than the flashy runoff of more barren areas. Although the greater amount of long-term barren area associated with the road and well pad construction under this alternative would tend to increase runoff and hence water yield, any increases are likely to be imperceptible due to the required setback distance from streams and the fact that the long-term disturbance represents only 3.4 percent of BLM lands in the Planning Area (of which 1.6 percent would also occur under Alternative I).

Based on these considerations, and assuming that the mitigation measures precluding use of onsite surface water for drilling or dust suppression purposes, impacts to water quantity under this alternative are considered negligible.

4.2.4.6 Indirect, Offsite, and Cumulative Impacts

Indirect Impacts

Indirect impacts on 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 would lead to 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.

None of the anticipated land uses or management activities under the five alternatives is expected to reduce water quantity, particularly in light of restrictions against using water collected onsite for dust suppression or other applications in oil and gas development. As described previously, oil and gas activities throughout BLM portions of the Planning Area would operate as self-contained operations that use offsite water rather than onsite surface water or shallow groundwater. Some additional stockponds could be built under any of the alternatives, but the amount of depletion from evaporation or consumption by livestock or wildlife would probably be negligible on a sitewide scale. Consequently, reduced flows probably would not occur, thereby avoiding the potential for increased concentrations of suspended solids, dissolved solids, and metals or other chemical constituents that affect water quality.

Under Alternative I, present land management activities would mostly be retained. However, increased use of the Planning Area for a variety of purposes that may have indirect impacts on streams, including OHV travel, has the potential to increase surface runoff and sediment delivery rates without the benefit of some of the protective stipulations and mitigation measures under Alternatives II through V. Therefore, minor indirect impacts to stream channels would be likely even for the No Action alternative.

Under Alternatives II through V, surface runoff and sediment delivery to streams would be addressed by a variety of NGD, SSR, restrictions on cross-country recreational travel, and (in some areas) special mitigation and range improvement measures. Therefore, likely indirect impacts to stream channels under these alternatives are considered negligible or, if minor, less than for Alternative I.

Under Alternative V, reduced no-lease areas, reduced extent of NGD/NSO and SSR/CSU stipulations, and no special management designations, combined with the larger area of long-term surface disturbance, create increased potential for indirect impacts to streams, especially in areas of currently unstable channels. However, proper placement of well pads, roads, and pipelines, and satisfactory implementation of measures to stabilize and revegetate areas of temporary disturbance are expected to keep indirect impacts to streams at a minor level.

Offsite Impacts

Offsite impacts to water resources include transport of sediments or contaminants through surface runoff or stream flow to downgradient receptors, including Parachute Creek and the Colorado River. The impact of sediments and chemical pollutants in offsite streams, lakes, or ponds from land use and management activities in the Planning Area is expected to be negligible compared to the various land uses and management actions in the offsite areas. The exception to this generalization would be if a chemical pollutant were discharged 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.

Cumulative Impacts

Cumulative impacts include impacts from other projects occurring onsite or offsite that, when combined with impacts from activities regulated by BLM in the Planning Area, represent a different level of impact than indicated by only the site-specific analysis. Regarding water resources, cumulative effects include urbanization of private lands in and near the Planning Area. Urbanization typically increases impervious surfaces, thereby increasing surface runoff and potentially increasing sediments and contaminants in local surface waters. Urbanization of private land is anticipated to continue at current rates and has the potential to disturb larger areas than the projected oil and gas development.

4.2.5 Climate and Air Quality

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 five 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.

This section of the RMPA/EIS is predicated on conservative assumptions and information available at the time of the analysis. Additional information, including comments from the public, may result in changes in the analysis presented in the Final RMPA/EIS. Where specific data or procedures were not available, appropriate assumptions were incorporated. For example, the far-field ("regional") air quality impact assessment of Alternative V assumed that an additional 3,055 wells would go into production (no "dry holes") within 20 years, then operate at full production (no "shut-ins").

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 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 2004).

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 five alternatives used 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 conservatively to 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 unreasonable results — i.e., beyond conservative to a level that is 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.

Impacts Common to All Alternatives (Near-Field Analysis)

Results of the near-field air quality analysis are presented in the following section. A more detailed description of the near-field modeling methodology and results is presented in the Air Quality Technical Support Document (TSD) (Trinity 2004). 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 2004). 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 2004). The input and output files for the post-processing are provided on CD in Appendix F of the TSD (Trinity 2004).

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.

Modeling Methodology. The following describes the methodology used for conducting the near-field dispersion modeling for the Planning Area air quality analysis, as performed by the BLM's National Science and Technology Center. 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 2004). Appropriate operating parameters were used for each source, and were in all cases, unless otherwise stated, the same as those used in the CALPUFF modeling performed by Trinity.

Only the following sources were included in the near-field modeling (inventory and RFD sources are not included in the near-field analysis):

- 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.
- A total of 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 2004).

Model receptors (points at which the model estimates concentrations) were placed according to the scheme outlined in Table 4-5 below. 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 Spacing for Near-Field Modeling

Pollutant(s)	Source Type(s)	Receptor Ranges (m)	Receptor Spacing (m)
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. The following paragraphs present the results of the ISCST3 near-field modeling for Glenwood Springs.

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 32.5 µg/m^3 (1-hour) and 11.8 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 8,032 µg/m^3 (1-hour) and 4,456 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. To address the concerns of some stakeholders and cooperating agencies, the modeling analysis for particulate matter (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 2004) 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 11.0 µg/m^3 (24-hour) and 1.9 µg/m^3 (annual). When background concentrations were added (54 µg/m^3 [24-hour]; 24 µg/m^3 [annual]), the total concentrations were 65 µg/m^3 for the 24-hour average and 26 µg/m^3 for the annual average. These concentrations are well below the applicable Colorado and National AAQS of 150 µg/m^3 (24-hour) and 50 µg/m^3 (annual).

  For all sources (well pads [construction, traffic], compressors, roads), the maximum modeled potential PM$_{10}$ concentrations were 7.2 µg/m^3 (24-hour) and 0.8 µg/m^3 (annual). When background concentrations were added (54 µg/m^3 [24-hour]; 24 µg/m^3 [annual]), the total concentrations were 61 µg/m^3 for the 24-hour average and 25 µg/m^3 for the annual average. These concentrations are well below the applicable Colorado and National AAQS of 150 µg/m^3 (24-hour) and 50 µg/m^3 (annual).

- **$PM_{2.5}$** – For the road-only analysis, the maximum modeled potential $PM_{2.5}$ concentrations were 1.7 µg/m^3 (24-hour) and 0.29 µg/m^3 (annual). When background concentrations were added (19 µg/m^3 [24-hour]; 7 µg/m^3 [annual]), the total concentrations were 21 µg/m^3 for the 24-hour average and 7.3 µg/m^3 for the annual average. These concentrations are well below the proposed National AAQS for $PM_{2.5}$ of 65 µg/m^3 (24-hour) and 15 µg/m^3 (annual).

  For all sources (well pads [construction, traffic], compressors, road), the maximum modeled potential $PM_{2.5}$ concentrations were 1.1 µg/m^3 (24-hour) and 0.13 µg/m^3 (annual). When background concentrations were added (19 µg/m^3 [24-hour]; 7 µg/m^3 [annual]), the total concentrations were 20 µg/m^3 for the 24-hour average and 7.1 µg/m^3 for the annual average. These concentrations are well below the proposed National AAQS of 65 µg/m^3 (24-hour) and 15 µg/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 µg/m^3 (3-hour), 39 µg/m^3 (24-hour), and 11 µg/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 µg/m^3, as well as the NAAQS of 365 µg/m^3 and 80 µg/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 5.4 µg/m^3. When this value is added to the assumed representative background concentration (34 µg/m^3), the resulting predicted maximum total impact is 39.4 µg/m^3, which is also below the applicable Colorado and National AAQS of 100 µg/m^3 (annual).

Hazardous Air Pollutants (HAPs). The following section describes the results of the near-field modeling for hazardous air pollutants. Maximum HAPs impacts during operations were predicted for the hypothetical arrangement of sources as described above. The emissions sources include 6 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 and/or EPA Reference Concentrations (RfCs). These thresholds are presented in Table 4-6. The results of the modeling follow the table.

The results of the near-field HAPs modeling show that the annual benzene concentration (12.1 µg/m^3) and the annual formaldehyde concentration (0.086 µg/m^3) exceed the low end of the range of acceptable air concentration limits (AACLs).

Because one or more of the AACLs or reference concentrations (RfCs) were exceeded, an incremental cancer risk analysis was performed for the two carcinogenic compounds emitted from the proposed sources modeled.

Table 4-6. Summary of Hazardous Air Pollutant Levels

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 DEQ Toxic Screening Level[2]
-	-	-	140 (24-hour)	-	-	North Dakota Department of Health, Division of Environmental Engineering, 33-15-02 or Air Toxics Policy
13 - 45[3] (annual)	-	8[3] (annual)	-	-	-	EPA IRIS Database 1/10,000 (1 x 10^{-4}) Risk Level
-	1,000 (24-hour)	-	1.0 (24-hour)	400 (24-hour)	100 (24-hour)	EPA IRIS Database RfC[1]

[1] *EPA's Integrated Risk Information System (IRIS) contains information on reference concentration for chronic inhalation exposure (RfC)(EPA 1997, per Trinity 2003a).*

[2] *The Toxic Screening Level (TSL) for Utah can be found in Utah Administrative Code R307-401(1)(d).*

[3] *The range of values shown here represents the air unit risk of 1 in 10,000 (1 x 10^{-4}) taken from EPA's IRIS database.*

Two estimates of cancer risk were made: one that corresponds to a most likely exposure (MLE) condition, and one reflective of the maximally exposed individual (MEI). The estimated cancer risks were adjusted to account for duration of exposure and time spent at 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 x10^{-4} (2.0 x 10^{-5} to 5.6 x 10^{-6} and 2.4 x 10^{-7}, respectively). Under the MEI analysis, the individual cancer risks for benzene (2.7 x 10^{-5} to 7.6 x 10^{-6}) and formaldehyde (3.4 x 10^{-7}) and the total cancer risk for the inhalation pathway (2.7 x 10^{-5} to 7.9 x 10^{-6}) fall toward the lower end of the threshold range of presumptively acceptable risks of 1.0 x 10^{-6} to 1.0 x 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 National AAQS. Detailed results are presented in the Technical Support Document.

Far-Field Analysis

Results of air quality analysis for each alternative are presented the following sections. Detailed modeling results, including the location and date of each maximum impact, are provided in the TSD (Trinity 2004). 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.

Modeling Methodology. The following describes the methodology used for conducting the far-field dispersion modeling for the Planning Area air quality analysis, as performed by Trinity Consultants and BLM National Science and Technology Air Quality (NSTC-AQ) staff.

This modeling analysis followed a general modeling procedure used in previous NEPA assessments and Clean Air Act New Source Review (NSR) permit applications and, specifically, the modeling protocol and subsequent addendum developed for this project (Trinity 2003a, b). 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 and temperature 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 National AAQS and 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 2004), 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 (Trinity 2004) 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 2004) 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).

Table 4-7. Background Criteria Air Pollutant Concentrations for GSRA

Pollutant	Annual (μg/m^3)	24-Hour (μg/m^3)	8-Hour (μg/m^3)	3-Hour (μg/m^3)	1-Hour (μg/m^3)	Monitoring Station Location Description
PM$_{10}$	24	54	-	-	-	Rifle, Garfield Co (1998-2000 data collected by CDPHE) [1]
PM$_{2.5}$	7	19	-	-	-	Grand Junction, Mesa Co. (1999-2001 data collected by CPHE) [1]
NO$_2$ [2]	34	-	-	-	-	Woodmen and Colorado College stations, Colorado Springs, El Paso Co. (1998-2000 data) [1]
CO [3]	-	-	4,444	-	8,000	Grand Junction, Mesa Co. (Average of 1999-2001) [1]
SO$_2$ [4]	11	39	-	110	-	Colorado College, Colorado Springs, El Paso Co. (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] *The NO$_2$ concentration recommended by CDPHE is originally stated in 0.018 ppm, annual average (Chick 2002, per Trinity 2003a).*

[3] *The 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] *The 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. Recommended Hazardous Air Pollutant Background Concentrations

Agency	Benzene	Ethylbenzene	Formaldehyde	Toluene	Xylenes
Annual Mean (ppbv) [1]	0.90	0.84	5.78	3.70	3.63 [2]
24-hour Maximum (ppbv)	2.72	10.68	14.00	33.26	43.66 [2]
Annual Mean (μg/m^3)	2.87	3.65	7.11	13.95	15.75
24-hour Maximum (μg/m^3)	8.68	46.35	17.22	125.39	189.48

[1] *ppbv = parts per billion, by volume*

[2] *The xylene concentration represents the sum of m,p-xylene and o-xylene.*

4.2.5.1 Alternative I

The following subsections present the CALPUFF modeling results for Alternative I for criteria pollutants (NAAQS and PSD increments), HAPs, visibility, deposition, and Acid Neutralizing Capacity (ANC) from BLM sources only.

Criteria Pollutants

The modeling results show no exceedances of the NAAQS for any pollutant, nor were any potential concentrations predicted that could exceed the Class I or Class II increments for BLM sources only.

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 μg/m^3) and formaldehyde (7.14 μg/m^3) as well as the 24-hour concentration for xylenes (189.5 μg/m^3) exceed their respective AACLs. BLM sources contribute, at most, 0.6% to these concentrations, meaning that at least 99.4% percent are due to assumed background concentrations. The background HAPs concentrations provided by CDPHE represent monitored urban concentrations and likely are overestimates of existing conditions in the Glenwood Springs area.

Because one or more of the AACLs/RfCs was exceeded (when background concentrations are included), an incremental cancer risk analysis was performed for benzene and formaldehyde emitted from the proposed sources modeled (xylenes are not considered carcinogenic). Two estimates of cancer risk were made: one that corresponds to a most likely exposure (MLE) condition and one that reflects the maximally exposed individual (MEI). The estimated cancer risks were adjusted to account for duration of exposure and time spent at home. Background concentrations are not included in the concentrations used for risk assessment calculations because only the incremental cancer risk due to BLM sources is the focus of this portion of the analysis.

Under the MLE scenario, the range of estimated individual cancer risks associated with long-term exposure to benzene from BLM GSRA sources only is 1.8×10^{-10} to 6.5×10^{-10}. For formaldehyde, the MLE risk is 9.3×10^{-8}. All of these values are well below the lower end of the threshold range (1×10^{-4} to 1×10^{-6}) of presumptively acceptable risks (EPA 1998).

Under the MEI analysis, the range of individual cancer risks for benzene is 2.5×10^{-10} to 8.9×10^{-10}. For formaldehyde, the MEI risk is 1.3×10^{-7}. These values are also well below the lower end of the threshold range of presumptively acceptable risks. Therefore, these very low estimated risk values pose no concern for residents.

It should be noted that these risk calculations are based on the maximum modeled concentration found anywhere in the vicinity of the hypothetical arrangement of sources. It is unlikely that an individual is residing at this exact location for the entire length of time assumed in the calculations. 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 actual risks to residents likely being lower.

Visibility

Screening-Level Analysis. Since the proposed emissions constitute many small sources spread over a very large area, discrete visible plumes are not likely to impact PSD Class I or other wilderness areas, but the potential for cumulative visibility impacts (increased regional haze) is a concern. Regional haze (visibility) degradation is caused by fine particles and gases scattering and absorbing light. Changes to regional haze are measured in terms of perceptible visibility (1.0 deciview [dv]) differences from existing ambient background conditions.

Visibility can be affected by plume impairment (heterogeneous) or regional haze (homogeneous). Given the dispersed nature of potential emission sources, and because the GSFO area is not within 10 kilometers (6.2 miles) of any mandatory Federal Class I area, plume impairment will not be a factor. Since the potential air pollutant emission sources constitute many small sources spread over a very large area, discrete visible plumes are not likely to impact the distant sensitive areas.

Regional haze occurs at distances where air pollutants have become dispersed into the atmosphere, with no definable plume. The primary causes of regional haze are secondary sulfate and nitrate particulate matter (typically as ammonium salts), which are formed from SO_2 and NO_x gases through chemical transformation in the atmosphere. These reactions take time, such that near a source little NO_x or SO_2 will have formed nitrate or sulfate, whereas far from a source nearly all SO_2 will have formed SO_4 and much of the NO_x will have formed NO_3. A lesser contributor to regional haze is primary inhalable (PM_{10}) particulate matter emissions. This analysis consists of sources that do not have a defined location.

In addition, implementation of the Clean Air Act (including the determination of "visual impacts of plumes from present and future coal-fired power plants in the coalbed methane [natural gas] emphasis area") has been delegated to applicable local, State, and Tribal air quality regulatory agencies (with EPA oversight). The regulatory agencies will be able to determine the visual impact of the plume from individual emission sources during the new source review process. Therefore, this analysis does not evaluate the near-field visibility impact of the sources at the resource planning stage.

Potential changes to regional haze are calculated in terms of a perceptible or "just noticeable" change (1.0 dv) in visibility when compared to background conditions. A 1.0-dv change is considered potentially significant in mandatory Federal PSD Class I areas as described in the EPA Regional Haze Regulations (EPA 1999) and originally presented in Pitchford and Malm (1994). A 1.0-dv change corresponds to a 10-percent change in the extinction coefficient and a 2- to 5-percent change in contrast (for black target against a clear sky at the most optically sensitive distance from an observer). This represents a small but noticeable change in haziness under most circumstances when viewing in mandatory Federal Class I areas.

The screening-level analysis procedure for visibility is to follow the recommendations in the FLAG (2000) guideline document. Specifically, this analysis compares daily modeled primary (PM_{10}) and secondary (sulfate and nitrate) particulate matter concentrations to "natural" background conditions and seasonal relative humidity [f(RH)] values. From this comparison, a potential change in visibility is calculated. FLAG has identified a 0.5-dv (5-percent change in extinction) threshold as the "Limit of Acceptable Change" (LAC) for single-source impacts and a 1.0-dv (10-percent change in extinction) threshold for cumulative impacts.

The results of the screening visibility analysis for Alternative I as performed by Trinity (2004) are shown in Table 4-9. The results indicate that operations of proposed GSRA BLM sources do not result in a perceptible (1.0-dv reduction) impact on visibility at any of the PSD Class I Wilderness Areas under Alternative I.

In addition, the USFS and other members of the stakeholders group requested that a separate analysis be completed, comparing the screening visibility results to the USFS 0.5-dv Limit of Acceptable Change threshold to evaluate potential significant visibility impacts at the PSD Class I Areas. The results of this analysis may be found in the TSD (Trinity 2004). BLM performed the analysis of potential visibility impacts at the 0.5-dv level at the request of the USFS and other stakeholders, not based on any legal requirement, and any predicted visibility impacts below the 1.0-dv "just noticeable change" threshold would not be perceptible.

This screening-level regional haze analysis was conducted using conservative assumptions (as is the case with any sort of screening analysis) regarding emissions, plume transport time, humidity, and the conversion of NO_x to ammonium nitrate. It was assumed that 75 percent of the NO_x would convert to NO_2 and that all the NO_2 would convert to nitrate particles. In all likelihood, the amount of NO_x that converts to ammonium nitrate particles would be less. Even using these "reasonable, but conservative" analysis assumptions in the analyses, no perceptible visibility impact (>1.0-dv reduction) would occur at any Class I areas.

Table 4-9. Results of Screening-Level Visibility Analysis for Alternatives I through V
(BLM Sources Only, Glenwood Springs, CO Resource Areas)

PSD Class	Name of Class I or Class II Area	Days >1.0 Deciview Change	
		Screening-Level Modeling	
		Minimum	Maximum
I	Black Canyon of the Gunnison National Park	0	0
I	Eagle's Nest Wilderness	0	0
I	Flat Tops Wilderness	0	0
I	La Garita Wilderness	0	0
I	Maroon Bells-Snowmass Wilderness	0	0
I	Mt. Zirkel Wilderness	0	0
I	Rawah Wilderness	0	0
I	Weminuche Wilderness	0	0
I	West Elk Wilderness	0	0
II	Colorado National Monument	0	0
II	Dinosaur National Monument	0	0
II	Holy Cross Wilderness	0	0
II	Hunter-Frying Pan Wilderness	0	0
II	Raggeds Wilderness	0	0

Table 4-9 also presents screening visibility results for a number of Class II areas. These areas were added at the request of various members of the stakeholder group and are presented for disclosure purposes only. These Class II areas have no visibility protection under State or Federal law at this time and hence are not required to be included in the visibility analysis. However, inclusion in the analysis provides the BLM decision maker with a more complete picture of potential impacts throughout the region.

Because the results of the screening visibility analysis showed no potential impacts above the 1.0-dv level due to GSRA BLM sources only, no refined visibility analysis was conducted for Alternative I.

Deposition

All calculated potential values of sulfur and nitrogen deposition from 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.

Acid Neutralizing Capacity

Where background lake chemistry data were available, an analysis of potential changes to Acid Neutralizing Capacity (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 above 25 microequivalents 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 all lakes considered in the modeling analysis are well below their respective levels of concern for GSRA sources only.

4.2.5.2 Alternative II

The following subsections present the CALPUFF modeling results for Alternative II for criteria pollutants (NAAQS and PSD increments), HAPs, visibility, deposition, and ANC from BLM sources only.

Criteria Pollutants

As with Alternative I, the modeling results show no exceedances of the NAAQS for any pollutant, nor were any potential concentrations predicted that could exceed the Class I or Class II increments for BLM sources only.

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. However, when background concentrations are included, the annual concentrations for benzene (2.87 $\mu g/m^3$) and formaldehyde (7.14 $\mu g/m^3$) as well as the 24-hour concentration for xylenes (189.5 $\mu g/m^3$) exceed their respective AACLs. As with Alternative I, 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 show a risk value of 9.3×10^{-8}. All of the 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 1.3×10^{-7}. These risks values are also below the range of presumptively acceptable risks.

As described previously, the risk calculations are based on the maximum modeled concentration found anywhere in the vicinity of the hypothetically located sources; the calculated risk values should be viewed as an upper boundary on the range of possible risks associated with far-field impacts, with actual risks likely being lower.

Screening-Level Analysis. Results of the screening visibility analysis for Alternative II are the same as for Alternative I (Table 4-9). These indicate that operations of proposed GSRA BLM sources would not result in a perceptible visibility impact (1.0-dv reduction) at any of the PSD Class I Wilderness Areas analyzed. Results using the 0.5-dv threshold requested by USFS are provided in the TSD (Trinity 2004). As noted previously, Class II areas have no visibility protection under State or Federal law at this time, but selected areas 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 kg/ha/yr for total sulfur and 5 kg/ha/yr for total nitrogen. Methods are as described previously.

Acid Neutralizing Capacity

Results of this analysis indicate that impacts to all lakes considered in the modeling would be well below the thresholds of 10-percent change for lakes with background ANC values equal to or above 25 µeq/L, or a total change of less than 1.0 µeq/L for lakes below 25 µeq/L.

4.2.5.3 Alternative III – Preferred Alternative

The following subsections present the CALPUFF modeling results for Alternative III for criteria pollutants (NAAQS and PSD increments), HAPs, visibility, deposition, and ANC from BLM sources only. Note that the modeling and data analyses for this alternative do not reflect the proposed deferral of leasing for oil and gas on top of the plateau. As described previously, this would result in no oil and gas activities above the rim until 80 percent of the anticipated wells below the rim have been drilled. The deferral would result in a higher percentage of wells below the rim.

The modeling results and analyses described below for Alternative III conservatively used the same distribution of wells — i.e., above versus below the rim — as for Alternative IV, which has the same number of wells, area available for oil and gas development, and annual drilling rate but without the deferral. Thus, the projected air quality impacts are the same for Alternatives III and IV, while in reality the deferral is expected to lead to less impact. This is because the higher proportion of wells below the rim under Alternative III results in more multi-well pads and hence fewer pads, fewer miles of new or widened roads, and fewer vehicular trips for the same number of wells.

Criteria Pollutants

Results of the modeling show no exceedances of the NAAQS for any pollutant, nor would any predicted potential concentrations exceed the Class I or Class II increments for emissions from BLM sources.

Hazardous Air Pollutants

As with the previous alternatives, the modeled concentrations, excluding background concentrations, showed no values that exceeded the low end of the range of the AACLs/RfCs for BLM sources. However, when background concentrations are included, the annual concentrations for benzene (2.87 µg/m^3) and formaldehyde (7.15 µg/m^3) as well as the 24-hour concentration for xylenes (189.5 µg/m^3) exceed their respective AACLs. BLM sources contribute, at most, 0.5%; at least 99.5% percent of these concentrations are due to assumed background concentrations. Background HAPs concentrations provided by CDPHE represent monitored urban concentrations and likely are overestimates of existing conditions in the Glenwood Springs area.

Using the MLE scenario, an incremental cancer risk analysis for BLM sources yielded individual risks associated with long-term exposure of 1.8×10^{-10} to 6.5×10^{-10} for benzene, while the formaldehyde individual long-term risk was 1.0×10^{-7}. All of these risks are well below the EPA (1998) range of presumptively acceptable risks of 1×10^{-4} to 1×10^{-6}. (Xylenes are not considered carcinogenic).

Using the MEI analysis, the individual cancer risks for benzene were 2.5×10^{-10} to 8.9×10^{-10}, while the formaldehyde individual risk was 1.4×10^{-7}. These values are also below the lower end of the range of presumptively acceptable risks.

Visibility

Screening-Level Analysis. The results of the visibility analysis for Alternative III are the same as those for Alternatives I and II (Table 4-9). These indicate that potential BLM sources would result in no perceptible visibility impact (1.0-dv reduction) at any of the PSD Class I Wilderness Areas. Results using the USFS 0.5-dv threshold are presented in the TSD (Trinity 2004). Again, note that inclusion of sensitive Class II areas in the analysis is not required but is intended to provide decision-makers with a more complete picture of potential regional impacts. Therefore, no refined visibility analysis was conducted.

Deposition

All calculated potential values of sulfur and nitrogen deposition for BLM sources were well below the applicable thresholds of 3 kg/ha/yr for total sulfur and 5 kg/ha/yr for total nitrogen.

Acid Neutralizing Capacity

Results of this analysis indicate that impacts to all lakes considered in the modeling would be well below the thresholds of 10-percent change for lakes with background ANC values equal to or above 25 µeq/L, or a total change of less than 1.0 µeq/L for lakes below 25 µeq/L.

4.2.5.4 Alternative IV

The following subsections present the CALPUFF modeling results for Alternative IV for criteria pollutants (NAAQS and PSD increments), HAPs, visibility, deposition, and ANC from BLM sources only.

Criteria Pollutants

Results of the modeling show no exceedances of the NAAQS for any pollutant, nor would any predicted potential concentrations exceed the Class I or Class II increments for emissions from BLM sources.

Hazardous Air Pollutants

As with the previous alternatives, the modeled concentrations, excluding background concentrations, showed that there were no values that exceeded the low end of the range of the AACLs/RfCs for BLM sources. However, when background concentrations are included, the annual concentrations for benzene (2.87 µg/m^3) and formaldehyde (7.15 µg/m^3), as well as the 24-hour concentration for xylenes (189.5 µg/m^3), exceed their respective AACLs. BLM sources contribute, at most, 0.5% to these concentrations; at least 99.5% percent are due to assumed background concentrations. Background HAPs concentrations provided by CDPHE represent monitored urban concentrations and likely are overestimates of existing conditions in the Glenwood Springs area.

Using the MLE scenario, an incremental cancer risk analysis for BLM sources yielded individual risks associated with long-term exposure of 1.3×10^{-10} to 6.5×10^{-10} for benzene, while the formaldehyde individual long-term risk was 1.0×10^{-7}. All of these risks are well below the EPA (1998) range of presumptively acceptable risks of 1×10^{-4} to 1×10^{-6}.

Using the MEI analysis, the individual cancer risks for benzene were 2.5×10^{-10} to 8.9×10^{-10}, while the formaldehyde individual risk was 1.4×10^{-7}. These values are also below the lower end of the range of presumptively acceptable risks.

Visibility

Screening-Level Analysis. The results of the visibility analysis for Alternative IV are the same as for Alternatives I, II, and III (4-9). These indicate that potential BLM sources would result in no perceptible visibility impact (1.0-dv reduction) at any of the PSD Class I Wilderness Areas. Results using the USFS 0.5-dv threshold are presented in the TSD (Trinity 2004). Again, note that inclusion of sensitive Class II areas in the analysis is not required but is intended to provide decision maker with a more complete picture of potential regional impacts.

Deposition

All calculated potential values of sulfur and nitrogen deposition for BLM sources only were well below the applicable thresholds of 3 kg/ha/yr for total sulfur and 5 kg/ha/yr for total nitrogen.

Acid Neutralizing Capacity

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 μeq/L, or a total change of less than 1.0 μeq/L for lakes below 25 μeq/L.

4.2.5.5 Alternative V

The following subsections present the CALPUFF modeling results for Alternative V for criteria pollutants (NAAQS and PSD increments), HAPs, visibility, deposition, and ANC from BLM sources only.

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 μg/m^3) and formaldehyde (7.15 μg/m^3) as well as the 24-hour concentration for xylenes (189.5 μg/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.

As described previously, the risk calculations are based on the maximum modeled concentration found anywhere in the vicinity of the hypothetically located sources; the calculated risk values should be viewed as an upper boundary on the range of possible risks associated with far-field impacts, with actual risks likely being lower.

Visibility

Screening-Level Analysis. Results of the screening visibility analysis for Alternative V are the same as for Alternatives I through IV; there were no modeled impacts that exceeded the 1.0 deciview 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 2004).

As noted previously, Class II areas have no visibility protection under State or Federal law at this time but 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 kg/ha/yr for total sulfur and 5 kg/ha/yr for total nitrogen.

Acid Neutralizing Capacity

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 µeq/L, or a total change of less than 1.0 µeq/L for lakes below 25 µeq/L.

4.2.5.6 Discussion of Air Quality Impacts under Alternatives I through V

The above analysis shows that the proposed BLM sources in the GSRA are not projected to cause an exceedance of any applicable standard or threshold.

It should also be noted that the multiple conservative assumptions used throughout the modeling further 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 are 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 one of the five 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

These qualitative impact level values recognize that the calculated values are likely higher than actual conditions, based on the multiple conservative assumptions used in the modeling and described above.

As discussed previously, 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 PSD increments or NAAQS standards, more restrictive operational constraints or more stringent mitigation measures would be required.

4.2.5.7 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) to determine potential cumulative air quality impacts. The results discussed below therefore represent the highest cumulative impact from the five alternatives. Detailed information on the sources outside the Planning Area is presented in the TSD (Trinity 2004).

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, the 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.

As described for the five alternatives, risk calculations are based on the maximum modeled concentration found anywhere in the vicinity of the hypothetical arrangement of sources. Therefore, the calculated risk levels should be viewed as an upper bound on the range of possible risks associated with far-field impacts, with risks to actual residents likely being lower.

Visibility Screening-Level Analysis. Results of the visibility analysis performed by Trinity (2004) for BLM sources and all sources are presented in Table 4-10.

Table 4-10. Results of Screening-Level and Refined Modeling of Cumulative Visibility Impacts
All Sources, Vernal, UT and Glenwood Springs, CO Resource Areas [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] *BLM sources of emissions shown in parentheses. Class II areas and Class I areas with no impact in screening analysis did not have a refined analysis conducted.*

The results shown in Table 4-10 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 2004). As with the five 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 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 2004). 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.

Air Resource Specialists, Inc. (2002, per Trinity 2004) 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 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 4-10.

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 one Class I area (the Black Canyon of the Gunnison; maximum potential impact is 1 day). No BLM sources (Vernal and 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 above, 25 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.

4.3 BIOLOGICAL ENVIRONMENT

4.3.1 Upland Vegetation and Riparian/Wetland Areas

Introduction

A number of management actions proposed for incorporation into the RMP have the potential to impact native vegetation. Two categories of actions are described and assessed by alternative below. The first category includes management actions directed at vegetation resources. The second category includes other proposed management actions such as oil and gas development, livestock grazing and range management, and travel management.

Native 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.

For oil and gas development, assumed numbers of wells and well pads and acres of surface disturbance associated with wells, roads, and pipelines under the five alternatives are taken from Table 4-1. Extent of existing and proposed surface-use stipulations are also shown in Table 4-1 and described in Table 2-1. For this analysis, estimated disturbance areas are assumed to be distributed among upland and riparian/wetland communities in proportion to their relative area, unless otherwise restricted by surface-use stipulations.

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.

A number of indirect impacts to vegetation resources are possible as a 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. 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 the following analysis, implementation of all general mitigation measures listed in Section 2.2 are assumed for areas designated SSR/CSU or with standard restrictions and limitations. Some of the latter include areas subject to permit-level special mitigation requirements to reduce long-term impacts and enhance reclamation of temporary impacts. For any of the SSR/CSU areas under all alternatives and special management areas under Alternatives II through IV, site revegetation would require that an entity causing a permitted ground-disturbing activity:

1. Drill seed the disturbed area with a seed mix of species native to the local area at a rate of 100 seeds per square foot (rate would be doubled for broadcast or hydroseeding where drill seeding is impracticable) following adequate soil preparation that includes removal of annual weeds, decompaction (“fluffing”) of compacted soil, and harrowing to prepare the seedbed.

2. Seed disturbed areas in fall or early winter (depending on elevation) to exploit elevated moisture normally available in winter and spring as an aid in germination and seedling establishment.

3. Mulch seeded areas with certified weed-free native hay or straw.

4. Control all listed noxious weeds until the site is returned to the desired condition.

5. Plant containerized native shrubs and trees (as appropriate based on the surrounding plant community) when conditions warrant following successful noxious weed control, in natural-appearing groups at a spacing that approximates the structure of local plant communities.

6. Fence revegetated well pads to exclude livestock grazing for a minimum of 2 years.

Standardized definitions were used to categorize impacts of specific management actions on vegetation resources. A range of areas of estimated disruption is associated with each category. When quantitative analysis is not possible, categories are based upon the potential physical impacts in terms of Colorado Land Health Standards (Appendix F). For riparian/wetland vegetation, these categories are based on the potential physical impacts in terms of Colorado Land Health Standard #2. For upland vegetation, 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** – Effects unlikely to impair the resource value. No physical disruption to resources.
- **Negligible** – Detectible effects would last no more than 1 year (i.e., not detectible after one full growing season) and are unlikely be noticeable in terms of Land Health Standards. A more severe impact may be negligible if it is temporary (duration <2years).
- **Minor** – Total area of disruption less than 5 percent of the resource. May result in noticeable but not substantial impairment of the resource value in terms of Land Health Standards. Effects may be of concern to the general public.
- **Moderate** – Total area of disruption 6 to 15 percent of the resource. May cause substantial impairment of the resource value in terms of Land Health Standards. These effects may increase over time or be long-term or permanent. Effects are likely to be visible and may be of concern to the general public.
- **Major** – Total area of disruption greater than 15 percent of the resource. Likely to cause substantial impairment of the resource value in terms of Land Health Standards. These effects may increase over time, or be long-term or permanent. If negative, they would likely result in unmitigatable impacts regulated by major environmental laws such as the ESA. Effects would be highly visible and of concern to the general public.

The same terms are applied in a more relative sense to describe beneficial impacts.

Table 4-11 summarizes impacts to upland and riparian/wetland vegetation under the five alternatives.

4.3.1.1 Alternative I

Under Alternative I, the general objective is to maintain current ecological values and processes and biological diversity under existing management direction and activities. This analysis assumes that resource condition and trends described in Section 3.3.1 would continue.

Table 4-11. Summary of Impacts to Upland and Riparian/Wetland Vegetation by Alternative

Management Action	Alternative				
	I	II	III	IV	V
Upland Vegetation Management	Minor to Moderate (–)	Moderate (+)	Minor to Moderate (–)	Minor to Moderate (–)	Moderate to Major (–)
Riparian/Wetland Vegetation Management	Minor to Moderate (–)	Major (+)	Moderate (+)	Moderate (+)	Moderate to Major (–)
Rangeland Management	Minor (+)	Moderate to Major (+)	Moderate (+)	Moderate (+)	Moderate (–)
Travel Management	Localized Major (–)	Moderate (+)	Moderate (+)	Moderate (+)	Moderate (+)
Oil and Gas Development	Minor (–)	Minor (–)	Minor (–)	Minor (–)	Minor to Moderate (–)

[1] *Does not include special status plant species or plant communitieses; see Section 4.3.3.*

Direct and Indirect Impacts

Vegetation Management Actions — Under continuing management actions, the condition of upland vegetation communities above the rim would be expected to continue to be good. The only exception is the trend for noxious weeds. Under existing noxious weed management (Section 3.3.1.3), such populations are expected to increase in frequency, density, and diversity over the time period of this analysis. This presents the potential for minor to moderate negative impacts to these resources if noxious weed populations invade and expand into native plant communities.

Some upland communities below the rim would most likely continue in fair to poor condition with a declining (decreasing) trend. Noxious weeds would be expected to increase below the rim as well. Over time, this would result in minor to moderate negative impacts to most of these communities.

Most riparian/wetland areas could be expected to be at PFC, or FAR in an upward trend, or to make progress toward meeting land health standards if precipitation levels are adequate, riparian restoration projects are implemented, and rangeland improvements continue to be realized. However, continuing increases in noxious weed population frequency, density, and diversity are expected under current management actions. Over time, this would result in minor to moderate negative impacts to most of these communities.

Range Management Actions — Continuation of rangeland projects and administrative solutions (season-of-use revisions, stock level adjustments, pasture exclusions and utilization stipulations) are expected to result in continuing, gradual, long-term improvements to range condition and trend. In addition, this alternative would include high-intensity monitoring of allotments where resource conflicts have been identified. However, land treatments are only required for those allotments not meeting a minimum ecological condition rating of 40 percent (failing standards). These actions would be expected to result in minor positive impacts to both upland and riparian/wetland vegetation.

Travel and Recreation Management — The no-action alternative would allow the most unrestricted travel throughout the Planning Area (Section 2.4.1). All of the area would be open to cross-country and motorized or mechanized travel. Based on current levels of use in the Hubbard Mesa area and expected increased recreational use of the Planning Area, this could be expected to result in increasing numbers of pioneered roads. Such roads could result in major, localized direct impacts where upland

and/or riparian/wetland vegetation is removed, as well as indirect impacts from fragmentation of communities, and may in turn cause a loss of ecological processes and habitat structure and function, and increased spread of noxious weeds (Harris and Silvea-Lopez 1992, Zink et al. 1995).

Oil and Gas Development — Although no new oil and gas (or other mineral) leasing would occur on top of the plateau, an estimated ten new wells on seven new pads would be located on existing leases in this area, resulting in approximately 31 acres of long-term surface disturbance from pads and supporting roads (Table 4-2) and minor impacts to vegetation resources. The remaining area, representing more than 99 percent BLM lands atop the plateau, would not be subject to these impacts.

Below the rim, 28 percent of the area (10,912 acres) would remain unleased (Table 4-1), resulting in no impacts from oil and gas activities. Continued development of areas currently leased for oil and gas would cause an estimated 1,120 acres of long-term impacts to areas below the rim, representing 2.9 percent of this part of Planning Area. An additional 730 acres (1 percent) of temporary impacts are also estimated. The total area of ground disturbance below the rim represents 4.8 percent of this area. These actions would result in minor impacts to portions of the pinyon/juniper woodlands and sagebrush shrublands below the rim

Alternative I would protect 60.1 percent of BLM lands in the Planning Area (44,267 acres) in no-lease areas, 18.9 percent (13,912 acres) with NGD/NSO stipulations, and 11.2 percent (8,256 acres) with SSR/CSU stipulations (Table 4-1). The remaining 9.7 percent (7,167 acres) would be available for oil and gas development with standard lease terms. Assuming the application of special reclamation mitigation actions to SSR/CSU areas and that BLM causes proposed ground-disturbing activities to be located to avoid and protect riparian vegetation, these actions are expected to result in minor impacts to vegetation resources. It is possible that steep slopes such as occur in this area can preclude relocation as far from a stream corridor as might otherwise be preferable. In these cases some amount of riparian vegetation would be negatively affected, but the number and magnitude of such cases is expected to be small.

A portion of the estimated long-term disturbance from oil and gas development under this alternative is associated with construction or widening/improving 152 miles (513 acres) of access roads (Table 4-3). The portion of new versus widened access roads cannot be determined at this time. In addition to the direct impacts of vegetation removal, these roads will indirectly impact vegetation resources by fragmenting communities and creating increased opportunities for invasion by noxious weeds. These impacts will be cumulative to those estimated in the discussion of travel management, above.

Offsite and Cumulative Impacts

Future development of oil and gas on non-BLM portions of the Planning Area and adjacent areas is assumed to result in impacts similar to those from development on BLM portions. These cumulative impacts would be greater if reclamation of short- and long-term disturbances and avoidance of riparian areas were not performed to the standards discussed above. Reclamation on private lands is negotiated between the landowner and oil and gas operator and may therefore be less stringent in terms of plant species composition, cover, or structure. Failure to perform adequate reclamation or avoid riparian/wetland areas could result in indirect impacts to BLM lands by creating a seed source for noxious weed infestations or contributing to sedimentation in riparian areas. Degradation of these areas would also cause a decrease in the areal extent of vegetation communities and in the quality of wildlife habitat and human recreation experience throughout the area.

Offsite impacts could occur if the Planning Area becomes a source for noxious weed invasions of contiguous sites. This is not likely, as the infestation of surrounding areas is expected to be similar to that on the Planning Area. However, if more pristine sites do occur in the vicinity, and management actions do not discourage proliferation of noxious weeds onsite, the Planning Area could become a source for these plant species. This would be especially true in areas where human traffic or wildlife movement would move weed seeds into new sites.

All of the potential negative impacts discussed for riparian/wetland areas within the Planning Area are cumulative, with 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 surrounding region as well. Therefore, negative impacts that may result from management actions under this RMP have the potential to be cumulatively greater than when assessed in isolation.

Regardless of management actions within the Planning Area, direct and negative impacts to native vegetation will result from ongoing human development throughout the general region, which will bring new roads, housing projects, commercial development, and increasing recreational use of wildlands. The same indirect impacts to native vegetation discussed above will also result. In many cases, the loss or fragmentation of native plant communities is highly visible. These impacts will continue on a regional scale and will 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 will 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 and Mitigation

Several management actions proposed in this alternative would simultaneously affect upland and riparian/wetland vegetation. These include direct management of the resources themselves as well as management of noxious weeds, travel, grazing, and oil and gas development. Potential impacts to upland and riparian/wetland vegetation are discussed above and summarized in Table 4-11.

4.3.1.2 Alternative II

Under Alternative II, ecological values and processes and biological diversity would be protected by limiting surface disturbance and promoting natural ecosystem processes and functions in all systems.

Direct and Indirect Impacts

Vegetation Management Actions — The condition of upland vegetation communities throughout the Planning Area would be expected to continue to be good, moving in an upward trend due to specific focus on achieving goals for diverse native composition and production on upland sites. This includes using only native species in revegetation seed mixes and emphasizing natural processes to rehabilitate or restore natural plant communities.

This is the only alternative with a stated emphasis on noxious weed inventory, detection, and monitoring. These management actions will 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 combination of management actions 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 areas adjacent to these resources. Due to these protections and specific management actions, a large number of riparian reaches would be expected to return to PFC over time, resulting in major positive impacts to riparian/wetland areas within the Planning Area.

Range Management Actions — Administrative solutions (season-of-use revisions, stock level adjustments, pasture exclusions and utilization stipulations) would be emphasized over rangeland projects for meeting resource management objectives. These are expected to result in accelerated progress towards meeting or achieving land health standards in terms of long-term improvements to range condition and trend than the other four alternatives. In addition, Alternative II provides for high-intensity monitoring of highest-priority allotments and allotments not meeting land health standards. Allotment management plans would be developed for several situations, including not meeting, or having identified issues in meeting standards and direct conflicts with wildlife, watershed, and riparian/wetland, botanical, or wilderness values. Land treatments would be required for those allotments not meeting a minimum ecological condition rating of 70 percent. Generally improving range condition and specific management of sites with vegetation resources in conflict with livestock management would produce moderate to major positive impacts to both upland and riparian/wetland vegetation resources over time.

Travel and Recreation Management — Although an SRMA for OHV use would be designated in the Hubbard Mesa area, travel within the SRMA and the remainder of the Planning Area would be limited to designated routes. This prohibition of cross-country travel would prevent continued expansion of unauthorized travel routes throughout 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 resources.

Oil and Gas Development — Development of fluid mineral resources under Alternative II would allow an estimated 310 new well pads and an associated 1,348 acres of new long-term disturbance (1.8 percent of BLM lands in the Planning Area) during the 20-year period of analysis (Table 4-3). An additional 916 acres of temporary impacts are also estimated, for a total disturbance to 3.1 percent of BLM lands in the Planning Area.

A total of 70 percent of upland plant communities on the top and sides of the plateau would remain unleased (21,382 acres, 29.1 percent of Planning Area) or be protected by NGD/NSO stipulations (31,200 acres, 41.4 percent) associated with the ACECs. An additional 7,015 acres (9.6 percent) would be designated as SSR/CSU (Table 4-1).

Areas of standard restrictions and limitations (14,005 acres, 20.0 percent) would occur primarily below the rim in pinyon/juniper and sagebrush shrublands. A smaller area of standard restrictions and limitations is located near the northern edge of the Planning Area, which supports a mosaic of aspen and conifer woodlands and sagebrush shrublands. If short-term disturbances in the SSR/CSU and areas subject to special mitigation are revegetated as described above, impacts of the disturbances on upland plant communities would be minor.

A portion of the estimated long-term disturbance from oil and gas development under this alternative is associated with construction or widening/improving 186 miles (602 acres) of access roads (Table 4-2). In addition to the direct impacts of vegetation removal, these roads will indirectly impact vegetation resources by fragmenting communities, increasing the potential for noxious weed infestation. These impacts will be in addition to those estimated in the discussion of travel management.

Special Resource Management — A number of positive impacts to upland and riparian/wetland vegetation would result from the special management stipulations proposed for these resources under the proposed ACECs, as well as positive impacts due to management of noxious weeds, travel, and rangeland. Considered together with the comprehensive protection of large areas by NGD/NSO designations, it is anticipated that upland and riparian/wetland vegetation within the Planning Area would generally experience local and widespread positive impacts under Alternative II. Exceptions may include some negligible to localized minor negative impacts to upland and riparian/wetland areas, mostly below the rim, where ground-disturbing activities may be cumulative from existing weed infestations and other degradation.

Above the rim, a broad protection zone would be afforded riparian/wetland areas due to specific NGD/NSO stipulations to protect genetically pure populations of Colorado River cutthroat trout from direct and indirect impacts, and to protect special status plant species and significant plant communities, as well as the hydrological and ecological processes that support them (Section 3.5.7). Eligibility of some stream segments for WSR designation would protect an area of 0.25 mile on either side of stream centerlines from ground-disturbing activities that might impair values until a suitability analysis has been completed. In addition, an SSR/CSU stipulation would provide controls on the specific location of proposed surface uses within a 500-foot buffer outside the edge of the riparian or wetland vegetation in these areas.

Below the rim, most riparian/wetland areas would also be protected by NGD/NSO or SSR/CSU stipulations. For the remainder, BLM could require a proposed ground-disturbing activity to be shifted by up to 200 meters. Impacts of oil and gas development on riparian/wetland resources 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. This could result in negligible to minor loss of riparian/wetland vegetation.

Offsite and Cumulative Impacts

Offsite and cumulative impacts under Alternative II would be similar to those for Alternative I. Although the same types of impacts from oil and gas development would occur regardless of location on BLM or private lands, private landowners negotiate their own agreements with oil and gas companies regarding reclamation standards, road design, and other factors. Failure to perform adequate reclamation or avoid riparian/wetland vegetation during offsite development could in turn result in indirect impacts to BLM lands through invasion of noxious weeds or transport of eroded soils and sediments. Degradation of these areas would also cause a decrease in the areal extent of vegetation communities and in the quality of wildlife habitat and human recreation throughout the area.

Increased impacts to offsite areas could occur if the Planning Area becomes a source of noxious weeds for contiguous sites. This is not likely, as the infestation of surrounding areas is expected to be similar to that on the Planning Area. However, if more pristine sites do occur in the vicinity, and management actions do not discourage proliferation of noxious weeds onsite, the Planning Area could become a source for noxious weed infestation, especially in areas where human traffic and livestock or wildlife movement can serve to spread weed seeds into new sites.

All potential negative impacts discussed for riparian/wetland areas within the Planning Area are cumulative with 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 RMP have the potential to be cumulatively greater than when assessed in isolation.

Regardless of management actions within the Planning Area, direct and negative impacts to native vegetation will result from ongoing human development throughout the general region, which will bring new roads, housing projects, commercial development, and increasing recreational use of wildlands. The same indirect impacts to native vegetation discussed above will also result. In many cases, the loss or fragmentation of native plant communities is highly visible. These impacts will continue on a regional scale and will 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 will 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 and Mitigation

Alternative II provides the most comprehensive protection of riparian/wetland areas from surface disturbance by several, sometimes overlapping, stipulations 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, 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 4-11.

4.3.1.3 Alternative III – Preferred Alternative

Under Alternative III, important ecological values and processes would be protected by the designation of two ACECs (East Fork Parachute Creek and Trapper/ Northwater Creek) and of the WSR-eligible stream corridors. In addition, the entire Parachute Creek watershed would be given special management focus as a designated WMA. Alternative III emphasizes developing and implementing management prescriptions that would limit surface disturbance, implement active management, and mitigate effects of disturbances.

Direct and Indirect Impacts

Vegetation Management Actions — The condition of upland vegetation communities above the rim would be expected to continue to be good, except for an expected increase in noxious weed population frequency, density, and diversity. Some communities below the rim would probably continue in fair to poor condition with a decreasing trend. Noxious weeds would be expected to increase below the rim to an even greater extent, given current conditions. Over time, this would result in minor to moderate negative impacts to most of these communities.

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 areas adjacent to these resources. Due to these protections and specific management actions, it is expected that a large number of riparian reaches would gradually return to PFC, resulting in major positive impacts to riparian/wetland areas within the Planning Area. However, these positive impacts would be diluted by expected continuing increases in the frequency, density, and diversity noxious weed populations.

Range Management Actions — Alternative III is similar to Alternative I in that both would use rangeland improvements and administrative solutions (season-of-use revisions, stock level adjustments, pasture exclusions and utilization stipulations) in order to progress towards meeting land health standards. In addition, both alternatives require that only native species be used for revegetation seeding. However, land treatments would only be required within allotments identified as not meeting a minimum ecological condition rating of 50 percent. Alternative III also provides for development of allotment management plans for several situations, including direct conflicts with wildlife, watershed, and riparian/wetland, botanical, or wilderness values. Generally improving range condition, and specific management of sites with vegetation resources in conflict with livestock management will produce moderate positive impacts to both upland and riparian/wetland vegetation resources over time.

Travel and Recreation Management — Motorized or mechanized travel would be restricted to designated routes, including within the Hubbard Mesa SRMA. This restriction, combined with the closure and revegetation of 26 miles of existing routes and limiting another

24 miles of existing routes to only administrative use, would result in moderate positive impacts to upland and riparian/wetland resources.

Oil and Gas Development — A total of 1,761 acres (2.4 percent of BLM lands in the Planning Area) of long-term disturbance is expected to occur from oil and gas development under Alternative III in 20 years, based on 1,324 wells and 402 new pads (Table 4-3). An additional 1,187 acres of short-term disturbance is also expected, for a combined disturbance to 4.0 percent of BLM lands in the Planning Area. Most of these impacts would occur to vegetation below the rim.

The deferral of leasing and drilling for oil and gas on top of the plateau under Alternative III would not affect the type and extent of impacts to upland or riparian/wetland vegetation, except to the degree that it affects the number and location of wells and other facilities during the 20-year period of analysis and the rate at which they are developed upon the end of the deferment period.

Upland vegetation would benefit from the deferral of leasing above the rim through limitation of large-scale surface disturbance for a period of 10 to 20 years or more (estimated at 16 years for this RMPA/EIS).

Once leasing is allowed, vegetation atop the plateau would be subject to less impact from oil and gas development than under Alternative II, with a total of only 51 wells on 39 pads estimated during the 20 years (Table 4-2).

One or more NGD/NSO stipulations would apply to an estimated 42.0 percent of BLM lands (30,928 acres). Most of this area wraps around the lower cliffs and so comprises much of the pinyon/juniper woodland and contiguous Douglas-fir forest habitats in the Planning Area, as well as some mountain shrublands. The remaining NGD/NSO designations focus on riparian areas along Trapper/Northwater and East Fork Parachute Creeks.

Another 29,594 acres (40 percent) would have SSR/CSU designations, and permit-level special mitigation could be required in portions of the ACECs and within the WMA. Standard restrictions and limitations would apply to 13,080 acres (17.8 percent) of the BLM lands.

A portion of the estimated long-term disturbance from oil and gas development under this alternative is associated with construction or improvement of 241 miles (817 acres) of access roads (Table 4-2). In addition to the direct impacts of vegetation removal, these roads will indirectly impact vegetation resources by fragmenting plant communities, increasing the potential for noxious weed infestation. These impacts would be cumulative to those estimated in discussion of travel management.

Impacts to upland vegetation and riparian/wetland vegetation from oil and gas development would be minor.

Special Resource Management — SSR/CSU areas and special resource management areas consist primarily of spen woodlands, mountain shrublands, and coniferous forests on top of the plateau and in pinyon/juniper woodlands along the eastern flanks. The areas subject to standard restrictions and limitations comprise some lower pinyon/juniper and sagebrush shrublands on the lower, eastern side of the Planning Area. If short-term disturbances in SSR/CSU and special management areas are revegetated using the special measures described above, these would result in minor impacts to upland vegetation communities.

Like Alternative II, Alternative III would protect riparian/wetland areas from surface disturbance by several, sometimes overlapping, stipulations and conditions. Above the rim, a number of beneficial impacts to riparian/wetland vegetation would result from the special management stipulations proposed for these resources within the proposed ACECs as well as the Parachute Creek WMA. These would provide a broad protection zone for riparian/wetland areas through specific NGD/NSO stipulations to protect genetically pure populations of Colorado River cutthroat trout from direct and indirect impacts and to protect special status plant species and significant plant communities, and the hydrological and ecological processes that support them (Section 3.5.7) as well as prescribe special management goals, objectives, and actions for the entire WMA.

Eligibility of some stream segments for WSR designation would protect an area of 0.25 mile on either side of stream centerlines from ground-disturbing activities that might impair values until a suitability analysis has been completed. In addition, an SSR/CSU stipulation would provide controls on the specific location of proposed surface uses within a 500-foot buffer outside the edge of the riparian or wetland vegetation in these areas.

Alternative III would not identify or provide special protection to areas identified as having wilderness character. However, a total of 9,006 acres would be managed so as to protect roadlessness and naturalness under associated NGD/NSO designations that would not be subject to would not be subject to modification, waiver or exceptions (Map 36).

Below the rim, most riparian/wetland areas would also be protected by NGD/NSO or SSR/CSU stipulations. For the remainder, BLM could require the shifting of proposed ground-disturbing activity by up to 200 meters as necessary. Resultant impacts of oil and gas development to riparian/wetland resources protections would be negligible except in areas with steep slopes or other resource management concerns such as visual resources, sensitive species, and wildlife. These issues can preclude movement of proposed disturbances so that relocation stipulations may not be completely implemented. In these cases, some amount of riparian vegetation is lost, which could cause minor impacts in these areas.

Offsite and Cumulative Impacts

Offsite and cumulative impacts under Alternative III would be similar to those for Alternatives I and II. Although the types of impacts from oil and gas development would occur regardless of whether on BLM or private lands, private landowners negotiate their own agreements with oil and gas companies regarding reclamation standards, road designs, and related factors.

Failure to perform adequate reclamation or avoid riparian/wetland vegetation during offsite development could in turn result in indirect impacts to BLM lands by invasion of noxious weeds or transport of eroded soils and sediments. Degradation of these areas would also cause a decrease in the areal extent of vegetation communities and in the quality of wildlife habitat and human recreation throughout the area.

Increased impacts to offsite lands could occur under Alternative III if the Planning Area becomes a source for spreading noxious weeds to contiguous areas. This is not likely, as the infestation of surrounding areas is expected to be similar to that on the Planning Area. However, if more pristine sites do occur in the vicinity, and management actions do not discourage proliferation of noxious weeds onsite, the Planning Area could become a source for noxious weed infestation, especially in areas where human traffic and livestock or wildlife movement can serve to spread seeds.

All of the potential negative impacts discussed for riparian/wetland areas within the Planning Area are cumulative with 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 of the riparian/wetland areas in the surrounding region as well. Therefore, negative impacts due to management actions under this RMP have the potential to be cumulatively greater than when assessed in isolation.

Regardless of management actions within the Planning Area, direct and negative impacts to native vegetation will result from ongoing human development throughout the general region, which will bring new roads, housing projects, commercial development, and increasing recreational use of wildlands. The same indirect impacts to native vegetation discussed above will also result. In many cases, the loss or fragmentation of native plant communities is highly visible. These impacts will continue on a regional scale and will 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 will 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 and Mitigation

Several management actions proposed in this alternative would affect upland and riparian/wetland vegetation. These include direct management of these resources as well as management of noxious weeds, travel, 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 4-11.

A number of positive impacts to upland and riparian/wetland vegetation would be anticipated under Alternative III. These would result from proposed ACEC and WMA designations and special management stipulations, as well as beneficial impacts due to rangeland and travel management. These beneficial impacts could be diluted when considered cumulatively with anticipated minor to moderate impacts to upland vegetation from noxious weeds and ground-disturbing activities, including oil and gas development.

4.3.1.4 Alternative IV

Under Alternative IV, the most important ecological values and processes would be protected by developing and implementing management prescriptions that would limit surface disturbance, implement active management, and mitigate effects of disturbances.

Direct and Indirect Impacts

Vegetation Management Actions — The condition of upland vegetation communities above the rim would be expected to continue to be good, except for an expected increase in the frequency, density, and diversity of noxious weed populations. Some communities below the rim would probably continue in fair to poor condition with a decreasing trend. Noxious weeds would be expected to increase below the rim to an even greater extent, given current conditions. Over time, this would result in minor to moderate negative impacts to most of these communities.

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 areas adjacent to these resources. Due to these protections and specific management actions, it is expected that a large number of riparian reaches would gradually return to PFC, resulting in major positive impacts to riparian/wetland areas within the Planning Area. However, these positive impacts would be diluted by expected continuing increases in noxious weed population frequency, density, and diversity.

Range Management Actions — Alternative IV is similar to Alternative I in that both would use rangeland improvements and administrative solutions (season-of-use revisions, stock level adjustments, pasture exclusions, and utilization stipulations) in order to progress towards meeting land health standards. In addition, both alternatives require that only native species be used for revegetation seeding. However, land treatments would only be required within allotments identified as not meeting a minimum ecological condition rating of 50 percent. Alternative IV also provides for development of allotment management plans for several situations, including direct conflicts with wildlife, watershed, and riparian/wetland, botanical, or wilderness values. Generally improving range condition, and specific management of sites with vegetation resources in conflict with livestock management, will produce moderate positive impacts to both upland and riparian/wetland vegetation resources over time.

Travel and Recreation Management — Travel would be restricted to designated routes, except that cross-country travel would be permitted in an SRMA at Hubbard Mesa. While this could impact vegetation on Hubbard Mesa, much of the area has already been impacted, and providing this recreational opportunity could reduce unauthorized OHV travel in other parts of the Planning Area. 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 resources.

Oil and Gas Development — A total of 1,940 acres (2.6 percent of BLM lands in the Planning Area) of long-term disturbance is expected to occur from oil and gas development under Alternative IV during 20 years, based on 1,324 wells and 449 pads (Table 4-3). Another 1,329 acres of short-term disturbance is also expected, for a combined disturbance to 7.5 percent of BLM lands in the Planning Area. Most of these impacts would affect vegetation below the rim.

One or more NGD/NSO stipulations would apply to an estimated 42.0 percent of BLM lands (30,928 acres). Most of this area wraps around the lower cliffs and so comprises much of the pinyon/juniper woodlands and contiguous Douglas-fir forests within the Planning Area, and some mountain shrublands. Another 27,486 acres (37.3 percent) would have SSR/CSU designation, and permit-level special mitigation could be required for portions of the ACECs and the WMA. Standard restrictions and limitations would apply to 15,188 acres (20.6 percent) of the BLM lands (Table 4-1).

A portion of the estimated long-term disturbance from oil and gas development is associated with construction or improvement of 270 miles (861 acres) of access roads (Table 4-2). In addition to the direct impacts of vegetation removal, these roads will indirectly impact vegetation resources by fragmenting communities, increasing the potential for noxious weed infestation. These impacts will be cumulative to those estimated in discussion of travel management.

Special Resource Management — SSR/CSU and special management areas are primarily located in aspen woodlands, mountain shrublands, and coniferous forests on top of the plateau and in pinyon/juniper woodlands along the eastern flanks. The areas subject to standard restrictions and limitations comprise some lower pinyon/juniper and sagebrush shrublands on the lower, eastern side of the Planning Area. If short-term disturbances in SSR/CSU and special mitigation areas are revegetated using the special measures described above, these disturbances would result in minor impacts to upland vegetation communities from oil and gas development. This alternative includes designation of the Trapper/Northwater Creek WMA, with the specific management objectives listed in Table 2-3.

Alternative IV would protect riparian/wetland areas from surface disturbance by several, sometimes overlapping stipulations and conditions, although the area of these protections is smaller than in Alternatives II or III.

Above the rim, a number of beneficial impacts to riparian/wetland vegetation would result from the special management proposed for these resources within the Trapper/Northwater Creek WMA. Specific NGD/NSO stipulations to protect genetically pure populations of Colorado River cutthroat trout from direct and indirect impacts would also protect special status plant species and significant plant communities and the hydrological and ecological processes that support them (Section 3.5.7).

Eligibility of some stream segments for WSR designation would protect an area of 0.25 mile on either side of stream centerlines from ground-disturbing activities that might impair values until a suitability analysis has been completed. In addition, an SSR/CSU stipulation would provide controls on the specific location of proposed surface uses within a 500-foot buffer outside the edge of the riparian or wetland vegetation in these areas.

Below the rim, most riparian/wetland areas would also be protected by NGD/NSO or SSR/CSU stipulations. For the remainder, BLM could require the shifting of proposed ground-disturbing activity by up to 200 meters as necessary. Resultant impacts of oil and gas development to riparian/wetland resources protections would be negligible except in areas with steep slopes or other management concerns such as visual resources, sensitive species, and wildlife. These issues can preclude movement of proposed disturbances so that relocation stipulations may not be completely implemented. In these cases, some amount of riparian vegetation is lost. This could cause minor impacts in these areas.

Offsite and Cumulative Impacts

Offsite and cumulative impacts under Alternative IV would be similar to those for Alternatives II and III. Although the types of impacts from oil and gas development would occur regardless of whether on BLM or private lands, private landowners negotiate their own agreements with oil and gas companies regarding reclamation standards, road designs, and related factors.

Failure to perform adequate reclamation or avoid riparian/wetland vegetation during offsite development could in turn result in indirect impacts to BLM lands by invasion of noxious weeds or transport of eroded soils and sediments. Degradation of these areas would also cause a decrease in the areal extent of vegetation communities and in the quality of wildlife habitat and human recreation throughout the area.

Increased impacts to offsite lands could occur under Alternative IV if the Planning Area becomes a source of noxious weeds to spread to contiguous sites. This is not likely, as the infestation of surrounding areas is expected to be similar to that on the Planning Area. However, if more pristine sites do occur in the vicinity, and management actions do not discourage proliferation of noxious weeds onsite, the Planning Area could become a source for noxious weed infestation, especially in areas where human traffic and livestock or wildlife movement can serve to spread seeds.

All potential negative impacts discussed for riparian/wetland areas within the Planning Area are cumulative with 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 of the riparian/wetland areas in the surrounding region as well. Therefore, negative impacts due to management actions under this RMP have the potential to be cumulatively greater than when assessed in isolation.

Regardless of management actions within the Planning Area, direct and negative impacts to native vegetation will result from ongoing human development throughout the general region, which will bring new roads, housing projects, commercial development, and increasing recreational use of wildlands. The same indirect impacts to native vegetation discussed above will also result. In many cases, the loss or fragmentation of native plant communities is highly visible. These impacts will continue on a regional scale and will 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 will 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 and Mitigation

Several management actions proposed in this alternative would affect upland and riparian/wetland vegetation. These include direct management of these resources as well as management of noxious weeds, travel, 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 4-11.

A number of positive impacts to upland and riparian/wetland vegetation would be anticipated under Alternative IV. These would result from special management stipulations, as well as beneficial impacts due to travel and rangeland management. These beneficial impacts could be diluted when considered cumulatively with anticipated minor to moderate impacts to upland vegetation from ground-disturbing activities, including oil and gas development and weed management.

4.3.1.5 Alternative V

Under Alternative V, modifications to ecological values and processes and biological diversity would result from ground-disturbing activities related to more intensive resource development and management, and mitigation or management conditions would be imposed to lessen impacts to identified key resources.

Direct and Indirect Impacts

Vegetation Management Actions —Proposed management actions include rehabilitation or revegetation of communities not meeting desired range conditions due to dominance of annual or weedy species, or juniper with forage-producing perennial seed mixes that would support livestock production and other commodity values. There is no requirement that these be native species. Over time, this would lead to a reduction in the diversity of native plant species and potential reduction in native plant communities. The frequency, density, and diversity of noxious weed populations would be expected to increase due to grazing pressure (see discussion below) and unfocused weed management. Some communities below the rim would most likely degrade on a steeper downward trend as they are already in fair to poor condition and contain larger areas of noxious weeds. Over time, this would result in moderate to major negative impacts to most upland communities.

The condition of many riparian/wetland areas could be expected to decline under this alternative due to continued expansion of noxious weed populations and the likelihood that livestock grazing will become more intensive and focused in these areas. The result would be moderate to major negative impacts over time.

Range Management Actions — Rangeland projects and land treatments would be emphasized as the preferred solution for meeting resource management objectives. These actions are expected to result in increased livestock distribution and therefore, forage utilization. Like Alternative I, Alternative V would include high-intensity monitoring of allotments where resource conflicts have been identified. However, allotment management plans would only be developed for situations where units are not meeting, or have identified concerns meeting, land health standards. Conflicts with other resources such as watershed, wetland/riparian, or botanical would not require management plans.

The condition of native upland vegetation communities would be expected to degrade as progress toward meeting land health standards would be limited to areas where practicable and treatments would only be required where allotments are identified as not meeting a minimum of 40% ecological condition (failing standards). Optimization of forage production and access to available forage would be emphasized, wider grazing distribution would occur, and seeding with non-native, forage-producing species would result in the net decrease and diversity of native plant species. Over time, this would result in moderate negative impacts to both upland and riparian/wetland communities.

Travel and Recreation Management — Travel would be restricted to designated routes. Cross-country travel would not be allowed, reducing the expansion of travel routes that fragment uplands, disturb riparian/wetland vegetation cover, and introduce noxious weeds. When combined with the closure and revegetation of existing routes, these proposed management actions would result in moderate benefit to upland and riparian/wetland resources.

Oil and Gas Development — A total of 2,495 acres (3.4 percent) of long-term disturbance is estimated for BLM lands in the Planning Area as a result of oil and gas development in 20 years, based on 1,582 wells and 584 pads (Table 4-3). An additional 1,726 acres of temporary disturbance is expected, for a combined disturbance to 5.7 percent of BLM lands.

A portion of the estimated long-term disturbance from oil and gas development under this alternative is associated with construction or widening of 350 miles (1,112 acres) of access roads (Table 4-2). In addition to the direct impacts of vegetation removal, these roads will indirectly impact vegetation resources by additional fragmentation of communities, increasing the potential for noxious weed infestation. These impacts will be cumulative to those estimated in the discussion of travel management.

Special Resource Management — Under this alternative, an estimated 21,609 acres (29.4 percent) of BLM lands in the Planning Area would be protected by NGD/NSO stipulations. Most of this area wraps around the lower cliffs and so comprises approximately half of the site's pinyon/juniper woodlands and most of the contiguous Douglas-fir forests, as well as limited amounts of mountain shrublands and coniferous forests on top of the plateau. Some additional protection would be provided in 21,517 acres of SSR/CSU stipulations (29.2 percent), mostly in small areas of aspen woodland and mountain shrubland on top of the plateau and pinyon/juniper woodland along the eastern flanks. The remaining 41.4 percent would have standard restrictions and limitations. Moderate negative impacts from oil and gas development would be expected in areas of standard restrictions and limitations.

Above the rim, almost all riparian/wetland areas would be protected from direct impacts from ground-disturbing activities by NGD/NSO buffers, although such buffers would be narrower for smaller tributaries and some headwater areas.

Below the rim, most of the riparian/wetland areas would be protected by NGD/NSO or SSR/CSU stipulations. The remainder would be subject to the standard lease provision that gives BLM authority to require shifting of a proposed ground-disturbing activity by up to 200 meters to protect a resource value. In all cases, the physical protection to riparian and wetland communities could be narrower than that provided by the other alternatives. As a result, direct and indirect impacts of oil and gas development to riparian/wetland resources could range from minor to moderate.

Offsite and Cumulative Impacts

Offsite and cumulative impacts under Alternative V would be similar to those for the previous alternatives. Although impacts from oil and gas development would occur regardless of whether on BLM or private lands, private landowners negotiate their own agreements with oil and gas companies regarding reclamation standards, road designs, and related factors.

Failure to perform adequate reclamation or avoid riparian/wetland vegetation during offsite development could result in indirect impacts to BLM lands through invasion of noxious weeds or transport of eroded soils and sediments. Degradation of these areas would also cause a decrease in the areal extent of vegetation communities and the quality of wildlife habitat and human recreation throughout the area.

Increased impacts to offsite lands could occur under Alternative V if the Planning Area becomes a source for noxious weeds to spread to contiguous sites. This is not likely, as the infestation of surrounding areas is expected to be similar to that on the Planning Area. However, if more pristine sites do occur in the vicinity, and management actions do not discourage proliferation of noxious weeds onsite, the Planning Area could become a source for noxious weed infestation, especially in areas where human traffic and livestock or wildlife movement can serve to spread seeds.

All of the potential negative impacts discussed for riparian/wetland areas within the Planning Area are cumulative with 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 of the riparian/wetland areas in the greater region as well. Therefore, negative impacts due to management actions being considered for incorporation into the RMP have the potential to be cumulatively greater than when assessed in isolation.

Regardless of management actions within the Planning Area, direct and negative impacts to native vegetation will result from ongoing human development throughout the general region, which will bring new roads, housing projects, commercial development, and increasing recreational use of wildlands. The same indirect impacts to native vegetation discussed above will also result. In many cases, the loss or fragmentation of native plant communities is highly visible. These impacts will continue on a regional scale and will 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 will 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 and Mitigation

Several management actions proposed in this alternative would simultaneously affect upland and riparian/wetland vegetation. These include direct management of the resources themselves as well as management of noxious weeds, travel, 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 4-11.

When impacts are considered cumulatively, upland and riparian/wetland vegetation within the Planning Area would generally experience local and widespread negative impacts under Alternative V.

4.3.1.6 Overall Summary of Impacts to Vegetation

Potential impacts to upland and riparian/wetland vegetation are summarized by alternative and management action in Table 4-11. These summaries are based on the more detailed information presented above for the five alternatives. As shown by the table, land uses and management actions under different alternatives would result in differing levels of positive and negative impacts. Alternative V generally has the highest level of adverse impacts to vegetation resources, with impacts ranging from minor to major. Overall, Alternative II has the least adverse impacts to upland and riparian/wetland vegetation. Some of the impacts to vegetation described above may represent an irreversible and irretrievable commitment of natural resources (see Section 4.6).

4.3.2 Terrestrial and Aquatic Wildlife

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 associated with Alternatives I through V are summarized in the following subsections. 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.

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 migrational mortality and the need to establish a territory and form a pair bond more quickly. Maurer and Heywood (1993) noted that neotropical migrant songbirds (see Section 3.2.3) tend to be both more detectable and to be habitat-interior and habitat-specialist species; these species include warblers, vireos, and tanagers.

Relevant examples of published findings concerning habitat fragmentation include the following:

- 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 increased as habitat blocks increased in size. Areas ranged from less than 1.0 acre to nearly 125 acres. 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) with the same number of tracts in each size group.
- 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.
- 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 0.4 mile and avoidance within 0.25 mile of forest roads in summer range; 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 (825 feet) of a road, with paved roads showing more impact than unpaved roads and the latter more impact than primitive roads. 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) stated that for a study area in Idaho, 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.
- 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).
- 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.

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. This number is misleading because the total consists primarily of primitive routes that receive little use except during hunting season. The combination of Class 3 (light-duty, constructed), Class 4 (unimproved, constructed or user-created, sedan clearance), and Class 5 (unimproved, constructed or user-created, four-wheel-drive clearance) motorized routes, excluding ATV trails and dirt-bike single tracks, includes 222 miles, or 1.9 miles per square mile. Although this density is substantial and approximates the level reported to cause a 50-percent decline in elk (see above), it represents a baseline condition for the Planning Area except for additional impacts associated with increased use of the roads. The current ATV and dirt bike routes, though narrow, represent potentially severe disturbance due to noise, dust, speed, and the potential for travel onto adjacent off-route lands.

Disturbance — These impacts generally overlap with habitat fragmentation, because many of the more common and important types of fragmentation (e.g. roads) also include increased levels of human activity. Continuing with the above example of elk and roads, Thomas (1979) used data of Perry and Overly (1977) to plot use of summer range by deer and elk in responses 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. At densities of 3 miles per square mile, decreases in use by elk were 4, 52, and 65 percent for primitive, secondary, and primary roads, while deer decreased 14, 16, and 31 percent, respectively.

Witmer and DeCalesta (1985) found that habitats adjacent to closed spur roads showed no reduced elk use, while open spur roads showed a significant reduction up to 250 meters away. 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. Earlier, Irwin and Peek (1979) found that elk tended to remain in an area later into the fall in areas of closed roads than in areas of open roads accessible to hunters. Considering the generally higher quality of summer range, this tendency for earlier migration could affect winter survival. However, Holland (1989) reported that seasonal road closures for one month during the hunting season reduced the impact of the road by only 12 percent, compared to a 70-percent reduction in impacts for year-round closures to public access (except administrative use) and a 90-percent reduction for permanent closures.

While some species are more tolerant of human activity than others, virtually all species have some threshold of disturbance above which they will abandon or avoid an area. 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 can greatly exceed any direct habitat loss. For example, Reed et al. (1996) estimated that the effective habitat loss of roads was 2.5 to 3.5 times as great as actual habitat loss. Construction of a straight road 30 feet wide (a typical width for an oil and gas access road) would represent 3.6 acres of direct habitat loss. Multiplying this figure by 3.5 (the upper end of the range reported by Reed) yields an effective habitat loss of approximately 23 acres, or 3.6 percent of a square mile. This amount of loss is comparable to the 3-percent and 6-percent decreases in use of summer range by elk and deer, respectively, at a density of 2 miles of primitive roads per square mile of habitat, as described by Thomas (1979).

Roads are not the only cause of disturbance. 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, and potential release of toxic by-products from combustion.

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.

While habituation may occur for some species and some types of activities, this is less of an offsetting factor than suggested by the well-documented tendency for unhunted populations of ungulates and carnivores to appear indifferent to human presence. For these species, habituation is unlikely or less marked in hunted populations, in migratory populations of ungulates, or when the human activity is infrequent and represents a wide amplitude of disturbance. Conversely, habituation is most likely for unhunted populations and when the human activity becomes routine and occurs at a relatively low, consistent level (e.g., road traffic and day-to-day activities at rural residences).

In terms of potential oil and gas development in currently undeveloped portions of the Planning Area, the degree of avoidance due to disturbance is difficult to predict because it would depend on the dispersion of "disturbance centers" and specific vehicular travel routes required. If simultaneous well construction is clustered in adjacent or nearby 40-acre blocks, wildlife would be expected to avoid buffer zones (e.g., 0.5 mile for elk) around the individual areas of human activity and the main access routes but to continue to use the remaining habitat available. Van Dyke and Klein (1996) reported that elk tended to shift their habitat use patterns in response to oil well drilling but did not avoid the area altogether. Hiatt and Baker (1981) found that an oil well drill pad was temporarily avoided by elk but that the access road was not (although the study was of only a single well). Johnson et al. (1990) found that elk avoided oil and gas activities 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.

These studies appear to suggest that impacts to elk (and, by inference, other wildlife species) from disturbance associated with oil and gas development might not be as severe as indicated by some of the studies cited previously in this section. However, the latter group of references did not consider long-term population impacts. For example, a species may be able to shift its use for a short period, but the presumably less suitable habitat into which it moves would be unable to sustain the same level of use over the long term. Further, the return of wildlife to an area of avoidance following cessation of the disturbing activity might not apply to situations such as potential future development of the Planning Area, in which development would be likely to continue for 20 years and beyond. Therefore, regarding oil and gas development in the Planning Area, multiple disturbance centers and access roads associated with dispersed drilling locations could result in reduced wildlife use of the entire area of construction because of overlapping zones of avoidance. Using the example of elk, a 0.5-mile buffer around each new well site could preclude use in the intervening distance between sites as far apart as 1 mile. A spacing of several miles would be needed for the intervening habitat to receive undiminished use. This indicates that clustered development is probably preferable overall, although the degree of impact at the area of focused drilling would be greater than at more dispersed sites. Widely dispersed drilling could be desirable if the separation between sites is very large, although the potential for multiple major access roads in this situation would be less undesirable.

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 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 seclusion areas described previously. Any human activity or landscape modification that prevents the use of one or more of these limited migration corridors 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) have described wildlife mortality associated with oil pits in Wyoming, although the situation is different from existing or anticipated gas fields in the Planning Area. The pits were not primarily petroleum but instead consisted of produced water that contained some oil and oil by-products. Affected species included waterbirds as well as large mammals, raptors, and songbirds; 616 animals were found dead at oil pits during the 2-year study. Another 237 bird and mammal mortalities were attributable to hydrogen sulfide gas being stripped from the petroleum.

Impact Analysis

As throughout this RMPA/EIS, the general terms none, negligible, minor, moderate, and major are used to describe the level of effects anticipated under each of the five alternatives. 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 exterminated from large portions of the Planning Area.

The same terms are applied in a more relative sense to describe beneficial impacts.

Emphasis on Oil and Gas Development — The following subsections describe fish and wildlife impacts associated with future management actions and land uses contained within each of the five alternatives for analysis identified as part of this 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 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 selected alternative arising from this RMPA/EIS process, impacts resulting from development of oil and gas on both Federal and private land 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, comprising 1.9 acres of long-term and 1.5 acres of short-term disturbance) 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. These impacts are exacerbated when the first well is drilled in an area, because wildlife will 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 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.

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 may be minimized by a variety of mitigation measures, examples of which are provided in the following subsections.

In addition to avoidance or minimization, adverse impacts to fish and wildlife can also be offset by measures that improve the quality of habitats remaining available for wildlife. These may be implemented in portions of the Planning Area not affected or only minimally affected by development (e.g., the various no-lease or

NGD/NSO areas under the five alternatives) or, potentially, in offsite areas.

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 — relative 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.

The levels of impact ascribed to each alternative and resource component in the following analyses assume that all applicable stipulations and other management actions constituting an element of the alternative will be applied and enforced. Management prescriptions specific to oil and gas development and common to all alternatives include the following:

1. Place locked gates across well access roads to prevent unauthorized motorized use.
2. 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.
3. Require that water used in drilling operations, dust suppression, pad revegetation, or other consumptive uses be hauled from offsite areas so that natural watering sources for wildlife are not depleted or unnecessarily disturbed.
4. 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.
5. 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.
6. Where feasible and deemed appropriate by BLM, use clustering, collocation, or consolidation of facilities to reduce habitat loss, habitat fragmentation, and vehicular activity.
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, such as prescribed fires or other vegetation treatments, 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.

The analysis of impacts of oil and gas development on fish and wildlife resources within the Planning Area under the five alternatives also assumes the numbers of pads and acres of short-term and long-term surface disturbance presented in Tables 4-2 and 4-3. Cumulative impacts of oil and gas development are discussed in terms of BLM and private portions of the Planning Area and surrounding portions of the GSRA during the 20-year period of analysis (Table 4-3).

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 each alternative. Specific mitigation measures described for the alternatives typically apply to these other activities as well as to oil and gas.

4.3.2.1 Alternative I

Under Alternative I, the objective for ecological values and processes and biological diversity is to maintain current conditions with existing management direction and activities. For big game, the seclusion areas identified in the 1999 FSEIS (see Map 17) would apply. No management actions to enhance big game habitat or other special use areas are planned or precluded under this alternative; such actions would be considered on a case-by-case basis. See Section 4.3.3 for objectives related to special status species, including the endangered Colorado River fishes and genetically pure populations of the Colorado River cutthroat trout.

Direct and Indirect Future Impacts

Vegetation and Range Management — Continuation of current management would generally retain upland and riparian/wetland vegetation in its current condition, including trends in noxious weed frequency, density, and diversity (Section 4.3.1). While nothing under this alternative would preclude BLM from implementing more systematic weed management than at present, this analysis assumes that current management practices and trends would continue. Over time, an increase in noxious weeds could result in mostly adverse impacts to native ungulates, small mammals, raptors, and small birds using these habitats, and generally lesser impacts to other species groups. Continuation of rangeland projects and administrative solutions (season-of-use revisions, stock level adjustments, pasture exclusions, and utilization stipulations) under this alternative is expected to result in gradual, long-term improvements to range condition and trend.

Travel and Recreation Management — This alternative would allow the most unrestricted travel throughout the Planning Area, with no restrictions on cross-country travel and no routes closed to motorized or mechanized travel. The numerous roads, trails, and ATV paths within the Planning Area provide the potential for a high level of human disturbance to all wildlife species. Currently, the level of use is low throughout most of the year, except for high levels of recreational use in the Hubbard Mesa area and a seasonal influx of hunters atop the plateau in early fall. The lack of restrictions on cross-country travel under Alternative I and the expected increase in recreational use could result in increasing numbers of pioneered roads throughout the Planning Area. As discussed in Section 4.3.2.1, this would result in loss of seclusion, including during the sensitive big game birthing season and the raptor and songbird nesting seasons. While raptor nests are protected from oil and gas activities by TL and NSO stipulations, they would not be protected from disturbance associated with recreational use.

Some direct and indirect habitat loss would occur because of the tendency for wildlife to avoid roads and areas of increased recreation, extending up to several hundred meters from the road for furtive species such as mammalian and avian predators. Increased off-road use through sensitive habitats and across streams would have an adverse effect proportionately greater than the increase in number of miles. It is not possible to estimate the degree to which existing road-effect zones would become wider with additional use, but all areas would probably continue to be within the same general classes of use as at present (primary, secondary, or primitive). Therefore, impacts from increased recreational travel would be expected to be minor overall but more severe (moderate) in localized areas of concentrated recreational use.

Oil and Gas Development — No new oil and gas, coal, or oil shale leasing would occur on top of the plateau, eliminating these potential sources of impacts to upland or riparian/wetland communities in the 44,267 acres (60.1 percent of BLM lands in the Planning Area) within NOSRs 1 and 3. All of the mapped crucial mule deer winter range (24,978 acres) and big game seclusion areas (11,373 acres) on BLM lands made available for leasing would be protected by TL and NSO stipulations, respectively. Nonetheless, additional oil and gas development on existing leases or areas available to future leasing under this alternative would result in an estimated 1,120 acres of long-term habitat loss during the 20-year period of analysis. Since nearly all of this development would occur below the rim, the effect would be to reduce the amount of winter range by approximately 4.5 percent.

The TL stipulations for deer winter range would prevent or minimize construction-related disturbance impacts along oil and gas roads during winter but would not affect vehicular traffic associated with routine oil and gas operations. Applying a factor of 2.5 to 3.5 for estimating effective habitat loss due to disturbance from permissible routine operations during winter (see Reed et al. 1996, discussed in introduction to this section) indicates a reduction in effective winter range of 3,920 acres. This represents an effective loss of 15.7 percent of the winter range habitat in the Planning Area. Using a high density of 40 deer per square kilometer (one deer per 6.3 acres) of winter range (Lubow 1996), this roughly corresponds to a potential reduction in the population of 622 animals, assuming that (1) the winter range onsite is able to support such high densities and (2) the population is at carrying capacity. A more realistic estimate, based on CDOW's population goal for deer in GMU 41 and the area of winter range available, is a density of approximately one deer per 10 acres, resulting in an estimated reduction in carrying capacity of 392 animals at the end of the 20-year period of analysis.

Standard lease terms would allow BLM to shift the well pad and road alignments by up to 200 meters to minimize habitat loss. Nonetheless, the entire area of mapped winter range is used by deer to some extent, if only for important relaxation on warm, dry slopes. Therefore, any effective habitat loss would translate to some amount of decreased carrying capacity, since winter range is a limiting factor.

Another type of analysis would use the assumption reference described in the 1997 WRRA RMP (see 1999 FSEIS):

> "[A]voidance-related disuse, in most situations, accounts for up to 50 percent of potential forage and cover use within 300 feet of a road in heavy cover types, and 600 feet in open situations. Big game avoidance is considered minor at road densities of 1.5 miles per square mile or less (about 10 percent loss of effective habitat). As road density increases, the influence increases exponentially, such that at road densities of 3 miles per square mile, effective habitat is reduced by about 30 percent."

As described in the introduction to this section, other authors (e.g., Lyon 1983; Baker and Cai 1992) have estimated higher levels of effective habitat loss. The current road density of BLM lands in the Planning Area is approximately 2.3 miles per square mile (including all motorized-use routes); an additional 24 miles of new roads would be sufficient to increase the density to 2.9 miles per square mile — approaching the density at which the 1997 WRRA RMP predicted a 30-percent reduction in use by deer and elk and from which Thomas (1979) described 52-percent and 65-percent reductions for secondary and primary roads, respectively. The 247 new oil and gas pads estimated for Alternative I, mostly located in winter range habitats below the rim, would result in 148 miles of new or widened acess roads based on BLM's assumed figure of 0.6 mile of access road per pad (Appendix H). Although this would include some unknown degree of overlap with existing roads and routes to remain open for other administrative or recreational uses, it would cause the road density to exceed the levels discussed above. However, because the current road density is the baseline condition, and because of the uncertainty around the increased density required for new oil and gas development, road density is best used in this RMPA/EIS as a qualitative factor for assessing impacts in this RMPA/EIS.

A third method for assessing road impacts was used in the 1999 FSEIS. In this approach, the GIS database was used to create a 0.125-mile buffer along roads for deer and a 0.5-mile buffer for elk based on values reported in the scientific literature (see Section 4.3.2.1). These values resulted in effective habitat loss of 103 acres and 411 acres per mile of road for deer and elk, respectively. However, this method is of limited applicability for oil and gas fields that use existing roads where practicable for access (although widened or otherwise improved) and build new roads as spurs off the existing roads. Furthermore, most of the road use occurs during construction of wells, with much less frequent use thereafter. This would be the case in the Planning Area. A 40-acre surface spacing consists of blocks 1,320 feet long on a side, with 660 feet from the edge to the center — exactly the same as the 0.125 mile buffer. Thus, this method would suggest that the entire 40-acre block would be unusable by deer. This degree of habitat fragmentation would be an issue for habitat-interior species, but mule deer are often associated with habitat edges or mosaics and are habitat generalists. Therefore, a 0.125-mile avoidance zone is probably applicable only during the construction phase. Over the long term, the access roads would function ecologically as linear surface impacts rather than frequently traveled roads. Based on these considerations, this method appears to overestimate the avoidance zone for lightly traveled oil and gas roads during the long-term production phase.

Two important difficulties in attempting to quantify effective habitat loss from oil and gas well pads and access roads are (1) the uncertainty concerning the degree to which pads will share new access roads and use existing routes and (2) the precise location, distribution, timing/sequencing, and duration of construction. On the one hand, increased traffic on existing roads would tend to increase the level of disturbance and perhaps widen the road-effect zone. On the other hand, this use would not occur concurrently throughout the entire area, instead being distributed in specific portions of the 39 square miles of winter range within BLM portions of the Planning Area in any given year. New habitat loss would occur in areas of active development, but impacts in areas of operation and maintenance would be subject to no additional direct loss, some improvement in conditions as revegetated areas become established, and a lower level of human activity and vehicular traffic.

Regardless of which method is a better predictor of impacts to mule deer winter range under Alternative I, it is clear that any estimate of reductions in effective habitat would also apply to other species using the area in other seasons. Thus, for example, this effective-loss factor of 2.5 to 3.5 described previously would apply to many species of mammals, raptors, and small birds that use the pinyon/juniper woodlands, sagebrush shrublands, and other winter range habitats to meet their annual requirements. The TL 1 stipulation would have minimal benefit to these species.

Fragmentation impacts — i.e., reducing habitat blocks to sizes too small to support a species — are probably not great for the winter range habitats that would be affected by oil and gas under Alternative I, because the habitat in this area is already patchy. Current vegetation consists of a mosaic of pinyon/juniper, sagebrush mixed with other shrubs, and semi-desert scrub, depending on elevation, slope, and aspect, rather than a homogeneous community.

Elk winter range occurs over only a small portion of the existing area available for leasing under this alternative. Mountain lion populations would be most affected by changes in abundance of their favorite prey, mule deer. The preferred habitat of mountain lions consists of steep, rugged terrain, much of which is protected by NSO stipulations within the Planning Area, thus reducing direct habitat loss and disturbance to mountain lion. Most black bear habitat occurs above the rim and would remain unavailable for development under this alternative.

Alternative I would also protect the 11,373 acres of wildlife seclusion area below the rim from ground-disturbing activities by a combination of the NSO 11 stipulation and the no-lease designation in the NOSRs under this alternative. As described in Section 3.3.2, the seclusion areas are considered important for providing rugged, wooded, relatively inaccessible (to people) terrain in which large mammals may find refuge and forage during periods of heavy human use, particularly the hunting season. Although established for big game (including deer, elk, and mountain lions), the seclusion areas are also important for other species, including small neotropical migrant birds that are attracted by the presence of relatively unfragmented forest and woodland (see Section 4.3.4).

Raptor nests would be protected by TL stipulations during the season of active use and narrower but permanent NSO buffers throughout the year (Section 3.2.2). Bald eagle roost sites along the major riparian corridors would also be protected by NSO and TL stipulations. Therefore, no direct impacts to raptors would be expected from oil and gas development. However, indirect impacts would occur from loss of hunting habitat (i.e., areas where raptors seek prey, typically much larger than the territories defended around nests). The area of low-elevation habitats where oil and gas development would occur under this alternative are mostly used by species such as the golden eagle, red-tailed hawk, American kestrel, and western screech-owl and not the more sensitive species (see Section 4.3.4).

Waterfowl and shorebird nesting at Fravert Reservoir would be protected by the TL stipulation under all alternatives.

Offsite and Cumulative Impacts

Oil and gas development on private lands within the Planning Area and general region is expected to be similar in nature and extent to the impacts on BLM portions of the Planning Area. These would result in cumulative impacts to native vegetation, including big game winter range and other habitat types. Moreover, impacts on private lands could be significantly greater than on BLM lands if reclamation of disturbed areas and avoidance of riparian areas is not performed to the same standards as required by BLM. Similarly, protective stipulations are not required of private surface owners.

Impacts to wildlife would result from increasing levels of human use and development throughout the region, regardless of management actions within the Planning Area. For larger, more wide-ranging species, the combined effect of this accumulation of smaller scale impacts can become disproportionately large and result in population declines that greatly exceed the amount of actual habitat loss. For example, the 24,978 acres of mule deer winter range in the BLM portion of the Planning Area represents approximately 31 percent of the amount in GMU 32 (Table 3-13, Section 3.3.2). Since most of the area of anticipated oil and gas development on private land is below the rim, it is also mostly winter range (see 1999 FSEIS). The combined 58,584 acres of winter range within the entire Planning Area represents 72 percent of the 81,516 acres of deer winter range in GMU 32. Development of oil and gas on private land within the Planning Area would cause impacts to the mapped elk winter range along Parachute Creek sideslopes. These areas would not be affected by development on BLM land in the Planning Area.

Assuming that the private land is developed at a 20-acre surface spacing and excludes only areas steeper than 50 percent would result in an estimated 1,112 additional pads and 4,802 acres of additional long-term disturbance during the 20-year period of analysis. The combined direct long-term impact to 6,149 acres represents 4.8 percent of the Federal and private lands in the Planning Area. The exact amount of cumulative habitat loss would depend on specifics of oil and gas development locations and rates, the degree of disturbance-related habitat avoidance or diminished use, the effectiveness of reclamation and mitigation measures, and the ability of wildlife to tolerate the increased human activity and habitat fragmentation or successfully adjust their patterns of habitat use.

Summary of Impacts and Mitigation

Above the rim, long-term adverse impacts on wildlife under Alternative I would range from negligible to minor due to lack of restrictions on cross-country OHV use, anticipated continued increases in OHV and other recreational visitation, and the likely continued spread of noxious weeds and effects on plant communities. Below the rim, impacts would be more severe (minor to moderate) because that area would be subject to the bulk of oil and gas development. In all areas, the greatest impacts (localized major) would be temporary from noise, dust, and human activity in areas of active road, pad, and well construction or other ground-disturbing activities. Riparian and wetland areas throughout the Planning Area would be protected by NSO stipulations, as would the Anvil Points cave habitat for bats and the nests of raptors and waterbirds.

Impacts to mule deer winter range associated with oil and gas development on BLM lands could range from minor, based on 4.5 percent of direct habitat loss in this habitat type, to moderate based on a reduction in effective habitat of 15.7 percent or higher using one analytical approach. The wide range in possible impacts reflects the uncertainty concerning the actual extent to which deer would avoid roads, the extent to which the TL 1 seasonal restriction on construction would minimize behavioral avoidance by deer, and any effects of habituation to increased human presence. Pinyon/juniper woodland songbirds and other smaller species in the winter range habitats could suffer minor to moderate impacts, although probably not major due to generally narrower road-effect zones.

Measures that could help mitigate the impacts of increased oil and gas development in mule deer winter range include the management prescriptions common to all alternatives (see Section 4.3.2.1) as well as the following:

1. Require the operator to sequence exploration and construction into specific areas in a given year so that disturbance and habitat loss are limited to a small portion of developable land rather than dispersed throughout.
2. Increase the amount of riparian restoration to enhance the quality and extent of this important habitat; measures could include fencing of most or all riparian corridors to exclude livestock.

While these measures would not offset the loss of winter range or other habitats described above, they would help to reduce or slow the decline and benefit a variety of other species. Impacts of different management and land-use actions under this alternative are summarized in Table 4-12. See Section 4.3.4 for a discussion of impacts to special status species (including Federally listed or candidate threatened or endangered species and BLM or USFS sensitive species) under Alternative I.

4.3.2.2 Alternative II

The management goal for Alternative II is to protect ecological values and processes, and biological diversity, by limiting surface disturbance and promoting natural ecosystem processes and functions in all systems.

Protection of wildlife would result from the application of the same NSO and TL stipulations for winter range, wildlife seclusion, and raptor nesting habitats applied under Alternative I (see above). Additional protection would result from extension of these stipulations to NGD and TL stipulations for non-oil and gas activities, no-lease restrictions for areas having wilderness character (East Fork Parachute Creek, Northeast Cliffs, and Southeast Cliffs); NGD restrictions for stream segments eligible for WSR designation; and NGD or SSR designation for other areas of sensitive watersheds and designated ACECs in the areas of Anvil Points, Magpie Gulch, East Fork Parachute Creek, and Trapper/Northwater Creek. All of these special management areas would be subject to requirements for the special mitigation measures described previously.

Table 4-12. Summary of Impacts of Alternative I to Terrestrial and Aquatic Wildlife [1]

Taxonomic or Trophic Group	Vegetation and Range Management	Recreation and Travel Management	Oil and Gas Development	Special Resource Management Designations
Large Mammals (Deer Summer Range, Elk, Mountain Lion, Black Bear)	Negligible (+)	Minor (–)	Negligible (–)	None
Crucial Deer Winter Range	Negligible (+)	Minor (–)	Minor (–)	None
Medium-size Predators and Small Mammals	Negligible (+)	Minor (–)	Negligible to Minor (–)	None
Raptors	Negligible (+)	Minor (–)	Negligible to Minor (–)	None
Waterbirds	Negligible (+)	Negligible (–)	Negligible (–)	None
Small Birds	Negligible (+)	Minor (–)	Minor (–)	None
Reptiles and Amphibians	Negligible(+)	Negligible (–)	Minor (–)	None
Aquatic Species	Negligible (+)	Negligible to Minor (–)	Negligible to Minor (–)	None

[1] *Does not include special status (threatened, endangered, candidate, or sensitive) species; see Section 4.3.4.*

A new stipulation, NGD/NSO W-2, would prohibit long-term ground-disturbing activity (i.e., lasting longer than 2 years) in the unroaded wildlife habitat below the rim in the Anvil Points and Magpie Gulch ACECs, and SSR/CSU W-3 would protect and preserve bat habitat values associated with the Anvil Points ACEC.

An SRMA designation for the Hubbard Mesa OHV area would limit travel to designated routes, and 86 miles of existing routes (mostly atop the plateau) would be either closed and rehabilitated (43 miles) or limited to administrative use (an additional 43 miles). The entire portion of the Planning Area on BLM land would be closed to cross-country travel, including over-snow travel by snowmobile. Additionally, a total of 21,382 acres in areas having wilderness character would be closed to all motorized or mechanized use.

Direct and Indirect Future Impacts

Vegetation and Range Management — Vegetation goals would focus on improving the diversity, production, and native species composition of upland and riparian sites, including closure and revegetation of some existing routes. These proposed management actions would result in moderate positive impacts. Implementation of rangeland projects would be limited, but administrative solutions would be expected to result in more rapid, long-term improvements to range condition and trend, and hence wildlife habitat quality, than under the other four alternatives.

Travel and Recreation Management — Closing 21,382 acres to motorized and mechanized travel, limiting this travel to designated routes in the remaining 45,552 acres of BLM lands (including the Hubbard Mesa SRMA and over-snow travel by snowmobile), closing/rehabilitating 43 miles or existing routes, and limiting an additional 43 miles of existing routes to administrative use would increase the amount of solitude for wildlife and reduce the area of habitat loss associated with current road-effect zones along these routes.

Of the combined 86 miles of roads closed or limited to administrative use, all but 9 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. Using the road-effect zone calculation applied for mule deer winter range under Alternative I indicates that the amount of effective habitat gain above the rim would be substantial, assuming a 250-meter-wide zone of reduced use along these roads.

Oil and Gas Development — Slightly more than 70 percent of habitats on the top and sides of the plateau would either not be leased for oil and gas development under this alternative (21,382 acres) or would be protected with NGD/NSO stipulations (31,200 acres) or SSR/CSU stipulations (7,015 acres). The TL stipulations under this alternative would apply to the 10,206 acres of deer winter range outside the no-lease and NGD/NSO areas. All of the 3,645 acres of wildlife seclusion habitat would be protected by NSO 11 and a comparable NGD for other activities, and thus subject to limited habitat loss or fragmentation.

This alternative would result in approximately 66 new well pads above the rim and 244 below the rim. The wells below the rim would result in direct, long-term loss of an estimated 1,105 acres of deer winter range, plus displacement of deer (due to behavioral avoidance) from up to one-third of the remaining winter range within the developable area. Using a factor of 3.5 for calculating effective habitat loss associated with ongoing activities permitted during the 5-month TL stipulation (see Alternative I) would yield a total loss of approximately 3,868 acres, or approximately 15.5 percent of the winter range on BLM lands in the Planning Area. This amount is similar to the area affected under Alternative I. Using an assumed density of one deer per 10 acres of winter range (see discussion for Alternative I) indicates a potential decrease in carrying capacity by approximately 387 animals by the end of the 20-year period of analysis. The same mitigation measures listed for Alternative I (see above) could be applied under Alternative II to help reduce the severity and rate of this effective habitat loss.

While Alternative II would represent oil and gas development comparable to Alternative I below the rim, it would cause a qualitative change above the rim by opening an area that is currently characterized by its naturalness and seclusion for most of the year, excluding hunting season. The estimated 66 new pads and associated roads and pipelines above the rim under this scenario would result in long-term loss of an estimated 243 acres, plus the zone of behavioral avoidance, yielding an effective habitat loss of 847 acres based on a factor of 3.5. This represents 2.4 percent of the BLM land above the rim. Although small in absolute terms, the introduction of the type of disturbance associated with oil and gas development, including noise, areas of intensive human and vehicular activity, travel by much larger vehicles than currently venture into this remote area, and light pollution (if drilling occurs at night) could have substantially greater impacts than indicated by the small amount of land.

Of particular concern is the impact of habitat loss and increased human activity during the deer and elk birthing season in late spring and early summer. Initially, deer and elk could undergo marked shifts in patterns of use, including avoidance of areas suitable for bearing and rearing their young. The initial impacts would be relatively greater than indicated by the acres of habitat loss due to the disturbance being novel. Eventually, however, the initial level of impact should decrease as the animals learn what areas remain available for seclusion. Habitats atop the plateau generally provide good vegetation and topographic cover for wildlife, except for sagebrush shrublands and mixed mountain brush along open ridgetops and some sideslopes along upper reaches of drainages. This would tend to reduce the width of the road-effect zone and the duration of avoidance of construction activities.

Habitat fragmentation is a type of impact for species with relatively restricted home-range sizes (e.g., forest-interior neotropical migrant songbirds) and does not apply to wide-ranging ungulates at the scale of fragmentation associated with oil and gas pads (versus large-scale fragmentation from quilt-work clearcutting and clearing of ski slopes). Because each new well pad and associated road and pipeline within the 40-acre surface locations atop the plateau would represents 1.9 to 2.5 acres of direct long-term impacts, increased to approximately 7 to 9 acres using the factor of 3.5, effective habitat loss in each 40-acre location would be reduced by up to 22.5 percent. This amount would probably be sufficient to cause abandonment of the locations by some habitat-interior species and reduced use by other species (see Section 3.2.2). Two additional considerations concerning fragmentation are noteworthy:

- For wide-ranging wildlife such as deer and elk, larger avoidance zones around areas of active development are such that the remaining habitat within 20-acre or 40-acre blocks, or clusters of blocks being developed concurrently, would be effectively unavailable to these species.
- Although the level of disturbance within 40-acre blocks would be more severe and concentrated than that along access roads, the latter could extend through several miles of habitat. Thus the localized, limited-duration impacts of access roads would also be substantial. For example, Thomas (1979) estimated a 65-percent decrease in use of summer range by elk at a density of 3 miles of primary roads per square mile of habitat. Access roads for oil and gas development would easily meet his definition of a primary ("main") road during the construction period.
- For species with smaller home ranges, such as most of the forest-interior songbirds and small mammals, the existing conifer habitat is already quite linear due to the ridge-and-valley topography atop the plateau. Therefore, these habitats may already have too much edge to support forest specialists to the extent indicated by the numbers of acres present.
- For forest-interior species, the natural topography and existing degree of road fragmentation (2.3 miles of motorized routes per square mile) may make further fragmentation disproportionately more severe due to the limited capacity of the habitat blocks to absorb further habitat loss.

Impacts on other species, including raptors and the diverse and abundant small bird and small mammal species associated with the types of habitat atop the plateau (see Section 3.3.2), would also be greater than under Alternative I due to opening of more of the highlands to oil and gas development. However, the most important habitats (including aspen, spruce/fir forest, old-growth Douglas-fir forest, and riparian corridors) would be largely protected because of the no-lease designations, NGD/NSO and SSR/CSU stipulations, and special mitigation requirements related to areas having wilderness character, streams eligible for WSR designation, ACECs, or special status plant and wildlife species.

Offsite and Cumulative Impacts

These impacts would be similar to those for Alternative I, except that the overall loss of deer winter range in the Planning Area and region would be reduced, while loss of deer and elk summer range and fawning/calving habitat (and other habitat atop the plateau) would also occur.

Combined long-term impacts on Federal and private lands in the Planning Area are estimated at 6,148 acres, or 4.8 percent of the Planning Area during the 20-year period of analysis. Approximately 96 percent of this impact would occur in areas below the rim. Because the potential development on private land within the Planning Area is almost totally limited to winter range below the rim, no cumulative impacts to summer habitat (and year-round habitat for resident species atop the plateau) would occur as a result of development above the rim. However, impacts to offsite highland habitat could occur with oil and gas or other development and increased recreational use in other nearby areas, potentially including other BLM lands, National Forest lands, and some private lands. To the extent that highland habitats are affected elsewhere, the impacts atop the plateau under Alternative II would represent a cumulative impact.

Beneficial impacts of road closures and prohibiting cross-country travel would help offset anticipated increases in recreational use or other vehicle-related disturbance offsite as a consequence of continued human population growth. The degree of offset would depend on the specific timing, rate, and distribution of development (e.g., clustered or dispersed) under this alternative. These specifics are unknown at present.

Summary of Impacts and Mitigation

Overall, Alternative II would have minor to localized moderate long-term adverse impacts to wildlife. More severe (localized major) temporary impacts would occur in areas of active road, pad, or well construction or other ground-disturbing activities. Beneficial impacts from travel restrictions and vegetation/range management would offset much of the adverse impact from oil and gas development. Levels of impacts would be comparable among species/trophic groups.

The highly sensitive and important stream corridors atop the plateau would be protected by WSR eligibility, while these and lesser streams below the rim would also carry the NGD/NSO stipulation for riparian and wetland areas. The NGD/NSO for high- and moderate-risk fish habitat under this alternative (see Section 4.3.4) would also benefit other wildlife; these stipulations are not included under Alternative I, reducing the level of protection for riparian and aquatic systems. Similar NGD/NSO protection would also apply to the Anvil Points cave area and, along with TLs, to raptor and waterbird nesting areas. The old-growth Douglas-fir remnant communities would also be protected by an NGD/NSO, preserving unfragmented habitat for forest-interior small birds.

The greatest impacts under this alternative would be to developable portions of mule deer critical winter range (although less extensive than for Alternative I) and to seasonally sensitive uses of deer and elk production habitat and raptor and small bird breeding habitat atop the plateau. The latter group of impacts would be negligible in most of the highlands but locally moderate to major for some species in localized areas of oil and gas development. The severity of these impacts would be offset to some extent by the decrease in OHV use, especially cross-country travel, and by the presence of considerable areas of SSR/CSU or special mitigation designations with the associated opportunities for additional mitigation measures.

Special mitigation measures that could be applied under this alternative to lessen the impact on deer, elk, and other species — and which would be in addition to the management prescriptions that would apply to all alternatives (see Section 4.3.1) — could include the following:

1. Limit construction, drilling, and major routine maintenance atop the plateau to the winter months (November through April) when elk, deer, and mountain lions are generally not present atop the plateau, and when black bears are hibernating.
2. Alternatively, prohibit drilling and non-essential activities (regularly scheduled major maintenance) during the late spring/early summer season (May through mid-July), which encompasses the birthing season for deer and elk, the early rearing season for these species and black bears and mountain lions, and the nesting season for songbirds and several hawk species.
3. In areas of summer range and calving/fawning habitat, construct fencing to exclude cattle but allow passage of deer and elk along stream corridors to increase the amount of cover and forage for these species while concurrently improving habitat for songbirds, small mammals, amphibians, and aquatic species.
4. In areas of winter range, require that final revegetation include native shrubs in the seed mix and planting of native shrub "tubelings."
5. Require use of a biodegradable erosion-control mat to enhance revegetation success.

Table 4-13 summarizes direct and indirect impacts to major groups of terrestrial and aquatic wildlife under Alternative II. For impacts to special status species, see Section 4.3.4.

Table 4-13. Summary of Impacts of Alternative II to Terrestrial and Aquatic Wildlife [1]

Taxonomic or Trophic Group	Vegetation and Range Management	Recreation and Travel Management	Oil and Gas Development	Special Resource Management Designations
Large Mammals (Deer Summer Range, Elk, Mountain Lion, Black Bear)	Moderate (+)	Moderate (+)	Minor (–)	Moderate (+)
Crucial Deer Winter Range	Moderate (+)	Moderate (+)	Minor (–)	Minor (+)
Medium-size Predators and Small Mammals	Moderate (+)	Moderate (+)	Minor (–)	Moderate (+)
Raptors	Moderate (+)	Moderate (+)	Minor (–)	Moderate (+)
Waterbirds	Negligible (+)	Minor (+)	Negligible (–)	Minor (+)
Small Birds	Moderate (+)	Moderate (+)	Minor (–)	Moderate (+)
Reptiles and Amphibians	Moderate (+)	Moderate (+)	Minor (–)	Moderate (+)
Aquatic Species	Moderate (+)	Moderate (+)	Minor (–)	Moderate to localized Major (+)

[1] *Does not include special status (threatened, endangered, candidate, or sensitive) species; see Section 4.3.4.*

4.3.2.3 Alternative III – Preferred Alternative

The objective for ecological values under this alternative is to protect important ecological values and processes by developing and implementing management prescriptions that would limit surface disturbance and mitigate the effects of surface disturbance. This objective is within the context of an overall management objective for Alternative III of balancing oil and gas development with focused mitigation. For wildlife, this includes protective measures for special status species, including the Colorado River cutthroat trout (Section 4.3.3). This alternative includes designation of the Trapper/Northwater Creek drainage as a WMA, with the specific management objectives listed in Table 2-3.

NGD/NSO and TL stipulations related to raptor nests and nesting areas would continue, as would the waterfowl and shorebird nesting area TL at Fravert Reservoir. The TL stipulation for mule deer winter range would also be applied.

No special protection would be provided in the areas identified under Alternative II as having wilderness character. However, two ACECs would be designated (East Fork Parachute Creek and Trapper/Northwater Creek), the WSR-eligible stream corridors would be protected, and the entire Parachute Creek watershed would be given special management focus by a WMA designation.

The Hubbard Mesa SRMA for OHV recreation under Alternative II would also be designated under this alternative, with travel limited to designated routes. Not including the SRMA, a total of approximately 26 miles of existing routes would be closed, and an additional 24 miles would be limited to administrative use.

Alternative III would not designate the big game seclusion areas of Alternative II, meaning that the NGD/NSO stipulation for this specific resource would be removed. However, some seclusion would be provided through restrictions on travel, management actions to enhance big game habitat where practicable, and measures to preclude, limit, or mitigate habitat loss within the seclusion habitat. Fortuitously, some of these habitats would be protected by an NGD/NSO aimed at one or more other resource values, such as steep slopes, sensitive viewsheds, and remnant plant communities (including old-growth Douglas-fir). If this alternative were selected and implemented without these other NGD/NSO stipulations, the resultant habitat loss, fragmentation, or disturbance of the seclusion areas would be expected to affect deer and elk populations adversely.

Direct and Indirect Future Impacts

Vegetation and Range Management — Under Alternative III, wildlife habitat types (vegetation communities) would not receive the same management focus as in Alternative II. Measures to improve the upland vegetation and riparian/wetland condition of these areas would be beneficial at a localized level but diluted overall by the potential for decline in other areas. Rangeland improvements and administrative solutions to livestock issues to be implemented under Alternative III are expected to result in more rapid improvements to range condition and trend than under Alternative I, but less than under Alternative II (see Section 4.3.1.4).

Travel and Recreation Management — Prohibiting cross-country motorized or mechanized travel throughout the Planning Area (including the Hubbard Mesa SRMA), limiting 24 miles of existing routes to administrative use, and closing/rehabilitating an additional 26 miles of existing routes would increase the amount of solitude for wildlife and reduce the area of habitat loss associated with current road-effect zones along these routes.

Of the 50 miles of roads closed or limited to administrative use, all but 9 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. Using the road-effect zone calculation applied for mule deer winter range under Alternative I indicates that the amount of effective habitat gain above the rim would be substantial, assuming a 250-meter-wide zone of reduced use along existing roads.

Deer and elk hunting opportunities and levels could decline as the attractiveness of the area to hunters decreases (due to oil and gas operations), regulations become more restrictive due to lower deer populations, and cross-country OHV travel is prohibited. In the case of deer, for example, population declines in 1999 triggered a change in regulations and resulted in a 72-percent decrease in hunter numbers within the Planning Area. Although unlikely, deer population declines associated with this alternative could exceed those that precipitated the hunting reduction in 1999, depending on specifics of where and at what rate new oil and gas development occurs and whether seasonal migration routes are affected.

Oil and Gas Development — Alternative III would result in an estimated 402 new well pads, of which 363 would be below the rim in big game winter range. NGD/NSO and TL stipulations related to raptor nests and nesting areas would continue, as would the waterfowl and shorebird nesting area TL at Fravert Reservoir. Oil and gas development, including construction or widening/improvement of 218 miles of access roads, would result in direct habitat loss of 1,595 acres of mule deer winter range in 20 years. Using the factor of 3.5 to estimate effective habitat loss indicates a decrease of 5,582 acres, or 22.3 percent of the amount on BLM lands in the Planning Area.

The existing 5-month TL stipulation for oil and gas development in big game winter range, intended to reduce disturbance and displacement during the crucial months of December through April, would also be applied under this alternative. The winter months create stresses on deer and elk due to a combination of reduced food availability and nutrition, cold temperatures, and difficulty in moving through deep snow. The protection afforded by the 5-month TL is more important under Alternative III than either of the two previous alternatives due to the greater total development in lower elevation (winter) habitats and the additional drilling intensity during the deferral period.

Therefore, the actual drilling intensity at lower elevations under this alternative is greater than indicated by the total number of pads and miles of new roads, because the bulk of these would be completed in less time than the 20-year period of analysis (potentially as little as 10 years).

Habitats on top of the plateau would be subject to less impact from oil and gas development than under the two previous alternatives. This area includes big game summer range and other high-quality habitats for non-game species including raptors and a rich assemblage of small birds and small mammals (see Section 3.3.2). An estimated 39 new pads and 166 acres of long-term disturbance, including that along 23 miles of new or widened access roads, would result in effective loss of 581 acres using the factor of 3.5. This represents 1.7 percent of these habitats on BLM lands — compared to 2.4 percent under Alternative II.

These impacts would occur in areas that are currently essentially natural and mostly untrammeled. Assuming that oil and gas development is dispersed throughout the area, the amount of development under Alternative III would fragment the habitat into smaller unbroken blocks with proportionately more edge and less habitat interior than at present. Only the WSR-eligible stream corridors and the NGD/NSO stipulation for Colorado River cutthroat would provide substantial seclusion from development above the rim. Together, human activity and habitat fragmentation associated with oil and gas development atop the plateau would have proportionately less impact on deer fawning, elk calving and summer use, and other species (e.g., habitat-interior songbirds and furtive mammal species) than previous alternatives during the deferral period but greater impact on these species once drilling is initiated. Thus, benefits of deferring development on top of the plateau would be offset by the greater development intensity once it begins and the much greater area ultimately available for development.

To help reduce impacts to sensitive, furtive, or habitat-interior species from increased human activity at higher elevations following the deferral period, BLM (with input from CDOW) may conclude that one of two alternative approaches should be emphasized:

- Encourage dispersed drilling to minimize the number of overlapping disturbance envelopes, thus providing nearby refugia for less mobile species or those with small home ranges.
- Encourage concentrated drilling, leaving other areas available to provide seclusion for more mobile, wide-ranging species.

The first option would benefit smaller and more territorial species, while the second option would benefit species such as elk and large carnivores.

Additionally, BLM and CDOW could conclude that the area atop the plateau should be closed to hunting in areas of active development following the deferral period. Such a restriction could be necessary for the safety of hunters as well as oil and gas workers, and by the loss of some existing refuge for big game animals. Creating unhunted areas on top of the plateau could also facilitate the habituation of deer, elk, and large carnivores to the oil and gas operations in these areas.

While disturbance-related impacts are difficult to avoid, the surface-use restrictions under Alternative III — with most of the development being in SSR/CSU areas — would give BLM the ability to reduce direct habitat impacts by requiring that a proposed ground-disturbing activity be shifted by more than 200 meters to protect a resource or to require special mitigation measures.

Another feature of Alternative III is the lack of specific protection of wildlife seclusion areas. These areas generally correspond to deer/elk seasonal migration routes between summer and winter range. The Roan Cliffs are a formidable obstacle to movement along most of their length, with only a few passages allowing elevational migration. If the NGD/NSO stipulations that coincidentally protect these movement routes under Alternative III (i.e., stipulations intended to protect other resource values) were dropped under this alternative, impacts to deer and elk movement would be severe unless oil and gas operations were sited to avoid creation of a migration barrier. The 200-meter relocation of ground-disturbing activities permissible under standard restrictions and limitations would probably be insufficient to ensure unimpeded movement of deer and elk through these confined corridors — especially in light of the more intensive development than under Alternatives I and II (in terms of wells per year) anticipated atop the plateau at the end of the deferral period.

Offsite and Cumulative Impacts

Below the rim, the types of offsite and cumulative wildlife impacts under Alternative III would be similar to those for Alternative II. However, the magnitude of offsite impacts would be greater due to the increased amount of oil and gas development and the more intensive development rate during the deferral period. This could shift more animals to offsite areas, potentially affecting the habitat quality of the offsite areas due to overuse and interfering with movement patterns of large, mobile species (e.g., deer).

Above the rim, both the greater level of oil and gas development than under Alternative II and, especially, the considerably greater intensity of development following the deferral period are likely to lead to the following offsite impacts after drilling begins on top of the plateau: (1) displacing more animals from onsite to offsite areas, with the associated adverse impacts to those lands, and (2) potentially reducing populations of elk and other large or wide-ranging species for which the home range includes both onsite and offsite areas.

Cumulatively, the onsite and offsite impacts resulting from implementation of this alternative would be in addition to habitat loss and disturbance impacts associated with oil and gas development in other areas. Similarly, these impacts would be cumulative to impacts from other sources, such as grazing and increasing levels of recreational use. Potentially, the intensity of oil and gas development could reach a level that reduces the attractiveness of parts of the area to recreationists — especially atop the plateau following the deferral period.

Combining the potential long-term impacts in the BLM portion of the Planning Area with likely development levels on private lands (see previous alternatives) would result in a potential direct loss of 5,923 acres, roughly 3.1 percent of the total area. Roughly 96 percent of this total would be in habitats below the rim.

Summary of Impacts and Mitigation

Overall, Alternative III would have minor to localized moderate long-term adverse impacts on wildlife. Compared to Alternative II, the impacts would be somewhat greater for species primarily using or relying on habitats below the rim but generally less for species on top of the plateau due to the estimated 16-year oil and gas deferral. Following the deferral period, the estimated annual development rate at the higher elevations (approximately 17 wells per year) would be greater than for Alternative II (approximately 4.4 wells per year, assuming that the drilling is relatively uniform throughout the 20-year period). Thus, while the total amount of development would be less than under Alternative II, the greater intensity of development following the deferral period would be greater and thus have more impact to sensitive or furtive species once it begins.

Another consideration is that the sudden increase in development from none to an estimated 17 wells per year would allow less opportunity for habituation than the slower development rate atop the plateau under Alternative II. Again, however, impacts from oil and gas would be virtually non-existent during the deferral.

Beneficial effects of travel restrictions, vegetation and range management, and special protection of WSR-eligible streams, and wilderness values, and the Parachute Creek WMA would help offset adverse impacts from oil and gas development. More severe temporary impacts would occur in proximity to active road, pad, or well construction due to noise, dust, and human activity, especially once development begins at the higher elevations. Other ground-disturbing activities could have similar effects, although at a lower level.

Discussions concerning impacts of Alternative II to species that inhabit pinyon/juniper and other winter range habitats and the myriad species that occupy habitats atop the plateau also apply to Alternative III. However, the severity of impacts under this alternative would be less due to fewer wells and less associated human activity, and larger areas of SSR/CSU or special mitigation protection instead of NGD/NSO stipulations. While the ability to shift a proposed ground-disturbing activity by more than 200 meters to avoid a sensitive resource with an SSR/CSU stipulation is preferable to the standard stipulation of up to 200 meters, the protection is clearly not as great as with an NGD/NSO.

The highly sensitive and important stream corridors atop the plateau would be protected by WSR eligibility, the East Fork Parachute Creek and Trapper/Northwater Creek ACECs, the riparian and wetland NGD/NSO, and the Colorado River cutthroat trout moderate- and high-risk habitat NGD/NSO. Raptor and waterbird nesting areas would continue to be protected.

Mule deer winter range could undergo an effective loss of 36 percent on BLM lands in the Planning Area, a moderate to potentially major impact in terms of reduced carrying capacity of this limiting resource. The potential for this outcome depends on the exact extent, timing, and duration of oil and gas development, as well as the effectiveness of mitigation measures. Greater-than-anticipated habituation of deer to oil and gas activities could also reduce the severity of the impact. Increased fragmentation of the pinyon/juniper woodland under this alternative would also increase the potential that one or more habitat-interior or habitat-specialist species could be exterminated from the Planning Area, or at least markedly reduced.

Effective loss of summer range would be approximately 70 percent that of Alternative II due to deferred development but would occur at approximately four times the annual rate once initiated. While habitat fragmentation associated with pads and access roads would be less under this alternative than Alternative II, this benefit would apply only during the 20-year period of analysis. Eventually, the decreased amount of surface-use restrictions under Alternative III would further decrease the carrying capacity for year-round or summer-resident habitat-interior species or other forest specialists atop the plateau. Fragmentation of currently small areas of conifer forest and mountain grassland could be especially detrimental due to the limited extent of these habitats on BLM lands (see Section 3.2.1) and their importance to some species. The riparian/wetland areas also have a small areal extent and are linear features, making them more vulnerable to fragmentation. These areas would be protected from direct impacts by NSO 2 and an analogous NGD for other land uses or management actions, but indirect impacts from disturbance could cause effective habitat fragmentation. These impacts would be expected to be lower in the two ACECs atop the plateau.

The combined effective habitat loss of 6,164 acres in BLM lands would represent an 8-percent reduction in habitat available to avian and mammalian predators for hunting and a comparable reduction in prey abundance. Therefore, mountain lions and black bears would be reduced, probably to a greater extent than indicated due to their furtiveness. For raptors, even the protective NGD/NSO and TL stipulations relative to raptor nesting may not be sufficient to maintain current populations, depending on precisely where and in what manner oil and gas development occurs. Forest-interior species such as the northern goshawk and boreal owl would probably be disproportionately affected due to the habitat fragmentation that would result from new well pads and access roads.

Quantifying impacts to wildlife is difficult due to the many project-, climate-, and behavior-related unknowns, unknowns concerning oil and gas development rate locations, and impacts of other land uses and management activities (e.g., recreation, range management) that affect species differently. Nonetheless, it is reasonable to conclude that Alternative III could cause the BLM portion of the Planning Area to suffer approximate declines of 33 percent in deer, 5 percent in elk, and 9 percent in overall wildlife abundance, as well as an unknown number of localized extirpations.

Although restricting motorized and mechanized travel to designated routes throughout the Planning Area would benefit a variety of species and resource values, it is unlikely that this restriction would fully offset the adverse impacts from the anticipated level of oil and gas development, especially after the deferral period. Table 4-14 summarizes impacts to fish and wildlife under Alternative III. See Section 4.3.4 for a discussion of impacts to special status species.

Table 4-14. Summary of Impacts of Alternative III to Terrestrial and Aquatic Wildlife [1]

Taxonomic or Trophic Group	Vegetation and Range Management	Recreation and Travel Management	Oil and Gas Development	Special Resource Management Designations
Large Mammals (Deer Summer Range, Elk, Mountain Lion, Black Bear)	Minor (+)	Moderate (+)	Moderate (–)	Moderate (+)
Crucial Deer Winter Range	Minor to Moderate (+)	Minor (+)	Moderate (–)	None
Medium-size Predators and Small Mammals	Minor (+)	Moderate (+)	Moderate (–)	Moderate (+)
Raptors	Negligible (+)	Moderate (+)	Moderate (–)	Moderate (+)
Waterbirds	Minor (+)	Minor (+)	Negligible (–)	Minor (+)
Small Birds	Minor (+)	Moderate (+)	Moderate (–)	Moderate (+)
Reptiles and Amphibians	Negligible to Minor (+)	Moderate (+)	Minor (–)	Moderate (+)
Aquatic Species	Minor (+)	Moderate (+)	Minor to localized Moderate (–)	Moderate (+)

[1] *Does not include special status (threatened, endangered, candidate, or sensitive) species; see Section 4.3.4.*

4.3.2.4 Alternative IV

The objective for ecological values under this alternative is to protect important ecological values and processes by developing and implementing management prescriptions that would limit surface disturbance and mitigate the effects of surface disturbance. This objective is within the context of an overall management objective for Alternative IV of balancing oil and gas development with focused mitigation. For wildlife, this includes protective measures for special status species, including the Colorado River cutthroat trout (Section 4.3.3). This alternative includes designation of the Trapper/Northwater Creek drainage as a WMA, with the specific management objectives listed in Table 2-3.

NGD/NSO and TL stipulations related to raptor nests and nesting areas would continue, as would the waterfowl and shorebird nesting area TL at Fravert Reservoir.

The TL stipulation for mule deer winter range would not be retained, but a shorter (60-day) TL would be applied as a COA. The 60-day period includes January and February, while the 5-month TL stipulation of Alternatives I through III also includes December, March, and April. It is difficult to assess the difference between these two levels of protection quantitatively. While January and February are the two coldest months in the region, they typically do not produce as deep or protracted a snow cover as March and April, which is the time when the animals' energy reserves are most depleted. Late winter/early spring is particularly difficult for a pregnant doe, which must ingest enough food to sustain itself and its fetus (sometimes twins) and must expend more energy to avoid a source of disturbance. Both an inability to obtain sufficient food intake and excessive stress from disturbance may lead to mortality of the fetus. Because the exact relationship between a 2-month and 5-month TL cannot be calculated — and in fact is likely to vary from year to year and site to site — this analysis assumes that a 2-month COA is only 40 percent as beneficial.

Alternative IV would also exclude the big game seclusion areas designated under Alternative II, meaning that the NGD/NSO stipulation for this specific resource would be removed, but some seclusion would be provided through restrictions on travel, management actions to enhance big game habitat where practicable, and measures to preclude, limit, or mitigate habitat loss within the seclusion habitat. Fortuitously, some of these habitats would be protected by an NGD/NSO aimed at one or more other resource values, such as steep slopes, sensitive viewsheds, and remnant plant communities (including old-growth Douglas-fir). If this alternative were selected and implemented without these other NGD/NSO stipulations, the resultant habitat loss, fragmentation, or disturbance of the seclusion areas would be expected to affect deer and elk populations adversely.

No special protection would be provided in areas identified under Alternative II as having wilderness character. However, a total of 9,006 acres would be managed in ways that would protect roadlessness and naturalness (Map 35). Additionally, two ACECs would be designated (East Fork Parachute Creek and Trapper/Northwater Creek), including the same areas as Alternative III. Protection of stream and riparian habitats along the WSR-eligible streams would also be the same as Alternatives II and III. A WMA would also be designated, but only for Trapper/Northwater Creek.

The Hubbard Mesa SRMA for OHV recreation under Alternatives II and III would also be designated, with motorized and mechanized travel limited to designated routes. Not including the SRMA, a total of approximately 26 miles of existing routes would be closed and additional 24 miles limited to administrative use.

Direct and Indirect Future Impacts

Vegetation and Range Management — Under Alternative IV, wildlife habitat types (vegetation communities) would not receive the same management focus as in Alternative II. Measures to improve the upland vegetation and riparian/wetland condition of these areas would be beneficial at a localized level but diluted overall by the potential for decline in other areas. Rangeland improvements and administrative solutions to livestock issues to be implemented under Alternative IV are expected to result in more rapid improvements to range condition and trend than in Alternative I, but less than Alternative II (see Section 4.3.1.4).

Travel and Recreation Management — Prohibiting cross-country motorized or mechanized travel throughout the Planning Area (except for the Hubbard Mesa SRMA), limiting 24 miles of existing routes to administrative use, and closing/rehabilitating an additional 26 miles of existing routes would increase the amount of solitude for wildlife and reduce the area of habitat loss associated with current road-effect zones along these routes.

Of the 50 miles of roads closed or limited to administrative use, all but 9 miles would be atop the plateau 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. Using the road-effect zone calculation applied for mule deer winter range under Alternative I indicates that the amount of effective habitat gain above the rim would be substantial, assuming a 250-meter-wide zone of reduced use along existing roads.

Deer and elk hunting opportunities and levels could decline as the attractiveness of the area to hunters decreases (due to oil and gas operations), regulations become more restrictive due to lower deer populations, and cross-country OHV travel on top of the plateau is prohibited. In the case of deer, for example, population declines in 1999 triggered a change in regulations and resulted in a 72-percent decrease in hunter numbers within the Planning Area. Although unlikely, deer population declines associated with this alternative could exceed those that precipitated the hunting reduction in 1999, depending on specifics of where and at what rate new oil and gas development occurs and whether seasonal migration routes are affected.

Oil and Gas Development — Alternative IV would result in an estimated 449 new well pads, of which 323 would be below the rim in big game winter range. NGD/NSO and TL stipulations related to raptor nests and nesting areas would continue, as would the waterfowl and shorebird nesting area TL at Fravert Reservoir. Oil and gas development, including construction or widening/improvement of 194 miles of access roads, would result in direct habitat loss of 1,466 acres in mule deer winter range. Using the factor of 3.5 to estimate effective habitat loss indicates a decrease of 5,131 acres, or 20.5 percent of the amount on BLM lands in the Planning Area.

Alternative IV would eliminate the existing 5-month TL stipulation for oil and gas development on winter range, currently in place to reduce disturbance and displacement of wintering deer, but a shorter (60-day) TL would be applied as a COA. The 60-day period includes January and February, while the 5-month TL stipulation of Alternatives I, II, and III also includes December, March, and April. It is difficult to assess quantitatively the difference between these two levels of protection. While January and February are the two coldest months in the region, they typically do not produce as deep or protracted snow cover as March and April, which is the time when the animals' energy reserves are most depleted. Late winter/early spring is particularly difficult for a pregnant doe, which must ingest enough food to sustain themselves and its fetus (sometimes twins) and expend more energy to avoid disturbance. Both excessive stress from disturbance and an inability to obtain sufficient food may lead to mortality of the fetus.

Because the exact relationship between 2-month and 5-month TLs cannot be calculated — and in fact is likely to vary from year to year and site to site — this analysis assumes that a 2-month COA is only 40 percent as beneficial across the entire 5-month winter season. This is represented mathematically using the factor of 8.75 (3.5 ÷ 0.4) to estimate effective (disturbance-related) habitat loss in winter range during the 5-month winter season. However, this applies only to construction during the winter season and not to ongoing operational activities, which are assumed to remain represented by the factor of 3.5. Therefore, the elevated loss of winter range would apply only to oil and gas activities during the 5-month winter-use season, and the time-weighted impact factor is ([5 x 8.75] + [7 x 3.5]) ÷ 12 = 5.7. Using this factor yields an effective habitat loss of 8,356 acres (33.5 percent), roughly equivalent to 836 animals assuming a density on winter range of one deer per 10 acres (see introduction to Section 4.3.2).

As an alternative analysis method, the estimated 194 miles of new roads could include approximately 124 miles on winter range, assuming a proportional distribution through the area below the rim. This equates to about 3.2 miles of road per square mile of habitat. As discussed previously, this density would be expected to reduce deer use by about 32 percent (Thomas 1979). Therefore, the range of potential decline in mule deer carrying capacity is 513 animals (assuming that the 60-day COA is as effective as the 5-month TL stipulation) to an estimated 799 animals using the road-density method and 836 animals assuming that the 60-day COA is only 40-percent effective compared to the 5-month stipulation.

As described for the previous alternatives, some mitigation measures such as clustering of wells in a given year, implementing measures to improve unimpacted habitat, and avoiding or limiting new road crossings of drainage corridors could reduce and partially offset the unavoidable adverse impacts.

Big game summer range and other high-quality habitats for non-game species atop the plateau, including raptors and a rich assemblage of small birds and small mammals (see Section 3.3.2), would also be subject to more impacts from oil and gas development than under the two previous alternatives. An estimated 126 new pads and 474 acres of long-term disturbance, including 76 miles of new or widened access roads, would result in effective loss of 1,659 acres, representing 4.8 percent of highland habitat on BLM lands — roughly double the amount under Alternative II. Although small in terms of acres, these impacts would occur in an area that currently is essentially natural and mostly untrammeled. Therefore, the level of new activity and associated disturbance and habitat fragmentation would have some impact on deer fawning, elk calving and summer use, and other species, including habitat-interior and habitat-specialist songbirds, proportionally greater than the previous alternatives. Assuming that oil and gas development is dispersed around the area, this level of development, while small, is likely to eliminate existing large, contiguous tracts of undisturbed habitat. Only the WSR-eligible stream corridors and the NGD/NSO stipulation for Colorado River cutthroat would provide substantial seclusion from development above the rim.

Habitat fragmentation under Alternative IV would also be greater than for the previous Alternatives, except for areas below the rim under Alternative III. Although the fragmentation effect on the surrounding habitat of each pad would be the same as discussed for Alternatives II and III, the effect of more pads above the rim (126 and 39, respectively) would be to fragment a greater portion of highland habitat. Most of the additional oil and gas development (compared to Alternative II) would be above the rim in areas designated for SSR/CSU stipulations. This would ameliorate potential adverse impacts by allowing BLM to require that a proposed ground-disturbing activity be shifted by more than 200 meters to reduce potential impacts to specific resources. The special mitigation measures listed for Alternative II could also be required in the SSR/CSU areas and in other areas with special management designations. Special mitigation could be specified as an LN or required as a COA.

Compared to Alternative III, which is assumed to have the same number of wells, habitat fragmentation and disturbance impacts under Alternative IV would be slightly less for areas below the rim but substantially more for areas atop the plateau due to the estimated 16-year deferral period in Alternative III (see Section 4.3.2.3). Total impacts under Alternative IV during the 20-year period of analysis would also be higher due to a larger number of pads and miles of new or widened access roads. However, the estimated annual drilling rate atop the plateau would be less under Alternative IV than under Alternative III once drilling at the higher elevations begins.

Alternative IV would not provide specific protection to wildlife seclusion, which generally corresponds to seasonal migration routes for deer and elk between summer and winter range. The Roan Cliffs are a formidable obstacle to movement along most of their length, with only a few passages allowing elevational migration. If the NGD/NSO stipulations that coincidentally protect these movement routes under Alternative IV (i.e., stipulations intended to protect other resource values) are dropped from this alternative, impacts to deer and elk movement would be severe unless oil and gas operations are sited to avoid creation of a migration barrier. The 200-meter relocation of ground-disturbing activities permissible under standard restrictions and limitations would probably not be sufficient to ensure unimpeded movement of deer and elk through these confined corridors.

Offsite and Cumulative Impacts

The types of offsite and cumulative wildlife impacts under Alternative IV would be similar to those under Alternative III. However, the impact levels could differ substantially due to the 2-month (instead of 5-month) TL for big game winter range under Alternative IV, and the deferral of drilling on top of the plateau until the last part of the 20-year period of analysis.

The 2-month TL could result in greater impacts to winter range, potentially displacing wildlife and adversely affecting movement patterns. For example, if deer concentrate in areas that offer some seclusion, whether on private or BLM lands, habitat quality could suffer in those areas due to overuse. If the areas to which deer are displaced are of lower quality than those they leave, or if the dispersal causes behavioral or physiological stress in the animals, the result could be a lower rate of winter survival.

Overall, the more protracted period of oil and gas development at higher elevations under Alternative IV than Alternative III (i.e., no deferral for development on top) would probably have less adverse impact on offsite wildlife. Because development would occur at a more uniform pace, wildlife would have a better opportunity to habituate and adjust their patterns of habitat use. This would be expected to reduce the amount of displacement to offsite areas compared to the rapid development on top of the plateau after the deferral period under Alternative III.

Cumulatively, the onsite and offsite impacts resulting from implementation of this alternative would be in addition to habitat loss and disturbance impacts associated with oil and gas development in other areas. Similarly, these impacts would be cumulative to impacts from other sources, such as grazing and increasing levels of recreational use. Potentially, the intensity of oil and gas development could reach a level that reduces the attractiveness of parts of the area to recreationists — especially atop the plateau following the deferral period.

Combining the potential long-term impacts in the BLM portion of the Planning Area with likely development levels on private lands (see previous alternatives) would result in a potential direct loss of 6,741 acres, roughly 5.3 percent of the total area. Nearly 93 percent of this total would be in habitats below the rim.

Summary of Impacts and Mitigation

Overall, Alternative IV would have minor to localized moderate long-term adverse impacts on wildlife, a generally greater level for each species/trophic group than for Alternative II. For mule deer, the potential decrease in effective winter range carrying capacity would be moderate to localized major, and potentially higher if the 60-day TL is less effective than assumed in this assessment.

Beneficial effects of travel restrictions, vegetation/range management, and special protection of WSR and wilderness values would help offset adverse impacts from oil and gas development. More severe temporary impacts would occur in proximity to active road, pad, or well construction due to noise, dust, and human activity. Other ground-disturbing activities could have similar effects.

Discussions concerning impacts of Alternatives II and III to species that inhabit pinyon/juniper and other winter range habitats and the myriad species that occupy habitats atop the plateau also apply to Alternative IV. Compared to Alternative II, the severity of impacts would be greater due to more wells and associated human activity and larger areas of SSR/CSU or special mitigation protection instead of NGD/NSO stipulations. While the ability to shift a proposed ground-disturbing activity by more than 200 meters to avoid a sensitive resource with an SSR/CSU stipulation is preferable to the standard stipulation of up to 200 meters, the protection is clearly not as great as with an NGD/NSO.

Compared to Alternative III, impacts under this alternative would be greater overall due to the greater number of pads, especially the much larger number of wells atop the plateau in 20 years, and the designation of the Hubbard Mesa SRMA for open OHV travel. The greatere number of wells atop the plateau would be offset to some extent by the lower annual development rate assumed for the top of the plateau under Alternative IV than for the same area following the deferral period under Alternative III.

The highly sensitive and important stream corridors atop the plateau would be protected by WSR eligibility, the East Fork Parachute Creek and Trapper/Northwater Creek ACECs, the riparian and wetland NGD/NSO, and the Colorado River cutthroat trout moderate- and high-risk habitat NGD/NSO. Raptor and waterbird nesting areas would continue to be protected. The Trapper/Northwater WMA would also provide BLM with some flexibility in managing for specific resources, including the ability to require special mitigation measures.

Mule deer winter range could undergo an effective loss of 33 percent on BLM lands in the Planning Area, a moderate to potentially major impact in terms of reduced carrying capacity of this limiting resource. The potential for this outcome depends on the exact extent, timing, and duration of oil and gas development, as well as the effectiveness of mitigation measures. Greater-than-anticipated habituation of deer to oil and gas activities could also reduce the severity of the impact. Increased fragmentation of the pinyon/juniper woodland under this alternative would also increase the potential that one or more habitat-interior or habitat-specialist species could be exterminated from the Planning Area, or at least markedly reduced.

Effective loss of summer range in 20 years would also be approximately twice as great as under Alternative II and more than three times as great as under Alternative III. Habitat fragmentation associated with the larger number of pads and associated access roads would further decrease the carrying capacity for year-round or summer-resident habitat-interior species or other forest specialists atop the plateau. Fragmentation of the currently small areas of conifer forest and mountain grassland could be especially detrimental due to the limited extent of these habitats within BLM lands (see Section 3.2.1) and their importance to some species. The riparian/wetland areas also have a small areal extent and are linear features, making them more vulnerable to fragmentation. These areas would be protected from direct impacts by NSO 2 and an analogous NGD for other land uses or management actions, but indirect impacts from disturbance could cause effective habitat fragmentation. These impacts would be expected to be lower in the two ACECs atop the plateau.

The combined effective habitat loss of 6,790 acres in BLM lands would represent a 9-percent reduction in habitat available to avian and mammalian predators for hunting and a comparable reduction in prey abundance. Therefore, mountain lions and black bears would be reduced, probably to a greater extent than indicated due to their furtiveness. For raptors, even the protective NGD/NSO and TL stipulations relative to raptor nesting may not be sufficient to maintain current populations, depending on precisely where and in what manner oil and gas development occurs. Forest-interior species such as the northern goshawk and boreal owl would probably be disproportionately affected due to the habitat fragmentation that would result from new well pads and access roads.

Quantifying impacts to wildlife is difficult due to the many project-, climate-, and behavior-related unknowns, unknowns concerning oil and gas development rate locations, and impacts of other land uses and management activities (e.g., recreation, range management) that affect species differently. Nonetheless, it is reasonable to conclude that Alternative IV could cause the BLM portion of the Planning Area to suffer approximately a 36-percent decline in deer, a 2-percent reduction in elk, an overall 8-percent reduction in wildlife abundance, and an unknown number of localized extirpations.

Although restricting motorized and mechanized travel to designated routes throughout the Planning Area would benefit a variety of species and resource values, it is unlikely that this restriction would fully offset the adverse impacts from the anticipated level of oil and gas development.

Table 4-15 summarizes impacts to fish and wildlife under Alternative IV. See Section 4.3.4 for a discussion of impacts to special status species.

Table 4-15. Summary of Impacts of Alternative IV to Terrestrial and Aquatic Wildlife [1]

Taxonomic or Trophic Group	Vegetation and Range Management	Recreation and Travel Management	Oil and Gas Development	Special Resource Management Designations
Large Mammals (Deer Summer Range, Elk, Mountain Lion, Black Bear)	Minor (+)	Moderate (+)	Negligible to Minor (–)	Moderate (+)
Crucial Deer Winter Range	Minor to Moderate (+)	Minor (+)	Moderate (–)	None
Medium-size Predators and Small Mammals	Minor (+)	Moderate (+)	Minor to Moderate (–)	Moderate (+)
Raptors	Negligible (+)	Moderate (+)	Minor to Moderate (–)	Moderate (+)
Waterbirds	Minor (+)	Minor (+)	Negligible (–)	Minor (+)
Small Birds	Minor (+)	Moderate (+)	Minor to Moderate (–)	Moderate (+)
Reptiles and Amphibians	Negligible to Minor (+)	Moderate (+)	Minor (–)	Moderate (+)
Aquatic Species	Minor (+)	Moderate (+)	Minor to localized Moderate (–)	Moderate (+)

[1] *Does not include special status (threatened, endangered, candidate, or sensitive) species; see Section 4.3.4.*

4.3.2.5 Alternative V

Objectives for ecological values under Alternative V are to allow ecological values and processes, and biodiversity, to be modified by surface disturbance associated with resource development, with mitigation focused on lessening impacts to identified key resources. This alternative includes no WSRs, ACECs, or special management of areas having wilderness character, and NGD/NSO stipulations are eliminated from most discretionary (non-regulatorily driven) resource values to which they were applied in some or all of the previous alternatives. Examples of retained NGD/NSO stipulations include raptor and waterfowl nesting areas, the Anvil Points cave area, and high-risk cutthroat trout habitat (see previous alternatives and Section 3.3.2 and 3.3.3. for descriptions). For big game, mitigation would be developed in response to ground-disturbing activities, with no other protection or management actions to improve habitat. This includes no NGD/NSO stipulations specific to wildlife seclusion areas and no TL, either as a 5-month stipulation or a 2-month COA, for mule deer winter range. Fortuitously, some of the winter range would remain protected by other resource-driven NGD/NSO designations, but the following impact analysis does not consider these, because they could be dropped from the alternative during subsequent phases of the RMPA/EIS process and because they mostly affect poor-quality winter (e.g., slopes steeper than 50 percent) or are linear (riparian corridors) or patchy (raptor nests).

Direct and Indirect Future Impacts

Vegetation and Range Management — Under proposed management actions, noxious weed populations would be expected to increase due to grazing pressure and lack of specific mitigation measures. Over time, this would result in moderate to major negative impacts to most of these habitats (Section 4.3.1).

Travel and Recreation Management — Like Alternatives II through IV, this alternative would prohibit most cross-country travel by motorized or mechanized vehicles, except for over-snow travel by snowmobile. The Hubbard Mesa area would not be designated an SRMA, but OHV travel would be restricted to designated routes there as well. Although the existing 259 miles of existing routes throughout the Planning Area would remain open to motorized and mechanized use, the prohibition against cross-country travel would reduce the expansion of travel routes that fragment habitat, disturb wildlife, and encourage erosion and introduction of weeds. This would benefit a variety of species and resource values, but it is unlikely that this restriction would offset the adverse impacts of habitat fragmentation and disturbance from the anticipated level of oil and gas development.

Oil and Gas Development — Compared to Alternative II, this alternative would replace approximately 10,000 acres of NGD/NSO and approximately 7,000 acres of SSR/CSU with standard restrictions and limitations, and the special mitigation areas would be dropped entirely. The result would be up to 584 well pads, of which 175 would be above and 409 below the rim. Direct long-term impacts above and below the rim would encompass approximately 641 and 1,854 acres, respectively.

For mule deer winter range below the rim, the 1,854 acres of long-term impacts during the 20-year period of analysis, including 245 miles of new or widened access roads, would translate to 6,489 acres of effective habitat loss using the factor of 3.5. This figure represents 26.0 percent of the winter range on BLM land in the Planning Area. However, lack of a TL stipulation or COA to reduce disturbance-related impacts to mule deer winter range during the season of use would result in substantially greater impacts. For example, a 200-meter (660-foot) impact width (315 feet on each side of a 30-foot road) would be expected to reduce use by approximately 50 percent in heavy cover types (woodlands and tall shrublands) (see 1999 FSEIS). A 50-percent reduction in use across a 660-foot width represents approximately three times as much impact as total avoidance across 105 feet (a factor of 3.5 for a 30-foot-wide road). Thus, the factor of 3.5 would become a factor of 10.5 for estimating effective habitat loss during the 5 months of winter use. The time-weighted impact factor (see Alternative IV) is ([7 x 3.5] + [5 x 10.5]) ÷ 12 = 8, and the resultant impact on winter range is approximately 14,832 acres. This represents 59.4 percent of the winter range and is roughly equivalent to 1,483 deer at a density of one deer per 10 acres. However, this impact level may be unrealistically large, for four reasons:

1. The impact width for a sinuous road is less than for a straight road due to overlap at curves.

2. Some access roads already occur in the winter range area.

3. The impact level assumes no habituation to oil and gas activities and traffic; some habituation is likely because of the gradual increase in activity over 20 years (i.e., about 5 percent of total impacts per year).

4. The impact level assumes that areas within 315 feet on either side of a road are totally avoided, when in reality they would be avoided only during regular human use and would be used by deer to some extent when an area is in operational mode or shut down due to inclement weather (studies indicate that deer move back into an area when disturbance ceases; see introduction to Section 4.3.2).

Using the alternative road-density method and assuming a proportionate distribution of roads throughout the area below the rim, approximately 64 percent of the 245 miles of new or widened access roads (i.e., 157 miles) would be located in winter range. The total areal winter range of 39 square miles yields a density of slightly more than 4 miles of road per square mile of habitat. Using the road-density method described in the introduction to Section 4.3.2, this density level would be expected to cause a 50 percent decline in deer use for secondary roads (1 to 1.5 miles wide, somewhat improved, good to fair condition, irregular maintenance). The resultant 50-percent reduction in effective habitat would decrease mule deer carrying capacity by approximately 1,249 animals using an average density of one deer per 10 acres (see Alternative II). Whether this estimate or the slightly higher estimate using the time-weighted impact factor method (1,483 animals) is more realistic, the net effect would be major.

Other species using the habitats below the rim, including several bird species that occur primarily in pinyon/juniper habitat, would be affected to a lesser extent, ranging from the amount of direct habitat loss to a decline of 26-percent using the factor of 3.5 (moderate impacts).

For all species, impacts of Alternative V atop the plateau would be greater than Alternative IV. The 641 acres of direct long-term habitat loss above the rim equates to 2,244 acres of effective loss during the 20-year analysis period, based on the factor of 3.5. Because new pads and increased traffic would occur throughout most of the highlands except drainage floors, the habitat loss and fragmentation could be major if impacts to spruce/fir and aspen forests are not avoided or minimized. This conclusion is based on the fact that most of the forest-interior and habitat-specialist species known or likely to occur atop the plateau occur in these types of habitats. Some forest species would likely be exterminated, at least from some blocks, and most species would be markedly reduced. Edge species and habitat generalists might benefit except for the offsetting impact of increased disturbance from human activity and actual habitat loss. Increased brood parasitism by brown-headed cowbirds on species such as the plumbeous vireo could also become a problem, and hunting and nesting habitat for the northern goshawk and boreal owl could be eliminated (see Section 4.3.3). The reduction in actual and usable summer range and calving habitat could cause elk numbers to decline by 6 to 7 percent using the factor of 3.5. This figure could be much higher if the most severe estimates of road-avoidance impacts to this limiting resource occur (see discussion in introduction to this section).

Due to reduced seclusion, habitat availability, prey abundance, and increased habitat fragmentation, mountain lions and black bears would also be expected to decline by an unknown percentage. Other predators, including raptors, would also be subject to decreases in prey abundance and the amount of habitat used for hunting prey, although once again the impact is difficult to quantify because the exact timing and distribution of new pads and roads is unknown. However, on a simple arithmetic basis, the combined loss of 3,885 acres of effective habitat in BLM portions of the Planning Area would be likely to represent at least that much total wildlife loss, corresponding to slightly more than 5 percent.

Offsite and Cumulative Impacts

Offsite and cumulative impacts resulting from implementation of Alternative V would be greater than the other alternatives due to the incrementally greater amount of habitat loss, habitat fragmentation, and human activity.

The combined 7,287 acres of long-term habitat loss under this alternative represents 5.7 percent of the combined Federal and private land in the Planning Area. Although Alternative V would allow a higher proportion of oil and gas development atop the plateau than the other alternatives, more than 91 percent of the impacts would be in winter range habitats below the rim. Therefore, cumulative impacts on wildlife at the higher elevations would largely be associated with wide-ranging species that also use lower areas. For example, many or most of the deer that winter on private land below the rim spend the summer on BLM land atop the plateau, and wide-ranging raptors such as golden eagles, prairie falcons and, in winter, bald eagles use both types of lands as hunting habitat.

Summary of Impacts and Mitigation

This alternative would result in moderate to major long-term adverse impacts to most species/trophic groups in the Planning Area, with the greatest impacts on species that are furtive or most vulnerable to habitat fragmentation. Beneficial impacts from travel management and vegetation/range management would not offset adverse impacts from oil and gas as much as under the other alternatives.

Riparian species would be subject to lesser impacts than upland species due to the continued preservation of riparian corridors. However, indirect impacts and fragmentation from stream crossings by new roads or increased traffic on existing roads across drainage floors would reduce the abundance and contiguity of these vulnerable areas as well. All upland habitat types would be reduced in extent, contiguity, and connectivity at a level that could cause localized extirpations and/or marked declines in some species — notably forest-interior species, habitat specialists, and furtive species, which include many of the special status species (Section 4.3.3).

As described for Alternative IV, quantifying impacts to wildlife is difficult due to the many unknowns concerning oil and gas development location, distribution, and timing/sequencing, as well as the adverse or beneficial impacts of other land uses and management activities (e.g., recreation, range management). All of these factors affect species differently. Nonetheless, it is reasonable to conclude that Alternative V could cause the BLM portion of the Planning Area to suffer a 50-percent decline in deer, a 6- to 7-percent reduction in elk, an overall 12-percent reduction in wildlife abundance, and a greater (but unknown) number of localized extirpations. Even this level of impact could be surpassed if mitigation measures are less effective than anticipated or if the degree of behavior avoidance is greater than assumed in the 3.5 factor used throughout the analysis.

Although restricting motorized or mechanized travel to designated routes throughout BLM lands would benefit a variety of species and resource values, it is unlikely that this restriction would offset adverse impacts from anticipated levels of oil and gas development, and especially the 350 miles of new or widened access roads.

To reduce the severity of unavoidable impacts, the management prescriptions common to all alternatives and the mitigation measures listed above for the four previous alternatives should be applied to this alternative. Table 4-16 summarizes impacts to fish and wildlife under Alternative V. Special status species are discussed in Section 4.3.4.

Table 4-16. Summary of Impacts of Alternative V to Terrestrial and Aquatic Wildlife [1]

Taxonomic or Trophic Group	Vegetation and Range Management	Recreation and Travel Management	Oil and Gas Development	Special Resource Management Designations
Large Mammals (Deer Summer Range, Elk, Mountain Lion, Black Bear)	Minor to Moderate (–)	Moderate (+)	Moderate to localized Major (–)	Minor (+)
Crucial Deer Winter Range	Negligible (+)	Minor (+)	Major (–)	None
Medium-size Predators and Small Mammals	Minor to Moderate (–)	Moderate (+)	Moderate to localized Major (–)	Minor (+)
Raptors	Minor to Moderate (–)	Moderate (+)	Moderate to Major (–)	Minor (+)
Waterbirds	Minor (–)	Minor (+)	Minor (–)	Minor (+)
Small Birds	Minor (–)	Moderate (+)	Moderate to Major (–)	Minor (+)
Reptiles and Amphibians	Negligible (–)	Moderate (+)	Moderate (–)	Minor (+)
Aquatic Species	Minor (–)	Moderate (+)	Moderate to localized Major (–)	Minor (+)

[1] *Does not include special status (threatened, endangered, candidate, or sensitive) species; see Section 4.3.4.*

4.3.2.6 Overall Summary of Impacts to Fish and Wildlife

Several land uses and management actions proposed in this alternative would adversely affect terrestrial and aquatic wildlife resources. These consist primarily of direct and indirect impacts from oil and gas development and continued use for grazing of domestic livestock. Under Alternatives II through V, restrictions on motorized and mechanized use would benefit wildlife, as would range management actions aimed at better control of weeds and restoration of areas degraded by intensive grazing use. The degree to which these beneficial measures would offset some of the adverse impacts from oil and gas varies, both among alternatives and between higher and lower elevations of the Planning Area. In general, impacts are lowest for Alternative II and greatest for Alternative V, although this is not consistently true.

The primary factor affecting the degree of impacts from oil and gas is the combination of no-lease areas, protective surface use stipulations (NGD/NSO, SSR/CSU, and TL), and special mitigation measures — all of which vary among the alternatives. Other important variables include the estimated 16-year deferral for drilling atop the plateau under Alternative III and unknowns regarding the exact scale, location, and timing of oil and gas construction activities under all alternatives and the ability of wildlife to adapt to the changed conditions.

For habitat-interior species, the unavoidable habitat fragmentation caused by new well pads and roads would make some areas of currently intact habitat either less suitable or unsuitable. For most species, disturbance associated with oil and gas traffic and drilling activities would cause temporary abandonment of areas surrounding intensive human use, although some long-term changes in wildlife distribution, habitat use, and abundance would also occur. For deer and elk, which are heavily hunted in the Planning Area, it is conceivable that any areas closed to hunting due to intensive oil and gas development could create a refuge effect, attracting the animals during hunting season. However, if a reduction in hunting pressure occurs, benefits to individual animals are likely to be more than offset by the adverse impacts of habitat loss and fragmentation.

Table 4-17 presents an overall summary of impacts to fish and wildlife resources under the five alternatives, using the broad impact levels described in the analyses above.

As shown in Tables 4-13 through 4-17, the potentially greatest impacts identified during this RMPAEIS include direct or indirect loss of crucial mule deer winter range. The higher impact levels of Alternatives III through V compared to Alternative II are associated not only with increased oil and gas development, but also with replacement of the 5-month TL with a 2-month TL (Alternative IV) or elimination of the TL altogether (Alternative V). These changes would result in disproportionate levels of disturbance-related impacts as well as direct habitat loss. The estimated impacts on mule deer are based on the following:

- Winter range is the limiting factor for mule deer in the Planning Area and project region.
- Winter range receives more concentrated use than summer range, and relatively large numbers of animals would therefore be affected per unit area of habitat loss or disturbance.
- Under all five alternatives, the area below the Roan Cliffs, which consists largely of winter range, would receive the most intensive oil and gas development.
- Winter through early spring is the period when deer are most easily stressed and fatigued when forced to move to another area to find suitable habitat or avoid a source of disturbance.

Notwithstanding these considerations, note that the impact descriptions for the five alternatives are presented in terms of habitat loss and potential reduction in carrying capacity. Thus, the estimates of declining deer based on an assumed 10 acres per deer are reductions in potential populations and not necessarily in current populations. Actual decreases in the deer population of the Planning Area and vicinity cannot be precisely quantified because:

- The existing deer population is substantially below carrying capacity, and reductions in habitat may therefore not translate directly to declines in deer numbers.
- Winter range is a mosaic of habitat types of varying quality and importance to wintering deer. It is not known precisely how oil and gas development or other impacts (e.g., recreational travel) would affect these different types, because the location and dispersion of wells and pads are not known.
- Oil and gas development and other impacts would occur incrementally and irregularly over the 20-year period of analysis. Thus, the impacts described in the text above and summarized in Tables 4-12 through 4-17 represent accumulated habitat loss across 20 years and not a sudden, total loss of habitat that could occur with some types of development (e.g., inundation by a new reservoir).
- The incremental development would allow time for the animals to habituate to some extent and shift their movement and use patterns in response to the changing environment. Complete avoidance of an area by wildlife would occur primarily during initial road construction and well development, and the degree of avoidance would be likely to diminish as habituation occurs, especially as the intensity of human activity decreases or ceases.

Table 4-17. Overall Summary of Impacts to Fish and Wildlife [1, 2]

Taxonomic or Trophic Group	Alternative				
	I	II	III	IV	V
Large Mammals (Deer Summer Range, Elk, Mountain Lion, Black Bear)	Negligible to Minor (–)	Negligible to Minor (–)	Negligible to localized Moderate (–)	Minor to localized Moderate (–)	Moderate (–)
Crucial Deer Winter Range	Minor (–)	Minor (–)	Moderate (–)	Moderate (–)	Major (–)
Medium-sized Predators and Small Mammals	Negligible to Minor (–)	Negligible to Minor (–)	Minor to Moderate (–)	Minor to Moderate (–)	Moderate (–)
Raptors	Negligible to Minor (–)	Minor (–)	Moderate (–)	Moderate (–)	Moderate to Major (–)
Waterbirds	Negligible (–)	Negligible (–)	Negligible (–)	Negligible (–)	Minor (–)
Small Birds	Negligible to Minor (–)	Minor (–)	Minor to Moderate (–)	Moderate (–)	Moderate to Major (–)
Reptiles and Amphibians	Negligible to Minor (–)	Minor (–)	Minor (–)	Minor (–)	Moderate (–)
Aquatic Species	Negligible to Minor (–)	Minor (–)	Minor to Moderate (–)	Minor to Moderate (–)	Moderate (–)

[1] *Overall impact level after combining adverse and beneficial effects of land uses and management actions after incorporating mitigation measures described in text.*

[2] *Does not include special status (threatened, endangered, or sensitive) species; see Section 4.3.4 and Table 4-19.*

In considering the impact levels for mule deer winter range, it should also be remembered that this species is a focus of hunting throughout the region. In this regard, deer (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 exploitation ("harvest"), while the primary concern for special status species is the potential for local or regional extirpation. However, very large reductions in deer (or elk) populations would adversely affect the quality of the recreational experience for visitors who enjoy seeing and observing wildlife as either the purpose or a desirable outcome of their outdoor activity.

The other important consideration regarding wildlife impacts is the deferral of oil and gas development atop the plateau under Alternative III. This is reflected by the range in the summary impact level for some species groups in Table 4-17. However, once drilling is initiated on top under Alternative III, the annual drilling rate would be four times the average annual rate for Alternative II and twice that for Alternative IV. This would be of particular concern for sensitive, furtive, or habitat-interior species, although they would benefit greatly during the deferment period. Some of the impacts to wildlife described above, including reductions in mule deer winter range and carrying capacity, could represent an irreversible and irretrievable commitment of natural resources (see Section 4.6).

4.3.3 Special Status Plants and Significant Plant Communities

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 RMP 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, including noxious weed management, rangeland management, oil and gas development, and travel management.

BLM Manual 6840 (IM No. 97-118) (BLM 2001b) directs 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 all alternatives, the general management goal in regard to 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.

Additional specific management objectives are discussed in Section 3.3.3 and at the beginning of each alternative section below.

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.
- A botanical survey would be performed in any appropriate habitat.

- If a resource is found in areas under CSU stipulations, the proposed disturbance would be moved up to 400 meters from the outer resource perimeter, as well as its local habitat, to prevent negative impacts.
- In areas of standard lease terms, the proposed structures would be moved up to 200 meters to avoid these impacts.
- If structures 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.

This same protocol is assumed for the analysis of other activities that result in localized ground disturbance.

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** – Effects unlikely to impair the resource value. No physical disruption to resources.
- **Negligible** – Detectible effects would last no more than 1 year (i.e., not detectible after one full growing season) and are unlikely be noticeable in terms of Land Health Standards. A more severe impact may be negligible if it is temporary (duration <2 years).
- **Minor** – Total area of disruption less than 5 percent of the resource. May result in noticeable but not substantial impairment of the resource value in terms of Land Health Standards. Effects may be of concern to the general public.
- **Moderate** – Total area of disruption 6 to 15 percent of the resource. May cause substantial impairment of the resource value in terms of Land Health Standards. These effects may increase over time or be long-term or permanent. Effects are likely to be visible and may be of concern to the general public.
- **Major** – Total area of disruption greater than 15 percent of the resource. Likely to cause substantial impairment of the resource value in terms of Land Health Standards. These effects may increase over time, or be long-term or permanent. If negative, they would likely result in unmitigatable impacts regulated by major environmental laws such as the ESA. Effects would be highly visible and of concern to the general public.

Note that the same terms are applied in a more relative sense to describe beneficial impacts.

It is 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 selected alternative will be managed in the same way described for currently known locations under the alternative discussions below.

4.3.3.1 Alternative I

Alternative I would maintain current ecological values and processes and biological diversity with existing management direction and activities. This includes a requirement to protect and maintain known special status plant species and significant plant communities and their habitat.

Direct and Indirect Impacts

Continuation of existing noxious weed management (Section 3.3.1) would be likely to increase the frequency, density, and diversity of such populations. This presents the potential for minor to moderate negative impacts to these resources if noxious weed populations invade and expand into suitable habitat for special status plant species and significant plant communities.

This alternative would allow the most unrestricted travel throughout the Planning Area (Section 2.4.1). There would be no restrictions to designated routes and no areas closed to motorized or mechanized travel. Based on current levels of use in the Hubbard Mesa area and expected increased recreation use of the Planning Area, this could be expected to result in increasing numbers of pioneered roads throughout the Planning Area. These could potentially cause moderate to major, localized direct impacts to sensitive species and/or significant plant communities, as well as potential indirect impacts from habitat destruction and fragmentation, deposition of dust, and increased spread of noxious weeds.

As noted in Section 3.3.3, several spurs off of the Anvil Points Rim Road dissect portions of the Great Basin grassland, causing fragmentation and increasing the potential for noxious weed invasion and potentially resulting in minor to moderate negative impacts to this significant plant community.

Of some special concern under this alternative is the status of the population of Parachute penstemon that occurs near the Anvil Points Mine. The road into this area has been gated, precluding public access into the area. However, a new well pad was constructed uphill from the gate in late summer of 2003. Since then, the gate has not been kept consistently closed, allowing greater access to the vicinity of the Parachute penstemon population. This could result in minor to moderate direct impacts to individual plants due to damage from road maintenance, vehicles, trampling, or collecting of plants, as well as indirect impacts from sedimentation of ground disturbance and increased opportunity for noxious weed entry into the habitat. The potential impacts from the gate removal on the road could be reduced considerably by installing a gate above the new well pad.

Currently, livestock grazing is not actively prevented from occurring in the vicinity of any of these resources and so would continue to be a potential source of direct negative impacts from trampling and grazing, as well as the indirect effect of local erosion and sedimentation and the spread of noxious weeds. Likewise, construction of range improvements (fences, ponds, etc.) in the vicinity of populations or communities could disrupt these resources both directly and indirectly by the physical disturbance as well as by focusing livestock grazing and trampling in a small area.

Even a short-term grazing event, if highly focused in the vicinity of one of these populations or communities, could result in localized disturbance with moderate to major impacts.

Under current management, the no-lease area contains all of the known special status plant species and significant plant communities on top of the plateau and along the upper portions of the cliffs. These resources would therefore incur no direct impacts from oil and gas development. Occupied and potential habitats for these resources below the rim are protected by CSU restrictions (Map 21) that require a clearance for these species be performed prior to approval of a well location. BLM can require that the proposed location be moved more than 200 meters to avoid impacts to these resources. The overall result of the CSU designation should result in minor localized negative impacts to sensitive plant species and/or significant plant communities and their habitat from oil and gas development below the rim.

Offsite and Cumulative Impacts

The Parachute penstemon population at the Anvil Points Mine is located very near the interface of BLM and private lands in the south-central part of the Planning Area. It is also the intersection of areas under no-lease and NGD/NSO areas. For the purpose of this analysis, it is assumed that this location would not be leased and would otherwise be managed under the NGD/NSO restrictions; therefore, it would experience no negative impacts from any of the ground-disturbing actions discussed above. However, additional mitigation measures such as boundary fencing and signing may be required to protect this unique and very rare resource from negative offsite impacts.

A positive impact to offsite areas could occur should some or all of the existing populations of special status plant species within the Planning Area expand, or new populations be recruited, due to positive responses as a result of management actions. These populations could potentially serve as larger sources for propagation of these species into new offsite areas. In addition, information collected from monitoring these species may be useful in managing them on other sites.

Under this alternative, more suitable habitat for sensitive species and significant plant communities may be retained as a result of the large area of no-lease lands above the rim being precluded from disturbance by oil and gas development. However, these areas are still subject to disturbance by other management actions discussed above.

It is believed that some sensitive plants are being heavily impacted by increasing human habitation and disturbance throughout the region due to road construction and residential and commercial development (CNHP 2001). Threatened or endangered plant species that occur on private lands are not specifically protected under the Endangered Species Act. Likewise, the State of Colorado provides no legal protection for any plant species but the State flower, the 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 are 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).

Several management actions proposed in this alternative would affect special status plant species and significant plant communities. These include management of noxious weeds, travel, rangeland, and oil and gas development. The potential impacts of these actions to special status plant species and significant plant communities are discussed above and summarized in Table 4-18. For Alternative I, the cumulative impact of these actions includes potential moderate to major impacts on a localized scale from travel and rangeland management with more widespread indirect impacts to the limited habitat for these resources from noxious weed management and gas and oil development below the rim.

4.3.3.2 Alternative II

Under Alternative II, protection of ecological values and processes and biological diversity would be addressed by designating four ACECs, managing three areas for wilderness characteristics, and managing streams atop the plateau for WSR eligibility as well as placing special management attention on enhancement of botanical and ecological resource values. Limited ground-disturbing activities would be allowed within occupied habitat, potential habitat, and areas of supporting ecological processes for these resources.

Direct and Indirect Impacts

Under this alternative, the entire footprint of each of the four ACECs would be covered with several special management stipulations specific to the relevant and important values they contain, including special status plants and significant plant communities. These stipulations are described in detail in Section 3.5.7 and Tables 2-2a-d. The result would be protection of these resources from most direct and indirect impacts through protection of entire watersheds, estimated areas of ecosystem processes, and large areas of potential habitat. This could result in minor to moderate positive impacts in terms of total population size and long-term sustainability of special status plant species as it would allow for colonization opportunities in new areas of suitable habitat. This is particularly important for those species whose current habitat may become unsuitable over time due to ecological succession.

Alternative II is the only alternative with a stated 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 would indirectly provide minor to moderate positive impacts to special status plant species and significant plant communities.

Riparian areas and river corridors are a focus of protection and management under this alternative. Specific stipulations for the protection of riparian areas and significant riparian plant communities within the designated ACECs are described in detail in Section 3.5.7 and Tables 2-2a-d. These include a specific objective for maintaining proper hydrologic function and protection of areas adjacent to these resources. Due to these protections and specific management actions, it is expected that a large number of riparian reaches would return to PFC over time, resulting in major positive impacts to riparian/wetland areas within the Planning Area, including those that contain, or are adjacent to significant riparian plant communities. This would result in minor to major positive impacts to these resources.

Management would limit OHV use and prohibit cross-country travel as well as restrict travel to designated routes and areas. In addition, all routes within 21,382 acres of lands having wilderness character would also be closed to motorized or mechanized travel. These actions would halt the expansion of travel routes throughout the Planning Area that could potentially disrupt these resources and/or introduce noxious weeds. 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.

Of some special concern under this alternative is the status of the population of Parachute penstemon that occurs near the Anvil Points Mine. The road into this area has been gated, precluding public access into the area. However, a new well pad was constructed uphill from the gate in late summer of 2003. Since then, the gate has not been kept consistently closed, allowing greater access to the vicinity of the Parachute penstemon population. This could result in minor to moderate direct impacts to individual plants due to damage from road maintenance, vehicles, trampling, or collecting of plants, as well as indirect impacts from sedimentation of ground disturbance and increased opportunity for noxious weed entry into the habitat. The potential impacts from the gate removal on the road could be reduced considerably by installing a gate above the new well pad.

Range management under this alternative would be expected to result in more rapid, long-term improvements to range condition and trend than under the other alternatives. Indirectly, this would have a positive impact on special status plant species and significant plant communities by eventually reducing the potential for infestation and spread of noxious weeds into their habitat. In addition, this alternative provides for development of allotment management plans for situations where there is direct conflict with botanical values. If monitoring detects the incipient stages of these conflicts, and management plans are devised to protect sensitive resources, a moderate positive impact could result.

A number of surface-use stipulations are proposed under Alternative II to protect these resources in the Planning Area (Map 22). These include the NSO and CSU stipulations for existing leases (see Section 4.3.3.1), which would be extended to other land uses and management actions by analogous NGD and SSR stipulations. Additional new stipulations are also proposed for Alternative II. The additional stipulations, indicated by a "P" (plants) prefix, would be applied only to new oil and gas leases and other uses. The current and proposed surface-use stipulations are described below.

- NGD/NSO 12 – No ground-disturbing activities in occupied habitat and adjacent ecosystem processes for Federally listed endangered, threatened, proposed, or candidate species.
- SSR/CSU 3 – Require special design, construction, implementation, and/or mitigation measures including relocation of operations by more than 200 meters for those species listed as sensitive by BLM and for significant natural plant communities.
- NGD/NSO P-1 – No ground-disturbing activities within occupied habitat for sensitive plants or significant plant communities, or within the adjacent areas that provide ecosystem processes needed to support these vegetation resources.
- NGD/NSO P-2 – No long-term ground-disturbing activities within areas of potential habitat of special status plant species or significant plant communities to allow for long-term viability and recovery of the resources or ecosystem processes.
- NGD/NSO P-3 – No long-term ground-disturbing activities within occupied habitat of old-growth Douglas-fir, including no removal of trees of any age class.
- NGD/NSO P-4 – No long-term ground-disturbing activities in areas designated as High Risk for special status plant species or significant plant communities (i.e., a high probability of occurrence of these species or communities).
- NGD/NSO P-5 – No long-term ground-disturbing activities in areas of Moderate Risk for special status plant species or significant plant communities, designated as having Moderate Risk Hydrologic Values that support these vegetation resources.

The result of implementing these stipulations would be that all known special status plant species and significant plant communities, much of the potential habitat for these resources, and a large portion of the watersheds and ecological processes that support them, would be contained within NGD/NSO areas (Map 22). These protections would reduce direct and indirect potential negative impacts from oil and gas development to negligible to minor.

Four Utah fescue populations atop the plateau occur outside specific special status plant NGD/NSO areas (Map 22). Two of these populations are located within areas with ACEC-specific NGD/NSO restrictions, which would protect relevant and important values, including special status plants. The other two Utah fescue populations occur in an area overlapped by NGD/NSO designations for WSR-eligible streams.

Offsite and Cumulative Impacts

Of some special concern under this alternative is the population of Parachute penstemon that occurs near the Anvil Points Mine. This population is located near the BLM and private land interface in the south-central part of the Planning Area. For the purpose of this analysis, it is assumed that this population would be managed under NGD/NSO stipulations and so would experience no negative impacts from any of the ground-disturbing actions discussed above. However, additional mitigation measures such as boundary fencing and signing may be required to protect this unique and very rare resource from negative offsite impacts.

A positive impact to offsite areas could occur should some or all of the existing populations of special status plant species within the Planning Area expand, or new populations be recruited, due to positive responses to management actions. Most potential habitat for sensitive species and significant plant communities is contained within ACECs and would be protected from disturbance by an NGD/NSO. These populations could potentially 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.

It is believed that some sensitive plants are being heavily impacted by increasing human habitation and disturbance throughout the region due to road construction and residential and commercial development (CNHP 2001). Threatened or endangered plant species that occur on private lands are not specifically protected under the Endangered Species Act. Likewise, the State of Colorado provides no legal protection for any plant species but the State flower, the 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 are 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).

Several management actions proposed in this alternative would affect special status plant species and significant plant communities. These include special management stipulations under the ACEC designations as well as management of noxious weeds, travel, rangeland, and oil and gas development. The potential impacts of these actions to special status plant species and significant plant communities are discussed above and summarized in Table 4-18.

A number of positive impacts to special status plant species and significant plant communities would be anticipated under this alternative. These would result from the special management stipulations under the proposed ACECs and protection of WSR-eligible streams, as well as positive impacts due to management of noxious weeds, travel, and rangeland. When these impacts are considered cumulative to the comprehensive protection of these resources by large ares of NGD/NSO restrictions, which prohibit ground-disturbing activities including oil and gas development, it is anticipated that special status plant species and significant plant communities in the Planning Area would experience local and widespread positive impacts under this alternative.

4.3.3.3 Alternative III – Preferred Alternative

Alternative III would allow a greater degree of surface disturbance than Alternative II by dropping management of areas for wilderness character and two ACECs and reducing the size of the remaining ACECs. A total of 9,006 acres would be managed in a way that would protect roadlessness and naturalness under associated NGD/NSO designations that would not be subject to modification, waiver or exceptions. Special status plant species and significant plant communities would receive protections from retaining the East Fork Parachute Creek and Trapper/Northwater Creek ACECs. WSR-eligible streams would continue to be protected. In addition, NGD/NSO and SSR/CSU stipulations specific to special status plants and significant plant communities would be applied and the Parachute Creek WMA would have special mitigation goals and objective to protect high value resources (Map 23).

The large increase in SSR/CSU areas under this alternative, and the accompanying decrease in no-lease and NGD/NSO areas, would allow more ground-disturbing activities in potential habitat and areas supporting ecological processes while continuing to protect the resources themselves. As described previously, SSR/CSU stipulations would allow BLM to require that a proposed ground-disturbing activity be shifted by more than 200 meters from its proposed location to protect a resource, and SSR/CSU areas would be subject to the same supplemental mitigation as identified for special mitigation areas.

Most of the SSR/CSU areas above the rim overlap with the Parachute Creek WMA. Ground-disturbing activities within this area would be subject to management actions that would minimize potential impacts to special status plant species and significant plant communities from disruption of the hydrologic regime, habitat integrity/function, and invasion of noxious weeds (Table 2-3). As these actions would only be applied if potential surface disturbance were planned to occur, they have negligible impact to these resources outside of such actions.

Direct and Indirect Impacts

This alternative includes several special management stipulations to protect special status plant species and significant plant communities. These stipulations, described in Table 2-1 and Section 3.5.7, include allowing future conditions to be determined largely by natural processes. This is especially pertinent to management of the several sensitive plants that are early successional species. These require ongoing natural disturbances for potential habitat. If all of these stipulations are implemented, the result would be minor to moderate positive impacts to these resources.

Noxious weeds would be managed under a continuation of existing noxious weed management. Following current trends (Section 3.3.1), noxious weed populations are expected to increase in frequency, density, and diversity. This presents the potential for minor to moderate negative impacts if noxious weed populations invade and expand into suitable habitat for special status plant species and significant plant communities.

Management would limit off-road vehicle use and restrict travel to designated routes and areas, including within the 2,460-acre Hubbard Mesa SRMA. 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.

Of some special concern under this alternative is the status of the population of Parachute penstemon that occurs near the Anvil Points Mine. The road into this area has been gated, precluding public access into the area. However, a new well pad was constructed uphill from the gate in late summer of 2003. Since then, the gate has not been kept consistently closed, allowing greater access to the vicinity of the Parachute penstemon population. This could result in minor to moderate direct impacts to individual plants due to damage from road maintenance, vehicles, trampling, or collecting of plants, as well as indirect impacts from sedimentation of ground disturbance and increased opportunity for noxious weed entry into the habitat. The potential impacts from the gate removal on the road could be reduced considerably by installing a gate above the new well pad.

Due to greater emphasis on improving vegetation condition, this alternative is expected to result in more rapid, long-term improvements to range condition and progress in meeting land health standards than Alternative I, but less than Alternative II. Indirectly, this would have a positive impact on special status plant species and significant plant communities by eventually reducing the potential for infestation and spread of noxious weeds into their habitat. In addition, this alternative provides for development of allotment management plans where there is direct conflict with botanical values. If monitoring detects the incipient stages of these conflicts, and management plans are devised to protect sensitive resources, this could have minor to moderate positive impact on these resources.

The NSO and CSU stipulations for existing oil and gas leases described for Alternative I would also be applied under Alternative III and extended to other land uses and management actions as NGD and SSR restrictions. These include NGD/NSO 12 for threatened or endangered species and SSR/CSU 3 for plant species and communities designated by BLM as sensitive. As with Alternative II, new stipulations that would be applied to new oil and gas leases and other management actions or land uses include NGD/NSO P-1 and NGD/NSO P-4 (see Section 4.3.3.2). These pertain to sensitive plant species, significant plant communities, and areas that provide ecological or hydrological functions needed to sustain these resources.

Alternative III also includes proposed stipulations related to botanical/ecological resources that differ from Alternative II. These proposed stipulations, described below, represent a lower level of protection (e.g., SSR/CSU rather than NGD/NSO) for special status plants and significant plant communities:

- SSR/CSU P-7 – In areas of Moderate Risk habitat for sensitive plant species or significant plant communities (designated as Moderate Risk Hydrologic Values), allow only activities that would not disturb, alter, or interrupt the hydrologic or ecological processes needed to support these vegetation resources. Special design, construction, operation, mitigation, and reclamation measures may be required, including relocation of a proposed facility or activity by more than 200 meters. Replaces NGD/NSO P-5.
- SSR/CSU P-10 – In areas of potential habitat for sensitive plant species and significant plant communities, allow only activities that would not reduce the habitat or disturb, alter, or interrupt ecological functions needed to support these resources. Special design, construction, operation, mitigation, and reclamation measures may be required, including relocation of a proposed facility or activity by more than 200 meters. Replaces NGD/NSO P-9.
- SSR/CSU P-12 – Cluster human-induced disturbances to prevent fragmentation in, or loss of, more than 10 percent of a contiguous block of old-growth Douglas-fir. Replaces NGD/NSO P-3.

As a result of implementing these stipulations, most known locations of special status plant species and significant plant communities would be contained within NGD/NSO areas (Map 23). However, in many cases these species and communities occur at the very edge of these areas, which lessens the protection afforded them. Likewise, much of the potential habitat and many of the ecological processes that support these resources are in CSU areas, where avoidance of these resources would be enforced, but indirect impacts such as noxious weed introductions and sedimentation from upgradient disturbance areas could still occur within the vicinity.

Four occurrences of Utah fescue are located in in the central part of the plateau not included in either NGD/NSO or SSR/CSU areas. Two of these populations are located within ACEC and WSR-eligible NGD/NSO areas. The other two populations of Utah fescue would be protected by required COA or special design, construction, implementation, and/or mitigation; however, indirect impacts to these populations could occur.

The deferral of leasing and drilling for oil and gas on top of the plateau under Alternative III would not affect the type and extent of impacts to known locations of special status species and significant plant communities resources, except to the degree that it affects the number and location of wells and other facilities during the 20-year period of analysis and the intensity of development above the rim upon the lifting of the lease deferral.

Within the 20-year plan life, and after leasing is allowed on top of the plateau, vegetation in that area plateau would be subject to less overall impact from oil and gas development than under

Alternative II due to the smaller total of 51 wells on 39 pads. In addition, all of the surface use stipulations discussed above would apply. The combination of these factors would result in implementation of Alternative III having in localized minor negative impacts to these resources.

Offsite and Cumulative Impacts

Of some special concern under this alternative is the population of Parachute penstemon near the Anvil Points Mine. This population is located very near the BLM and private land interface in the south-central part of the Planning Area. For the purpose of this analysis, it is assumed that this population would be managed under NGD/NSO stipulations and would experience no negative impacts from any of the ground-disturbing actions discussed above. However, additional mitigation measures such as boundary fencing and signing may be required to protect this unique and very rare resource from negative offsite impacts.

A positive impact to offsite areas could occur should some or all of the existing populations of special status plant species within the Planning Area expand, or new populations be recruited, due to positive responses as a result of management actions. These populations could potentially 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. This is potentially less likely under this alternative than Alternatives I and II, and more likely than under Alternative V, due to the relative areas of habitat protected from surface disturbance by no-lease, NGD/NSO and SSR/CSU stipulations in each alternative.

It is believed that some sensitive plants are being heavily impacted by increasing human habitation and disturbance throughout the region due to road construction and residential or commercial development (CNHP 2001). Threatened or endangered plant species that occur on private lands are not specifically protected under the Endangered Species Act. Likewise, the State of Colorado provides no legal protection for any plant species but the State flower, the 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 are 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).

Several management actions proposed in this alternative would affect special status plant species and significant plant communities. These include special management stipulations as well as management of noxious weeds, travel, rangeland, and oil and gas development. The potential impacts of these actions to special status plant species and significant plant communities are discussed above and summarized in Table 4-18.

A number of positive impacts to special status plant species and significant plant communities would be anticipated to occur under this alternative. These would result from the special management stipulations proposed 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 stipulations 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.

4.3.3.4 Alternative IV

Under Alternative IV, no areas would be managed for wilderness character. The East Fork Parachute Creek and Trapper/Northwater Creek ACECs would be designated, WSR-eligible streams would continue to be protected, and various NGD and SSR stipulations and special mitigation areas would be applied to protect high value resources. This alternative includes designation of the Trapper/Northwater Creek drainage as a WMA, with the specific management objectives listed in Table 2-3.

As in Alternative III, the large increase in SSR/CSU areas under this alternative, and accompanying decrease in no-lease and NGD/NSU areas, would allow more ground-disturbing activities in potential habitat and areas supporting ecological processes while continuing to protect the resources themselves (Map 23). As described previously, SSR/CSU restrictions would allow BLM to require that a proposed ground-disturbing activity be shifted by more than 200 meters from its proposed location to protect a resource, and SSR/CSU areas would also be subject to the same supplemental mitigation as identified for special mitigation areas.

Direct and Indirect Impacts

This alternative includes several special management stipulations to protect special status plant species and significant plant communities. These stipulations, described in Table 2-1 and Section 3.5.7, include allowing future conditions to be determined largely by natural processes. This is especially pertinent to management of the several sensitive plants that are early successional species. These require ongoing natural disturbances for potential habitat. If all of these stipulations are implemented, the result would be minor to moderate positive impacts to these resources.

Noxious weeds would be managed under a continuation of existing noxious weed management. Following current trends (Section 3.3.1), noxious weed populations are expected to increase in frequency, density, and diversity. This presents the potential for minor to moderate negative impacts if noxious weed populations invade and expand into suitable habitat for special status plant species and significant plant communities.

Management would limit off-road vehicle use and restrict travel to designated routes and areas, except within the Hubbard Mesa SRMA. This would reduce the expansion of travel routes throughout the Planning Area that have the potential to introduce physical disturbance and noxious weeds into the vicinities of special status plant species and significant plant communities. When combined with the closure and revegetation of selected existing routes, such as those that currently bisect significant plant communities, and the Anvil Points Mine Road, these proposed management actions would result in minor to moderate positive impacts to special status plant species and significant plant communities.

Of some special concern under this alternative is the status of the population of Parachute penstemon that occurs near the Anvil Points Mine. The road into this area has been gated, precluding public access into the area. However, a new well pad was constructed uphill from the gate in late summer of 2003. Since then, the gate has not been kept consistently closed, allowing greater access to the vicinity of the Parachute penstemon population. This could result in minor to moderate direct impacts to individual plants due to damage from road maintenance, vehicles, trampling, or collecting of plants, as well as indirect impacts from sedimentation of ground disturbance and increased opportunity for noxious weed entry into the habitat. The potential impacts from the gate removal on the road could be reduced considerably by installing a gate above the new well pad.

As under Alternative III, greater emphasis on improving vegetation condition is expected to result in more rapid, long-term improvements to range condition and progress in meeting land health standards than Alternative I, but less than Alternative II. Indirectly, this would have a positive impact on special status plant species and significant plant communities by eventually reducing the potential for infestation and spread of noxious weeds into their habitat within range allotments. In addition, this alternative provides for development of allotment management plans where there is direct conflict with botanical values. If monitoring detects the incipient stages of these conflicts, and management plans are devised to protect sensitive resources, this could have a minor to moderate positive impact on these resources.

The NGD/NSO and SSR/CSU restrictons described for Alternative II and III would also be applied under Alternative IV. These include NGD/NSO 12 for threatened or endangered species and SSR/CSU 3 for plant species and communities designated by BLM as sensitive. Both of these are currently applied to existing leases. As with Alternative II and III, Alternative IV also includes proposed new restrictions that would be applied only to new oil and gas leases and other uses. These include NGD/NSO P-1 and NGD/NSO P-4 stipulations (see Section 4.3.3.2), which pertain to sensitive plant species, significant plant communities, and areas that provide ecological or hydrological functions needed to sustain these resources.

Alternative IV also includes proposed stipulations related to botanical/ecological resources that differ from Alternative II (Map 23). These proposed stipulations, described below and summarized in Tables 2-2a-d, represent a lower level of protection (e.g., SSR/CSU rather than NGD/NSO) for certain resources:

- SSR/CSU P-7 – In areas of Moderate Risk habitat for sensitive plant species or significant plant communities (designated as Moderate Risk Hydrologic Values), allow only activities that would not disturb, alter, or interrupt the hydrologic or ecological processes needed to support these vegetation resources. Special design, construction, operation, mitigation, and reclamation measures may be required, including relocation of a proposed facility or activity by more than 200 meters. Replaces NGD/NSO P-5.
- SSR/CSU P-10 – In areas of potential habitat for sensitive plant species and significant plant communities, allow only activities that would not reduce the habitat or disturb, alter, or interrupt ecological functions needed to support these resources. Special design, construction, operation, mitigation, and reclamation measures may be required, including relocation of a proposed facility or activity by more than 200 meters. Replaces NGD/NSO P-9.
- SSR/CSU P-12 – Cluster human-induced disturbances to prevent fragmentation in, or loss of, more than 10 percent of a contiguous block of old-growth Douglas-fir. Replaces NGD/NSO P-3.

As a result of implementing these stipulations, most known locations of special status plant species and significant plant communities would be contained within NGD/NSO areas (Map 23). However, in many cases these species and communities occur at the very edge of these areas, which lessens the protection afforded them. Likewise, much of the potential habitat and many of the ecological processes that support these resources are in SSR/CSU areas, where avoidance of these resources would be enforced, but indirect impacts such as noxious weed introductions and sedimentation from upgradient disturbance areas could still occur within the vicinity. Therefore, localized minor impacts could be expected to occur as a result of oil and gas development.

Four occurrences of Utah fescue are located in in the central part of the plateau not included in either NGD/NSO or SSR/CSU areas. One of these populations is located within the Trapper/Northwater Creek ACEC NGD/NSO areas. A second is located within the Trapper/Northwater Creek WMA. The other two populations of Utah fescue would be protected by required COA or special design, construction, implementation, and/or mitigation; however, indirect impacts to these populations could occur.

Under Alternative III, most known special status plant species and significant plant community locations would be included in NGD/NSO areas (Map 23). This would protect these occurrences from surface disturbance, but not indirect impacts. Most of the potential habitat and/or ecological processes that support these resources atop the plateau would receive special mitigation through the designation of the Parachute Creek WMA. However, these resources located on or below the rim receive reduced surface protection under this alternative. This could seriously compromise the continuing health of these resources and would result in moderate negative impacts to some or all of them.

Offsite and Cumulative Impacts

Of some special concern under this alternative is the population of Parachute penstemon near the Anvil Points Mine. This population is located very near the interface of BLM and private land in the south-central part of the Planning Area. For the purpose of this analysis, it is assumed that this population would be managed under NGD/NSO stipulations and would experience no negative impacts from any of the ground-disturbing actions discussed above. However, additional mitigation measures such as boundary fencing and signing may be required to protect this unique and very rare resource from negative offsite impacts.

A positive impact to offsite areas could occur should some or all of the existing populations of special status plant species within the Planning Area expand, or new populations be recruited, due to positive responses as a result of management actions. These populations could potentially 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. This is potentially less likely under Alternative IV than Alternatives I and II, and more likely than under Alternative V, due to the relative areas of habitat protected from surface disturbance by no-lease, NGD/NSO and SSR/CSU stipulations in each alternative.

It is believed that some sensitive plants are being heavily impacted by increasing human habitation and disturbance throughout the region due to road construction and residential or commercial development (CNHP 2001). Threatened or endangered plant species that occur on private lands are not specifically protected under the Endangered Species Act. Likewise, the State of Colorado provides no legal protection for any plant species but the State flower, the 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 are cumulative to some past and some ongoing degradation of surrounding riparian areas in the past due to livestock grazing, unregulated stream crossings, noxious weed proliferation, and current drought effects (Section 3.3.1).

Several management actions proposed in this alternative would affect special status plant species and significant plant communities. These include special management stipulations for these resources as well as management of noxious weeds, travel, rangeland, and oil and gas development. The potential impacts of these actions to special status plant species and significant plant communities are discussed above and summarized in Table 4-18.

A number of positive impacts to special status plant species and significant plant communities would be anticipated under this alternative, due to the special management stipulations proposed for these resources, as well as positive impacts resulting from 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 because a large portion of these areas would be under SSR/CSU stipulations to 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.

4.3.3.5 Alternative V

This alternative would protect known populations of, and habitat for, Federally listed or candidate plant species. However, disturbances to BLM sensitive species, other plant species of special concern, significant plant communities, and their habitat would be permitted with mitigation applied to lessen impacts. No special management stipulations for special status plant species and significant plant communities would be applied through designation of ACECs or WMAs, and it is assumed that WSR-eligibility would not be maintained.

Direct and Indirect Impacts

Alternative V provides a continuation of existing noxious weed management. Following current trends (Section 3.3.1), noxious weed populations are expected to increase in frequency, density, and diversity. This presents the potential for minor to moderate negative impacts if noxious weed populations invade and expand into suitable habitat for special status plant species and significant plant communities.

Travel management under this alternative would limit off-road vehicle use and restrict travel to designated routes. Cross-country travel would not be allowed. This would reduce the expansion of public travel routes throughout the Planning Area that could introduce physical disturbance and noxious weeds in the vicinity of special status plant species and significant plant communities. (Roads to support oil and gas development are discussed below.) No closure and revegetation of existing routes is proposed under this alternative. As noted in Section 3.3.3, several spurs off the Anvil Points Rim Road dissect portions of the great basin grassland, causing fragmentation and increasing the potential for noxious weed invasion, potentially resulting in minor to moderate negative impacts to this significant plant community. Overall, these proposed management actions would result in minor negative impacts.

Of some special concern under this alternative is the status of the population of Parachute penstemon that occurs near the Anvil Points Mine. The road into this area has been gated, precluding public access into the area. However, a new well pad was constructed uphill from the gate in late summer of 2003. Since then, the gate has not been kept consistently closed, allowing greater access to the vicinity of the Parachute penstemon population. This could result in minor to moderate direct impacts to individual plants due to damage from road maintenance, vehicles, trampling, or collecting of plants, as well as indirect impacts from sedimentation of ground disturbance and increased opportunity for noxious weed entry into the habitat. The potential impacts from the gate removal on the road could be reduced considerably by installing a gate above the new well pad.

Rangeland projects and land treatments proposed for this alternative are to be made in coordination with other land uses. However, while development of allotment management plans would be required within administrative units that have identified issues meeting land health standards, they are not necessarily required for identified conflicts with watershed, wetland/riparian, or botanical values. Therefore, the possibility exists that the emphasis on rangeland projects and land treatments in areas outside of surface-use stipulations could result in minor to moderate direct or indirect negative impacts to special status plant species and /or significant plant communities.

Four occurrences of Utah fescue are located in in the central part of the plateau and not included in either NGD/NSO or SSR/CSU areas. These populations would be protected by required COA or special design, construction, implementation, and/or mitigation; however, indirect impacts to these populations could occur.

The existing NSO and CSU stipulations described for Alternative I would also be applied to other land uses and management actions as NGD and SSR stipulations, respectively, under Alternative V. These include NGD/NSO 12 for threatened or endangered species and SSR/CSU 3 for plant species and communities designated by BLM as sensitive. As with Alternatives II through IV, Alternative V includes proposed new stipulations that would be applied only to new oil and gas leases and management actions or land uses. These include NGD/NSO P-1 and NGD/NSO P-4 (see Section 4.3.3.2), which pertain to sensitive plant species, significant plant communities, and areas that provide ecological or hydrological functions needed to sustain these resources.

Alternative IV also includes proposed stipulations related to botanical/ecological resources that differ from Alternative II (Map 23). These proposed stipulations, described below and summarized in Tables 2-2a-d, represent lesser protection (e.g., SSR/CSU rather than NGD/NSO) for certain resources:

- SSR/CSU P-7 – In areas of Moderate Risk habitat for sensitive plant species or significant plant communities (designated as Moderate Risk Hydrologic Values), allow only activities that would not disturb, alter, or interrupt the hydrologic or ecological processes needed to support these vegetation resources. Special design, construction, operation, mitigation, and reclamation measures may be required, including relocation of a proposed facility or activity by more than 200 meters. Replaces NGD/NSO P-5.
- SSR/CSU P-10 – In areas of potential habitat for sensitive plant species and significant plant communities, allow only activities that would not reduce the habitat or disturb, alter, or interrupt ecological functions needed to support these resources. Special design, construction, operation, mitigation, and reclamation measures may be required, including relocation of a proposed facility or activity by more than 200 meters. Replaces NGD/NSO P-9.
- SSR/CSU P-12 – Cluster human-induced disturbances to prevent fragmentation in, or loss of, more than 10 percent of a contiguous block of old-growth Douglas-fir. Replaces NGD/NSO P-3.

As a result of implementing these stipulations, most known locations of special status plant species and significant plant communities would be contained within NGD/NSO areas (Map 23). However, in many cases these species and communities occur at the very edge of these areas, which lessens the protection afforded them. Likewise, much of the potential habitat and many of the ecological processes that support these resources are in SSR/CSU areas, where avoidance of these resources would be enforced, but indirect impacts such as noxious weed introductions and sedimentation from upgradient disturbance areas could still occur within the vicinity. Therefore, minor to moderate impacts could be expected to occur as a result of oil and gas development.

Most known special status plant species and significant plant community locations would be included in NGD/NSO areas (Map 23). This would protect these occurrences from disturbance. However, much of the potential habitat and/or ecological processes that support the resources receive no surface protection or special mitigation requirements under this alternative. This could seriously compromise the continuing health of these resources and would result in moderate negative impacts to some or all of them.

Offsite and Cumulative Impacts

The population of Parachute penstemon near the Anvil Points Mine is located very near the interface of BLM and private land in the south-central part of the Planning Area. For the purpose of this analysis, it is assumed that this population would be managed under NGD/NSO stipulations and would experience no negative impacts from any of the ground-disturbing actions discussed above. However, additional mitigation measures such as boundary fencing and signing may be required to protect this unique and very rare resource from negative offsite impacts.

A positive impact to offsite areas could occur should some or all of the existing populations of special status plant species within the Planning Area expand, or new populations be recruited, due to positive responses as a result of management actions. These populations could potentially 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. Expansion of these populations is less likely under this alternative than the others due to the relatively reduced areas of habitat protected from surface disturbance by no-lease, NGD/NSO and SSR/CSU stipulations.

It is believed that some sensitive plants are being heavily impacted by increasing human habitation and disturbance throughout the region due to road construction and residential or commercial development (CNHP 2001). Threatened or endangered plant species that occur on private lands are not specifically protected under the Endangered Species Act. Likewise, the State of Colorado provides no legal protection for any plant species but the State flower, the columbine. Neither special status plant species nor significant plant communities are necessarily inventoried on private lands. Therefore, monitoring and protection of these species occurs voluntarily 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 are 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).

Several management actions proposed in this alternative would affect special status plant species and significant plant communities. These include management of noxious weeds, travel, rangeland, and oil and gas development. The potential impacts of these actions to special status plant species and significant plant communities are discussed above and summarized in Table 4-18.

Under Alternative V, the cumulative impact of these actions includes potential moderate to major negative impacts to special status plant species and significant plant communities on a localized scale from rangeland management, with more widespread indirect negative impacts from noxious weed management. These would be cumulative to minor to moderate positive impacts from travel management. However, all of these impacts would occur in the context of much-reduced areas of protection from ground-disturbing activities, both for potential habitat and ecological processes. This would result in such a degree of potential negative impacts that some of these resources could experience irreparable and irretrievable damage.

4.3.3.6 Summary of Impacts to Special Status Plant Species and Significant Plant Communities

Potential impacts to special status plant species and significant plant communities are summarized by alternative and management action in Table 4-18. Detailed discussions of these impacts are provided in the alternative descriptions above. Some of the impacts to special status plants and significant plant communities described above may represent an irreversible and irretrievable commitment of natural resources (see Section 4.6).

Table 4-18. Summary of Impacts to Special Status Plants and Significant Plant Communities

Management Action	Alternative				
	I	II	III	IV	IV
Special Stipulations for ACECs	NA	Minor to Moderate (+)	Minor (+)	Minor (+)	NA
Protection of WSR-eligible Streams	NA	Minor to Moderate (+)	Minor to Moderate (+)	Minor to Moderate (+)	NA
Watershed Management Areas	NA	Minor to Moderate (+)	Minor to Moderate (+)	Minor (+)	NA
Management for Wilderness Values	NA	Minor to Moderate (+)	Minor (+)	NA	NA
Vegetation/Weed Management	Minor to Moderate (–)	Minor to Moderate (+)	Minor to Moderate (–)	Minor to Moderate (–)	Minor to Moderate (–)
Recreation/Travel Management	Localized Moderate to Major, (–)[2]	Minor to Moderate (+)	Minor to Moderate (+)	Minor to Moderate (+)	Minor (–)
Range Management	Localized Moderate to Major (–)	Moderate (+)	Minor to Moderate (+)	Minor to Moderate (+)	Minor to Moderate (–)
Oil and Gas[1] Development	Localized Minor (–)	Negligible to Minor (–)	Localized Minor (–)	Localized Minor (–)	Minor to Moderate (–)

[1] *Oil and gas impacts for Alternative I almost entirely below cliffs due to no-lease of NOSR 1.*

[2] *Minor to Moderate (–) for Great Basin grassland.*

4.3.4 Special Status Fish and Wildlife

Introduction

Special status fish and wildlife species discussed in this section are defined and listed in Section 3.3.4. A number of management actions have already been established for the production area of NOSR 3 or 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 five alternatives represent different combinations of management actions and land-use or resource-development scenarios, each with differing types and levels of impacts.

Under all alternatives, the general management goal is to ensure against actions that would jeopardize 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 each alternative are described below for the five alternatives.

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 will 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 CSU stipulation, BLM may cause the proposed activity to be shifted by more than 200 meters to avoid or minimize the impact. In special mitigation areas as well as CSU areas, BLM may require that the applicant undertake specific measures to reduce the potential for, or severity of, impacts associated with the proposed activity. These may be imposed through the COA process, and one or more LNs may already have been designated for the area, putting the applicant on notice of the need for special measures. Some standard restrictions and limitations also provide a measure of protection.

As pertains to special status fish and wildlife, the analysis uses the following general terms to describe adverse impacts:

- **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 exterminated 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 a general sense to all special status species, including Federally listed, proposed, or candidate threatened or endangered species, interagency consultation with USFWS pursuant to Section 7 of the ESA will address potential adverse impacts on these species during the preparation of a Biological Assessment (BA) and issuance of a Biological Opinion (BO) for the selected alternative.

The following alternatives analysis considers both short-term and long-term impacts to fish and wildlife resources. For the purpose of this analysis, short-term or temporary impacts are those that most often are 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 the production area of NOSR 3 and nearby private lands. 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.

4.3.4.1 Alternative I

The 1988 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 the following stipulations to reduce or avoid potential impacts from the oil and gas development on special status species and their habitats:

- NSO 3 (Major River Corridors) – Avoid a 0.5-mile buffer on either side of the Colorado River.
- NSO 7 and TL 6 (Raptors, general) – Avoid a 0.125-mile buffer around raptor nests year-round and a 0.25-mile buffer from February 1 through April 15.
- NSO 8, TL 10, and TL 11 (Bald Eagles) – Avoid 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.
- NSO 9 and TL 12 (Peregrine Falcons) – Avoid a 0.25-mile buffer around the cliff-nesting complex year-round and a 0.5-mile buffer around the cliff-nesting complex from March 15 to July 31.
- NSO 12 (Threatened or Endangered Species) – Avoid occupied habitat and any habitat required for the maintenance or recovery of the specific species.
- TL 13 (Waterfowl and Shorebird Nesting) – Avoid a 0.25-mile buffer around the nesting and brood-rearing habitat of Fravert Reservoir.
- CSU 3 (BLM Sensitive Species) – Special design and relocation by more than 200 meters may be required to protect the resource.

Alternatives II through V would add analogous NGD and SSR designations for land uses, resource development activities, and management actions not related to oil and gas

In addition, protective stipulations that are not aimed solely at species or groups of special status fish and wildlife would also benefit them. These include NSO 2 and CSU 2 for riparian and wetland zones, NSO 11 for wildlife seclusion areas, NSO 15 for areas with slopes steeper than 50 percent, NSO 19 for the Anvil Points Cave area, and TL 1 for big game winter range during the 5-month period December through April.

While the stipulations described above 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. These include NSO, TL, and CSU stipulations for the protection of the Colorado River cutthroat trout, raptor nests, and bald eagles nests, roosts, or concentration areas (BLM 2002a). The purpose of these stipulations is to meet the following objectives of the 1996 RMP: "(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."

Direct and Indirect Impacts

The general objective for ecological resources under Alternative I is to maintain current ecological values and processes, and biological diversity, with existing management direction and activities. This includes the requirement to protect special status fish and wildlife species and their habitat.

Due to the limitation of current noxious weed management, noxious weed populations are expected to increase in frequency, density, and diversity under this alternative. While this has the potential to affect special status species, the impacts are likely to be limited to slight changes in abundance and distribution of ground-dwelling species such as the Utah milk snake and avian predators (raptors) that may feed on ground-dwelling small mammals affected by the change in upland vegetation. Any impacts to riparian vegetation from weed infestations would be more serious because of the potential for damage to the riparian community, which supports a variety of neotropical migrant small birds as well as raptors and other species. Of particular concern would be any impacts to riparian vegetation that would affect in-stream habitat quality (e.g., decreased bank stability, decreased vegetation cover, and increased sedimentation) in reaches that either support the Colorado River cutthroat trout or are located upstream or in tributary reaches that could impact the occupied reaches.

This alternative would allow the most unrestricted travel throughout the Planning Area. No areas would be closed to off-route motorized or mechanized travel, and no existing routes would be restricted. As recreational use continues to grow based on projected regional population growth and the increasing popularity of outdoor recreation, the resulting potential for damage to vegetation and increased disturbance is likely to increase the size and severity of "road-effect zones" along commonly used routes. This would reduce effective habitat extent, increase effective habitat fragmentation, and potentially disrupt important movement patterns. Continued use of the Hubbard Mesa OHV area under current management would probably not add markedly to existing levels of wildlife avoidance.

Additionally, Alternative I would allow an estimated 247 new well pads in the production area of NOSR 3 below the rim, with an associated 1,120 acres of long-term habitat loss. This would represent a direct loss of 2.9 percent of lower-elevation habitats — including pinyon/juniper, sagebrush, and semi-desert scrub and smaller areas of Douglas-fir, riparian, and mountain shrub habitats. Using a factor of 3.5 to account for disturbance-related effective habitat loss (see Section 4.3.2) yields 3,920 acres or approximately 10.1 percent of these lower-elevation areas. Wildlife uses of these habitats include nesting/denning and hunting/feeding habitat for several special status mammals, birds, reptiles, and amphibians.

Potential impacts to special status species are summarized below. Species present in portions of western Colorado but not likely to occur in the Planning Area and vicinity, or to be affected by activities in the Planning Area, are not discussed below. 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 both the razorback sucker and Colorado pikeminnow within the Colorado River and 100-year floodplain along the southern boundary of the Planning Area from the town of Rifle downstream. In addition, critical habitat for the bonytail and humpback chubs has been designated for the Black rocks area near the Colorado-Utah border approximately 80 miles downstream. No significant impacts are expected to these species, based on the fact that Alternative I would not result in reduction of water volumes, increase in sediment transport, or decrease in water quality that would affect these species. Indeed, reduced sediment loads in the Colorado River and tributaries due to construction of dams is considered one of the key contributing factors to the historic decline of these native species. The NSO for protection of the Colorado River corridor would further reduce potential direct impacts to these species.

In terms of water quantity, USFWS previously agreed with BLM's position that oil and gas development would not deplete streamflows in the Upper Colorado River Basin and could actually increase flows.

An existing potential threat to these species is 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 (removal or capping) of the pile under any of the five alternatives would be expected to reduce or eliminate this potential threat. Development of industrial and other uses on private lands along the Colorado River, including oil and gas development, also represent a potential threat from transport of pollutants in surface runoff or unintended releases of contaminants. Potential impacts from oil and gas contaminants, generated both on private and BLM lands at lower elevations of the Planning Area, are minimized by standard restrictions and limitations aimed at capturing spills and releases before they can be transported to the river.

Boreal Toad — This candidate species is not known to occur in the Planning Area. The site is near the lower elevational limits of the species, and suitable habitat types within the Planning Area are limited and isolated.

Bald Eagle — The bald eagle is not known to nest in the Planning Area or vicinity but occurs as a winter visitor. Mature trees along riparian corridors provide perching and roosting habitat, while the Colorado River and nearby areas of open terrain provide hunting habitat. No significant impacts to the bald eagle would be expected under Alternative I based on NSO protection of the Colorado River corridor and other riparian areas, and NSOs and TLs for nests or 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 — This species is not known to occur in the Planning Area, but potentially suitable habitat occurs in tributary gulches of the Parachute Creek drainage. NSO restrictions on riparian corridors and wildlife seclusion areas under Alternative I 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 NSO for Federally listed species. However, the extent to which this alternative could affect potential hunting habitat is unknown, since that would depend on the location of any nest.

Lynx — This subalpine forest species is not expected to occur in the Planning Area. As discussed in Section 3.3.4, suitable conifer habitat is present atop the plateau, but the habitat is limited in extent, generally narrow (large edge-to-interior ratio), and isolated from more extensive habitats offsite.

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 NSOs 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 temperature of the large streams. Water 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 is expected to be remediated (removed or capped) under any of the five alternatives. Transport of chemical pollutants, including dissolved salts, as runoff or releases from oil and gas activities on private and public lands below the rim are minimized by standard mitigation measures.

Based on the discussion above, potential impacts to these species are expected to be none to negligible.

Colorado River Cutthroat Trout — Genetically pure populations of this subspecies would be subject to some impacts related to increased human use above the rim, especially due to unregulated cross-country travel, as well as continuation of grazing and the potential for weed infestations. Impacts could result from increased sediment load, siltation of substrate, loss of vegetation for screening and thermal regulation, and overfishing due to unregulated OHV access. The oil and gas NSO for riparian habitats would have little benefit to this subspecies under Alternative I, because the stream segments and watershed areas it occupies are limited to the no-lease area of NOSR 1. Therefore, impacts would result primarily from disturbance of soils or streambeds, and destruction of riparian vegetation, by cross-country OHV travel and livestock grazing.

Due largely to unregulated off-trail travel and limited range improvements, Alternative I could result in minor to localized major impacts to this subspecies.

Amphibians — The occurrence of both the Great Basin spadefoot and the northern leopard frog is limited by the availability of aquatic habitats: seasonal ponds or pools for the toad and perennial ponds or slow-flowing streams for the frog. Impacts under Alternative I would consist primarily of the potential for habitat degradation associated with livestock grazing and cross-country OHV travel.

Impacts would be negligible to minor, depending on whether drainages crossed by new well roads below the rim are used by toads or frogs. The potential for impacts above the rim is lower due to the less intensive use anticipated.

Reptiles — The Utah milk snake and midget faded rattlesnake are expected or known to occur in the Planning Area. The NSO for steep slopes would preserve much of the potential denning habitat for the rattlesnake, which would also be protected by the CSU for BLM sensitive species. The milk snake occurs along riparian corridors and moist gulches and would be generally protected by the riparian corridor NSO. Either species could be affected by cross-country OHV travel and by livestock grazing due to degradation of vegetation cover or direct mortality from being run over or trampled.

Overall, impacts to either species would be expected to be negligible.

Waterbirds — Barrow’s goldeneye and the white-faced ibis 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 NSO is probably the most important habitat protection within the Planning Area. A more extensive 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.

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 Alternative I due to some loss of hunting habitat and, except for cliff-nesters such as the peregrine falcon and golden eagle, potential loss of nesting habitat. However, the direct loss of 1,151 acres under Alternative I would be a small fraction (1.6 percent) of the Planning Area. Cliff-nesting areas for the two falcon species and the golden eagle are especially important because these species depend on high cliffs for nesting. For the peregrine falcon, formerly Federally listed as threatened but now delisted, 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 NSO and TL stipulations under Alternative I.

For the northern goshawk and boreal owl, aspen and conifer forests at higher elevations of the Planning Area and some areas of old-growth Douglas-fir just 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. Even with the limited oil and gas development atop the plateau under Alternative I, the forest habitats required by these species would be subject to increased disturbance from recreational OHV use.

Another special status raptor, the northern harrier, nests and hunts in more open habitats dominated by grasses, forbs, and low shrubs. Therefore, the additional oil and gas development below the rim under Alternative I would represent more of a potential impact than for the primarily forest-dwelling species at higher elevations. Swainson's hawk could occur at any elevation.

Based on the continuation of existing protective stipulations and limited oil and gas development, impacts to raptors under Alternative I are expected to range from none to negligible.

Neotropical Migrants and Other Small 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 birds of conservation concern, either occur or could occur in habitats of the Planning Area (see Section 3.3.4). Lower-elevation sensitive species or birds on the BCC list, 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 the same percentage of habitat as other species below the rim. Because of their smaller home ranges, however, these species would be more affected by the direct habitat loss below the rim (2.9 percent) than by effective habitat loss associated with behavior avoidance of oil and gas activities or other intensive land uses (10.1 percent).

For areas atop the plateau, the aging condition of the aspen forest due to fire suppression could gradually affect sensitive small birds such as the three-toed woodpecker, Williamson's sapsucker, the olive-sided flycatcher, and other birds above the rim An uncontrolled wildfire in these areas could have a more devastating effect on forest birds. Increased disturbance from growing motorized recreational use, including cross-country travel, could affect some species, as could any impacts on riparian habitats from livestock overuse of areas along drainages.

Habitats of particularly high quality for many birds, including some special status raptors, are the seclusion areas protected by NSO 11. As described in Section 4.3.2, these areas offer dense, rugged, unfragmented habitat that includes dense cover, water, proximity to open lands, and a connection through the cliffs between higher and lower elevations.

BLM has not yet developed conservation strategies for species on the BCC list. However, existing NSO and CSU stipulations aimed at reducing impacts to high-quality habitats — including riparian corridors, some areas with steep forest slopes, and areas around raptors nests — would benefit these species. On the other hand, the most important habitats for supporting BCC species and other small birds include mixed aspen and conifer forests atop the plateau, which are not afforded special protection or management. Alternative I, while not specifically managing for these species, would benefit them by retaining most of the area atop the plateau in a no-lease designation, limiting adverse impacts primarily to habitat damage associated with permissible cross-country OHV travel and rangeland impacts from livestock grazing.

Overall, impacts to sensitive small birds from Alternative I would be expected to be negligible, with most of the impacts occurring below the rim.

Bats — Gour species of sensitive bats known to occur in the area (spotted bat, fringed myotis, Yuma myotis, and Townsend's big-eared bat) and the big free-tailed is a potential resident. All would be largely protected by NSOs intended to protect riparian corridors, major river corridors, wildlife seclusion areas, slopes steeper than 50 percent, and the Anvil Points cave areas. Loss of some pinyon/juniper woodland below the rim would reduce roosting and hunting habitat for the bats, but only at the level of direct loss (2.9 percent). The actual reduction is probably much lower due to preferential use of other wooded or rocky areas.

Overall, impacts to these species from implementation of Alternative I would be expected to range from none to negligible. Potential sources of impacts would include increased and relatively unfettered recreational use above the rim.

Carnivores — The American marten is a denizen of mature subalpine forests and is not known to occur in the Planning Area. Although spruce/fir and Douglas-fir forests atop the plateau and along some cliff sections provide potentially suitable habitat, the onsite habitat is probably too limited in extent, perhaps too low in elevation, and too isolated from more extensive habitats offsite to support a viable population. Under Alternative I, habitats atop the plateau would be subject to disturbance and potential fragmentation from increased motorized recreation, including cross-country use.

Because of the low likelihood of occurrence, no impacts to the species would be expected from implementation of Alternative I. If the species were present, disturbance associated with increased recreational travel and the effective habitat fragmentation of disturbance corridors could cause a major impact if sufficient to force a group of martens to abandon the area.

Another USFS sensitive species and State-listed endangered species potentially present but not known to occur onsite is the river otter. If this aquatic carnivore were to disperse into or through the Planning Area from future release sites or natural dispersion from occupied habitat, movement would be along the Colorado River, which is protected by an NSO. Impacts to riparian vegetation by livestock and to seclusion areas by cross-country vehicle use could affect habitat quality for the otter.

Offsite and Cumulative Impacts

Cumulative impacts under Alternative I would be associated with the combination of oil and gas development on BLM land and private land within the Planning Area. Because of assumed higher well densities and lower levels of ecological protection on private lands, the combined result would be direct habitat loss of 4.7 percent and effective habitat loss of 16.4 percent of the Planning Area during the 20-year period of analysis. The larger number uses a factor of 3.5 to account for disturbance-related impacts (see Section 3.3.2). Nearly all private lands and about 97 percent of Federal lands impacted by oil and gas would be in habitats at lower elevations below the rim, including habitats such as pinyon/juniper, sagebrush, and semi-desert scrub mixed with smaller areas of mountain brush, Douglas-fir, and riparian/wetland vegetation. Impacts to the combined public and private lands below the rim would include a 6.4-percent direct habitat loss and 22.5-percent effective habitat loss.

For large, wide-ranging, or furtive species such as raptors and carnivores, this level of oil and gas development could represent a minor to moderate impact during construction and a minor impact over the long term. A higher impact level is not assumed despite the nearly 29-percent overall loss and 23-percent loss at lower elevations because the Planning Area would not represent the entire hunting habitat for species such as a wintering bald eagle or a nesting peregrine falcon. A northern goshawk atop the plateau would be more likely to have its hunting habitat entirely within the Planning Area, but the higher level of impact associated with construction would not occur simultaneously throughout the entire area. The NSO and TL restrictions for raptor nesting also reduce the potential for impacts.

For smaller species such as the boreal owl, flammulated owl, and neotropical migrant songbirds, the amount of direct habitat loss at full build-out would represent negligible to localized minor habitat loss due to their smaller home ranges and narrower zones of avoidance around areas human activity.

Offsite impacts could occur if future management or development actions result in reduced populations of wide-ranging species such as the bald eagle, which roosts mostly offsite but may feed onsite, and the peregrine falcon, which nests and roosts onsite but hunts offsite.

4.3.4.2 Alternative II

Alternative II would protect ecological values and processes and biological diversity by limiting surface disturbance and promoting natural ecosystem processes and functions. To accomplish these goals, four ACECs would be designated, and special management attention would be prescribed to protect and enhance ecological resource values.

Alternative II would incorporate the same surface-use stipulations as listed for Alternative I above, with the addition of ACEC-specific measures. These include:

- NGD/NSO stipulations W-4 and W-5 would prohibit loss or degradation of high-risk and moderate-risk habitat, respectively, for the Colorado River cutthroat trout.
- NGD/NSO W-6 would prohibit long-term (lasting longer than two growing seasons) ground-disturbing activities in areas of high value watershed processes upstream or upslope from occupied habitat of the Colorado River cutthroat trout.

Direct and Indirect Impacts

Several special management stipulations are proposed for special status plant species and significant plant communities within the designated ACECs (Section 4.3.3). Specific emphasis would be placed on noxious weed inventory, detection, monitoring, and specific project actions. Riparian areas and river corridors are a focus of vegetation protection and management under this alternative. This includes a specific objective for maintaining proper hydrologic function and protection of areas adjacent to these resources. Due to these protections and specific management actions, it is expected that many riparian reaches would return to PFC over time, resulting in positive impacts to riparian/wetland habitats, riparian wildlife communities, and aquatic species.

Travel management under this alternative would prohibit motorized or mechanized cross-country travel, including over-snow travel by snowmobile and OHV travel in the Hubbard Mesa SRMA. These measures would retard or prevent further expansion of travel routes throughout the Planning Area and reduce the impact of associated disturbance and habitat degradation. Permanently closing 34 miles of existing routes and limiting 44 miles of existing routes to administrative travel would also benefit wildlife. Together, these actions would result in some benefit to sensitive wildlife, depending on their vulnerability to disturbance and the size of their home range. These positive impacts would partially, but not fully, offset impacts from oil and gas development, especially atop the plateau.

An estimated 66 well pads above the rim and 244 below the rim are anticipated under this alternative. The lower elevation wells would result in long-term loss of approximately 1,105 acres of habitat, with effective loss of an estimated 3,868 acres. The latter figure represents 10.0 percent of BM lands below the rim. Closure of a small portion of the roads below the rim would have some benefit, as would restriction to designated routes of OHV travel in the Hubbard Mesa SRMA. However, the high level of use and disturbance (noise, dust, fast movement, etc.) on the designated OHV trails would still limit wildlife use of this area.

Another impact under this alternative would be oil and gas development atop the plateau in areas that currently are essentially “pristine” except for livestock grazing and the presence of lightly traveled roads and associated recreational use. The long-term habitat loss above the rim due to oil and gas development would be approximately 243 acres, or an effective loss of 847 acres of habitat, representing 2.4 percent of the highland habitats.

Impacts to specific groups of special status species would be as follows:

Endangered Colorado River Fishes and Sensitive Non-game Fishes — No impacts are expected for these species, for the reasons discussed under Alternative I. The increased development above the rim under this alternative is not an issue because the area does not include suitable habitat and is too far removed from occupied or potential habitat along the major streams for local stream impacts to have an influence. Closing 38 miles of routes and restricting travel to designated routes could benefit the species in terms of additional protection along lower elevation streams.

Colorado River Cutthroat Trout — Only negligible to minor impacts would occur based on the special management NGD/NSO stipulations described above, and especially if suggested mitigation measures to protect stream quality are implemented (see Section 4.3.2). Closing 38 miles of routes above the rim to public motorized use and restricting cross-country travel would further reduce stream impacts and also reduce the potential for overfishing or for ad hoc introductions of genetically impure strains, other subspecies, or other species by making access to some areas more difficult. Beneficial impacts to riparian corridors from active management and changes in grazing would also benefit the trout.

Amphibians — Impacts to the boreal toad, Great Basin spadefoot, and northern leopard frog would be negligible to minor, depending on whether drainages crossed by new well roads support breeding toads or contain perennial pools that support frogs.

Proposed mitigation measures under Alternative II would preclude new road crossings where feasible and require use of culverts or bridges to reduce impacts to streams.

Reptiles — The potential impacts to the Utah milk snake and midget faded rattlesnake would be similar to those described for Alternative I, as would the amount of oil and gas development at lower elevations where these species might occur. Neither species is expected above the rim. Restriction of travel to designated routes under this alternative would reduce the potential for direct and indirect impacts from habitat degradation and direct mortality from being run over by ATVs, dirt bikes, or bicycles.

Waterbirds — Barrow's goldeneye and the white-faced ibis occur in the Planning Area as migrants. Impacts would be similar to those for Alternative I, except that restriction of motorized travel to designated routes would reduce the potential for disturbance.

Bald Eagle — In general, the potential for adverse impacts would be the same as described under Alternative I. Impacts would be none to negligible based on the Colorado River NGD/NSO stipulation and the NGD/NSO and TL stipulations for nests and winter roosts. Some loss of hunting habitat could result from oil and gas development, but this represents a small portion of likely winter hunting habitat. Restriction of travel to designated routes would benefit the species, especially if it were to prevent disturbance of roosting eagles during the winter.

Mexican Spotted Owl and Western Yellow-billed Cuckoo — These Federally listed or candidate species are unlikely to occur. If present, impacts would be similar to those under Alternative I except for decreased disturbance due to limitation of OHV travel to designated routes under this alternative. The western yellow-billed cuckoo is a bird of mature riparian forest, and potential habitat would be protected by stipulations aimed at aquatic and riparian areas. Retention of wildlife seclusion area protection would preserve the most important potential habitat for the Mexican spotted owl.

Other Raptors — Sensitive or State-listed raptors such as the peregrine falcon, prairie falcon, ferruginous hawk, Swainson's hawk, golden eagle, northern goshawk, northern harrier, flammulated owl, boreal owl, and burrowing owl would be subject to negligible to minor impacts based on the relatively minor amount of nesting and hunting habitat affected, and continued NGD/NSO stipulations for the Colorado River, other riparian areas, nesting areas, and wildlife seclusion areas, as well as the TL stipulation for nests.

The northern goshawk and boreal owl and, to a lesser extent, the flammulated owl are the special status raptors most likely to occur above the rim. The effective loss of 840 acres of highland habitat during the 20-year period of analysis would represent 2.4 percent of the habitat for these species, a negligible amount. Protection of most of the forested habitat within the WSR-eligible stream corridors and in areas having wilderness character would probably result in most wells being in more open sagebrush ridgetops, which generally are less important habitats for these species. Another sensitive raptor, the northern harrier, could both nest and hunt in the open sagebrush, semi-desert scrub, and grassland/pasture habitats of the Planning Area. For this species, as well as the ferruginous hawk and Swainson's hawk, the greater degree of oil and gas development on open ridgetops atop the plateau would cause greater habitat loss than for forest-dwelling species (minor impacts).

Closing 43 miles of existing routes under this alternative, limiting 43 miles of existing routes to administrative use, and prohibiting cross-country motorized or mechanized travel would reduce impacts associated with OHV use. This would create a greater degree of seclusion for all raptors and help offset some of the impacts associated with oil and gas development.

Neotropical Migrants and Other Small Birds — As described for Alternative I, not all neotropical migrants are designated as special status species, nor are all of them forest species. However, many of the species nest in pinyon/juniper woodland, aspen forest, or conifer forest habitats such as occur in the Planning Area. The total of 1,348 acres of direct habitat loss and 4,711 acres of effective habitat loss under this alternative would represent 1.8 and 6.4 percent, respectively, of BLM lands in the Planning Area during the 20-year period of analysis. However, since smaller species are affected by relatively small-scale impacts, most of the disturbance-avoidance effects would coincide with active construction, which would occur gradually over many years. Thus, the habitat loss in any one year would represent a gradual accrual of long-term impacts, plus impacts related to specific areas of construction. Since most of the impact would be direct rather than indirect, and since most of the higher-elevation forests would be avoided under Alternative II (due to WSR, wilderness character, and other NGD/NSO stipulations), impacts to these species would be negligible. The closure of existing routes and restriction of motorized travel on designated routes could offset any adverse impacts.

Bats — Due to protection of the Anvil Points cave area, the steep slope stipulation, and protection of most forest areas under various NGD/NSO and TL stipulations described above, the 1,348 acres of direct habitat loss — much of it semi-desert scrub or sagebrush habitat — would result in negligible impacts to bats under Alternative II.

Carnivores — In the unlikely event that the lynx, wolverine, or American marten occur in the Planning Area (the marten being the most likely), impacts would be greater under Alternative II because of the substantially greater amount of aspen and conifer habitat atop the plateau that would be affected by oil and gas development. The effective habitat loss of 2.4 percent of the highland habitats would represent a negligible to minor impact, depending on specific locations relative to occupied home ranges. Because of protective stipulations for the WSR-eligible stream segments, areas having wilderness character, and other specific resources, it is expected that most impacts would be in habitats not currently suitable for these secretive species. This consideration, coupled with the road closures and restrictions to designated routes, could offset any potential adverse impact from oil and gas development. Should the river otter occur, none of the anticipated land use or management action impacts would be likely to affect this aquatic species because its habitat is essentially limited to the Colorado River, which is protected by various stipulations related to other riverine resources (see above).

Offsite and Cumulative Impacts

Cumulative impacts under Alternative II would be associated primarily with the combination of oil and gas development on BLM land and private land within the Planning Area. Cumulative impacts from continued increases in recreational use throughout the region would also be expected, but the route closures and restrictions on cross-country motorized travel under Alternative II would reduce these, and the private land in the Planning Area would receive less-intensive recreation than the BLM land. In terms of oil and gas development, the cumulative impact during the 20-year period of analysis would result in an estimated 6,148 acres of direct loss and 21,518 acres of effective habitat loss, with about 78 percent of this amount on private lands. The direct and effective habitat loss estimates for the entire Planning Area during the 20-year analysis period are 4.8 and 16.9 percent, respectively.

Nearly all of the private land and about 82 percent of the BLM land affected by oil and gas would be in lower-elevation habitat types such as pinyon/juniper, sagebrush, and semi-desert scrub mixed with smaller areas of mountain brush, Douglas-fir, and riparian/wetland vegetation. Therefore, impacts to combined public and private lands at these lower elevations would represent direct and effective habitat losses of approximately 7 percent and 23 percent, respectively.

For large, wide-ranging, or furtive species such as raptors and carnivores, the effective habitat loss could represent a moderate impact during construction and over the long term. A higher impact level is not assumed despite the nearly 9-percent overall loss and 23-percent loss at lower elevations because the Planning Area would not represent the entire hunting habitat for species such as a wintering bald eagle or a nesting peregrine falcon. A northern goshawk atop the plateau would be more likely to hunt entirely within the Planning Area, but the level of impact associated with construction would not occur simultaneously throughout the entire area, being spread over many years. The NGD/NSO and TL restrictions for raptor nesting areas would also reduce the potential for adverse effects on these species.

For smaller species such as the boreal owl, flammulated owl, and neotropical migrant birds, the direct habitat loss would be negligible to minor; they have smaller home ranges and narrower zones of avoidance due to human activity. Most impacts would be below the rim.

Offsite impacts could also occur if future management or development actions result in reduced populations of wide-ranging species such as the bald eagle, which roosts mostly offsite but may feed onsite, and the peregrine falcon, which nests and roosts onsite but hunts offsite.

4.3.4.3 Alternative III – Preferred Alternative

This alternative makes the entire Planning Area available for oil and gas development, although leasing and drilling atop the plateau would be deferred until 80 percent of anticipated wells below the rim have been drilled. Two of the four ACECs and the areas having wilderness character assumed for Alternative II would not be carried into Alternative III, although the WSR-eligible streams and other surface-use would be applied, and 9,006 acres would be managed in ways that would protect roadlessness and naturalness (Map 36). Specific measures associated with the East Fork Parachute Creek and Trapper/Northwater Creek ACECs include NGD/NSO W-4 to protect high-risk habitat for Colorado River cutthroat trout from direct impacts, and SSR/CSU W-7 to protect moderate-risk cutthroat trout habitat from most indirect impacts. The SSR/CSU W-7 stipulation provides less protection than the

NGD/NSO W-6 stipulation for the same areas under Alternative II. This alternative includes designation of the Trapper/Northwater Creek drainage as a WMA, with the specific management objectives listed in Table 2-3.

Most other stipulations for Alternatives I and II would also be applied under this alternative. Exceptions are that the 5-month TL stipulation for big game winter range would be replaced with a 2-month COA, and the NGD/NSO W-2 stipulation for wildlife seclusion areas would be dropped.

Direct and Indirect Impacts

Due to the emphasis on active measures to improve range condition, Alternative III could hasten long-term improvements compared to both Alternatives I and II. However, this assumes that related ground-disturbing activities, such as new stockponds to disperse livestock use, are designed, located, and built in a way that minimizes impacts. Improved range condition and distribution of livestock would benefit some special status species, including indirect impacts related to increased abundance of prey species in the areas of improving plant cover and forage quality. Aquatic species would also benefit due to enhancement of some currently degraded areas along streams that attract concentrated wildlife use. Offsetting this benefit to a degree would be a less systematic approach to weed management than under Alternative II. Overall, range condition improvements would have negligible to localized minor beneficial impacts to special status wildlife.

Alternative III would limit motorized or mechanized travel to designated routes, including the Hubbard Mesa SRMA but excluding over-snow travel by snowmobile. These management actions would reduce the expansion of travel routes throughout most of the Planning Area, thereby reducing direct and effective habitat loss resulting from impacts to vegetation, sediment transport to streams, dispersed sources of disturbance to wildlife solitude, and (potentially) fishing pressure on the Colorado River cutthroat trout. Combined with the closure of 26 miles of existing roads or routes and restriction to administrative use on an additional 24 miles, the overall impact of travel management on special status fish and wildlife would be positive. These positive impacts would help offset, but not fully offset, adverse impacts from increased oil and gas development.

All BLM lands would be open to oil and gas leasing, but more than 31,000 acres would remain closed to ground-disturbing activities due to NGD/NSO stipulations associated with sensitive resources. Alternative III would result in an estimated 402 new well pads, of which 323 would be below the rim and 39 above the rim. These pads would require approximately 241 miles of new or widened access roads. Impacts below the rim would include an estimated 1,595 acres of direct and 5,582 acres of effective habitat loss over 20 years. The latter represents 13.4 percent of lower-elevation habitats (mostly pinyon/juniper, sagebrush, and semi-desert scrub). The 39 pads above the rim would directly impact 166 acres, with 581 acres of effective habitat loss (1.7 percent of the higher elevation areas). These areas include aspen, conifer, sagebrush, and mixed mountain brush communities. Both above and below the rim, the new pads and associated impacts would create additional habitat fragmentation and increased disturbance from human activity, although these would be offset to some extent by the more stringent restrictions on cross-country motorized travel than at present.

Habitat fragmentation would be greater than for Alternative II overall, although less so for the area atop the plateau during the 20-year period of analysis due to deferred drilling. However, the annual drilling rate in that area would be considerably greater once drilling is initiated, resulting in increased fragmentation from human disturbance and more rapid habitat loss.

Impacts to specific groups of special status species are summarized below. For all species using habitats on top of the plateau, the impact discussions address the post-deferral period, estimated to occur approximately 16 years into the 20-year period of analysis.

Endangered Colorado River Fishes and Sensitive Non-game Fishes — No impacts are expected for these species, for the reasons discussed under Alternative I. The increased development above the rim under this alternative is not an issue because the area does not include suitable habitat and is too far removed from occupied or potential habitat along major streams for local stream impacts to have an influence. Closing roads and restricting travel to designated routes could benefit the species by additional protection along lower elevation streams.

Colorado River Cutthroat Trout — Eventually, impacts would be greater for Alternative III than for Alternative II because of the increased area available for oil and gas development. However, the increased impacts would not begin until late in the 20-year period. After drilling has begun in that area, NGD/NSO stipulations for high- and moderate-risk trout habitat and riparian/wetland vegetation would protect the occupied habitat and much of the adjacent watershed. While some areas with other NGD/NSO stipulations in Alternative II would instead have SSR/CSU stipulations under this alternative, the remaining NGD/NSO areas and the ability under SSR/CSU to shift surface facilities by more than 200 meters is expected to continue to keep impacts to trout habitat in the minor range. However, impacts to the trout and occupied or suitable habitat would be moderate in localized areas following initiation of drilling if stream crossings are not minimized and if "low-water" stream crossings (instead of culverts or bridges) are permitted.

Closing 41 miles of existing routes above the rim to public motorized use and restricting cross-country travel would further reduce stream impacts and reduce the potential for overfishing by making access to some areas more difficult. Improvements in the quality of riparian corridors from active management and changes in grazing would also benefit the trout.

Amphibians — The boreal toad, Great Basin spadefoot, and northern leopard frog would suffer negligible to minor impacts, depending on whether drainages crossed by new well roads support breeding toads or contain perennial pools that support frogs. Proposed mitigation measures would preclude new road crossings where feasible and require the use of culverts or bridges to reduce physical impacts to streams.

Reptiles — The types of potential impacts to the Utah milk snake and midget faded rattlesnake would be similar to those described for Alternative II, but the area impacted in lower elevation habitats would be approximately 36 percent greater. Neither species is expected above the rim. Continuation of the Alternative II restriction on travel to designated routes would reduce the potential for direct and indirect impacts from habitat degradation and direct mortality from being run over by ATVs, dirt bikes, or bicycles.

Waterbirds — Impacts to Barrow's goldeneye and the white-faced ibis would be similar to those for the previous alternatives due to protective stipulations, except that restriction of motorized travel to designated routes would reduce the potential for disturbance impacts.

Bald Eagle — As with the previous alternative, impacts would be none to negligible based on the Colorado River NGD/NSO stipulation and the NGD/NSO and TL stipulations for nests and winter roosts. Some loss of hunting habitat could result from oil and gas development below the rim, but this represents a small portion of likely winter hunting habitat.

Mexican Spotted Owl and Western Yellow-billed Cuckoo — These species are considered unlikely to occur. If present, they would be subject to impacts similar to those under Alternative I, except for decreased disturbance due to limitation of OHV travel to designated routes under this alternative. Additionally, Alternative III differs from Alternatives I and II because it does not include the NGD/NSO stipulation for wildlife seclusion areas, which provide some of the most important potential habitat for the Mexican spotted owl due to the combination of remoteness, compositional and structural diversity, and lack of fragmentation. The western yellow-billed cuckoo is a bird of mature riparian forest, and potential habitat would be protected by stipulations aimed at aquatic and riparian areas.

Other Raptors — The peregrine falcon, prairie falcon, ferruginous hawk, Swainson's hawk, golden eagle, northern harrier, northern goshawk, flammulated owl, boreal owl, and burrowing owl would be subject to the same types of impacts as for the previous alternatives. Impact levels to these special status species would be expected to remain in the range of minor based on the amount of nesting and hunting habitat affected under Alternative III and the application of NGD/NSO stipulations for the Colorado River, other riparian areas, and raptor nests (coupled with TLs during the nesting season). However, dropping the NGD/NSO protection for wildlife seclusion would increase the potential for impacts, especially for the flammulated owl.

The northern goshawk and boreal owl are typically associated with the types of habitats that occur above the rim. The effective habitat loss of 581 acres in nesting and hunting areas for the portion of the 20-year period of analysis following the oil and gas deferral would reduce the total habitat available by approximately 1.7 percent, a negligible to minor impact. Most of the forest habitat would be protected by various NGD/NSO stipulations associated with sensitive resources. Consequently, ground-disturbing activities would occur primarily in more open sagebrush ridgetops, which generally are less important habitats for these species. The northern harrier, ferruginous hawk, Swainson's hawk, and golden eagle could occur in open sagebrush, semi-desert scrub, and grassland/ pasture habitats atop the plateau and would be more likely affected (minor impacts) by their preference for the type of open terrain where much of the potential oil and gas impact is likely to occur.

As with other special status species, the closure of 17 miles of existing routes above the rim, restriction to administrative access on 24 miles of existing routes, and prohibition against cross-country motorized travel would reduce impacts associated with OHVs. This would create a greater degree of seclusion for raptors and help offset some of the impacts associated with oil and gas development.

Neotropical Migrants and Other Small Birds — For the special status small-bird species that use Douglas-fir, pinyon/juniper, sagebrush, or other habitats below the rim, the estimated 5,582 acres of effective habitat loss (using a factor of 3.5) would represent 14.4 percent of this portion of the BLM lands and could reduce population sizes proportionately. The same is true for the 1.7 percent of effective habitat loss above the rim in sagebrush, mountain brush, aspen, and mixed conifer habitats. These losses represent negligible to localized minor impacts to small birds (including species on the BCC list) during the 20-year period of analysis. However, since smaller species are affected by relatively small-scale impacts, avoidance of disturbance zones around the areas of direct habitat loss would be greatest during active construction, which would occur gradually over many years. Thus, the habitat loss in any one year would represent a gradual accrual of long-term impacts, plus impacts related to specific areas of construction. Fortuitously for these species, much of the riparian and conifer forest habitat would be avoided under Alternative III due to NGD/NSO stipulations, limiting adverse impacts to species associated with these habitats.

The closure of some existing routes and restriction of motorized travel on designated routes could offset some adverse impacts. However, the lack of NGD/NSO protection for the approximately 3,400 acres of wildlife seclusion areas would add to the impacts for several BCC and other neotropical migrant bird species because these areas offer mature, diverse, remote, and unfragmented habitat.

Bats — Due to protection of the Anvil Points cave area, the steep slope stipulation, and protection of most forest areas under various NGD/NSO and TL stipulations described previously, the direct loss of relatively small areas of habitat (1.6 percent of the BLM portion of the Planning Area) would represent negligible impacts to hunting habitat for bats. This conclusion is based on the fact that the highest-quality hunting and roosting habitat for bats —

including riparian areas, mature forests, and cliffy areas — would be less impacted than more open, scrubby terrain.

Carnivores — Although the lynx, wolverine, and American marten are unlikely to occur in the Planning Area, impacts to any of these species that could be present would be potentially greater under Alternative III due to the greater amount of oil and gas development above the rim. If any of these species were present (the marten is the most likely), the loss of habitats above the rim would amount to only about 1.7 percent of the total in the Planning Area. While this would appear negligible to minor, the fragmentation and loss of seclusion to these furtive species resulting from the increased development (including 23 miles of access roads above the rim) and deletion of special protection measures for areas having wilderness character, two ACECs, and wildlife seclusion areas could have a moderate to localized major impact. Road closures and restrictions to designated routes could help offset any potential adverse impacts to these species from oil and gas development.

Should the river otter occur, it would be expected only along the Colorado River corridor, which would remain largely unaffected by any proposed land uses or management actions under this alternative and remain protected by NGD/NSO and TL stipulations aimed at other aquatic or riparian resources (see above).

Offsite and Cumulative Impacts

As with Alternative II, offsite and cumulative impacts under Alternative III would be associated primarily with the combined effect of oil and gas development on BLM land and on adjacent or nearby private land. Although cumulative impacts from other uses such as recreation and livestock would occur, these would be less marked than impacts from oil and gas. This conclusion is based on (1) the greater amount of direct and indirect habitat loss from oil and gas development than anticipated with other uses, (2) the proportionately lower recreational use on private lands than BLM lands, and (3) the relatively small differences among the alternatives in terms of grazing impacts, which are ongoing and expected to continue at a similar (though reduced) level.

Cumulative impacts from oil and gas development during the 20-year period of analysis would result in an estimated 3,923 acres of direct habitat loss and 13,730 acres of effective habitat loss using a factor of 3.5. The latter value represents 10.8 percent of the Federal and private lands in the Planning Area. Nearly all private lands and about 76 percent of BLM lands affected by oil and gas development would be in lower elevation habitat types such as pinyon/juniper, sagebrush, and semi-desert scrub, with smaller areas of mountain brush, Douglas-fir, and riparian/ wetland vegetation. Direct and effective habitat loss would represent approximately 8.3 percent and 29.2 percent, respectively, of these portions of the Planning Area below the rim.

For large, wide-ranging, and furtive sensitive species such as raptors and carnivores, this could represent a moderate to localized major impact during construction and over the long term. A higher impact level is not assumed despite the nearly 11-percent overall loss and more than 29-percent loss at lower elevations because the Planning Area would not represent the entire hunting habitat for a wintering bald eagle and would represent only minor hunting habitat for a peregrine falcon. A northern goshawk atop the plateau would be more likely to hunt entirely within the Planning Area, but the higher level of impact associated with construction would not occur simultaneously throughout the entire area, being spread over many years.

For smaller species such as the flammulated owl, boreal owl, and neotropical migrants, the direct habitat loss would be negligible to minor due to their smaller home ranges and narrower zones of avoidance around areas of human activity.

Offsite impacts could also occur if future management or development actions result in reduced populations of wide-ranging species such as the bald eagle, which roosts mostly offsite but may feed onsite, and the peregrine falcon, which nests and roosts onsite but hunts offsite.

4.3.4.4 Alternative IV

This alternative emphasizes a variety of multiple uses, balancing development of mineral resources with focused mitigation. To accomplish this, two of the four ACECs and the areas having wilderness character assumed for Alternative II would not be carried into Alternative IV, although the WSR-eligible streams and other surface-use stipulations would be retained. Specific measures associated with the East Fork Parachute Creek and Trapper/Northwater Creek ACECs include NGD/NSO W-4 to protect high-risk habitat for Colorado River cutthroat trout from direct impacts, and SSR/CSU W-7 to protect moderate-risk cutthroat trout habitat from most indirect impacts. The SSR/CSU W-7 stipulation provides less protection than the NGD/NSO W-6 stipulation for the same areas under Alternative II. This alternative includes designation of the Trapper/Northwater Creek drainage as a WMA, with the specific management objectives listed in Table 2-3.

Most other stipulations described for Alternatives I and II would also apply under this alternative, except that the 5-month TL stipulation for big game winter range would be replaced with a 2-month COA, and the NGD/NSO W-2 stipulation for wildlife seclusion areas would be dropped.

Direct and Indirect Impacts

Due to the emphasis on active measures to improve range condition, Alternative IV could hasten long-term improvements compared to both Alternatives I and II. However, this assumes that related ground-disturbing activities, such as new stockponds to disperse livestock use, are designed, located, and built in a way that minimizes impacts. Improved range condition and distribution of livestock would benefit some special status species, including indirect impacts related to increased abundance of prey species in the areas of improving plant cover and forage quality. Aquatic species would also benefit due to enhancement of some currently degraded areas along streams that attract concentrated wildlife use. Offsetting this benefit to a degree would be a less systematic approach to weed management than under Alternative II. Overall, range condition improvements would have negligible to localized minor beneficial impacts to special status wildlife.

Alternative IV would restrict motorized or mechanized travel to designated routes throughout the Planning Area, excluding the Hubbard Mesa SRMA and excluding over-snow travel by snowmobile. These management actions would reduce the expansion of travel routes throughout most of the Planning Area, thereby reducing direct and effective habitat loss resulting from impacts to vegetation, sediment transport to streams, dispersed sources of disturbance to wildlife solitude, and (potentially) fishing pressure on the Colorado River cutthroat trout. Combined with the closure of 26 miles of existing roads or routes and restriction to administrative use on an additional 24 miles, the overall impact of travel management on special status fish and wildlife would be positive. These positive impacts would help offset, but not fully offset, adverse impacts from increased oil and gas development.

All Federal minerals would be available for leasing, but more than 31,000 acres would remain closed to ground-disturbing activities due to NGD/NSO stipulations associated with sensitive resources. Alternative IV would result in an estimated 449 new oil and gas pads: 323 below the rim and 126 above the rim. These pads would require approximately 270 miles of new or widened access roads. Impacts below the rim would include an estimated 1,466 acres of direct and 5,131 acres of effective habitat loss over the long term. The latter represents 13.2 percent of the lower-elevation habitats (mostly pinyon/juniper, sagebrush, and semi-desert scrub). The 126 pads above the rim would directly impact 474 acres, with 1,659 acres of effective habitat loss (4.8 percent of the higher elevation areas). These areas include aspen, conifer, sagebrush, and mixed mountain brush communities. Both above and below the rim, the new pads and associated impacts would create additional habitat fragmentation and increased disturbance from human activity, although these would be offset to some extent by the more stringent restrictions on cross-country motorized travel than at present.

Habitat fragmentation would be greater than for Alternative II. Although the fragmentation effect on the surrounding habitat of each pad would be the same as discussed for Alternative II, the effect of more pads above the rim (126 versus 66) and more miles of access roads (76 versus 40) would be to fragment a greater portion of highland habitat. Most of the additional wells above the rim would be in areas designated for SSR/CSU stipulations.

Impacts to specific groups of special status species are as follows:

Endangered Colorado River Fishes and Sensitive Non-game Fishes — No impacts are expected for these species, for the reasons discussed under Alternative I. The increased development above the rim under this alternative is not an issue because the area does not include suitable habitat and is too far removed from occupied or potential habitat along the major streams for local stream impacts to have an influence. Closing roads and restricting OHV travel to designated routes could benefit the species by additional protection along lower elevation streams.

Colorado River Cutthroat Trout — Impacts would be greater for Alternative IV than for Alternative II because of the increased area available for oil and gas development. This 91-percent increase between the alternatives during the 20-year period of analysis would be reflected by a 98-percent increase in acres of long-term impacts from pads, roads, and associated direct and indirect impacts. However, the continued application of NGD/NSO stipulations to high- and moderate-risk trout habitat and to riparian/wetland vegetation would protect the occupied habitat and much of the adjacent watershed. While some areas with other NGD/NSO stipulations in Alternative II would be replaced with SSR/CSU stipulations under this alternative, the remaining NGD/NSO areas and the ability under SSR/CSU to shift surface facilities by more than 200 meters is expected to continue to keep impacts to trout habitat in the minor range. However, impacts to the trout and occupied or suitable habitat would be moderate in localized areas if stream crossings are not minimized and if "low-water" stream crossings (instead of culverts or bridges) are permitted.

Closing 41 miles of existing routes above the rim to public motorized use and restricting cross-country travel would further reduce stream impacts and reduce the potential for overfishing by making access to some areas more difficult. Improvements in the quality of riparian corridors from active management and changes in grazing would also benefit the trout.

Amphibians — The boreal toad, Great Basin spadefoot, and northern leopard frog would suffer negligible to minor impacts, depending on whether drainages crossed by new well roads support breeding toads or contain perennial pools that support frogs. Proposed mitigation measures would preclude new road crossings where feasible and require the use of culverts or bridges to reduce physical impacts to streams.

Reptiles — Potential impacts to the Utah milk snake and midget faded rattlesnake would be similar to those described for Alternative II, but the area impacted in lower elevation habitats would be approximately 33 percent greater. Neither species is expected above the rim. Continuation of the Alternative II restriction on travel to designated routes would reduce the potential for direct and indirect impacts from habitat degradation and direct mortality from being run over by ATVs, dirt bikes, or bicycles.

Waterbirds — Impacts to Barrow's goldeneye and the white-faced ibis would be similar to those for the previous alternatives due to protective stipulations, except that restriction of motorized travel to designated routes would reduce the potential for disturbance impacts.

Bald Eagle — As with the previous alternative, impacts would be none to negligible based on the Colorado River NGD/NSO stipulation and the NGD/NSO and TL stipulations for nests and winter roosts. Some loss of hunting habitat could result from oil and gas development below the rim, but this represents a small portion of likely winter hunting habitat.

Mexican Spotted Owl and Western Yellow-billed Cuckoo — These species are considered unlikely to occur. If present, they would be subject to impacts similar to those under Alternative I, except for decreased disturbance due to limitation of OHV travel to designated routes under this alternative. Additionally, Alternative IV differs from Alternatives I and II because it does not carry forward the NGD/NSO stipulation for wildlife seclusion areas, which provide some of the most important potential habitat for the Mexican spotted owl due to the combination of remoteness, compositional and structural diversity, and lack of fragmentation. The western yellow-billed cuckoo is a bird of mature riparian forest, and potential habitat would be protected by stipulations aimed at aquatic and riparian areas.

Other Raptors — The peregrine falcon, prairie falcon, ferruginous hawk, Swainson's hawk, golden eagle, northern harrier, northern goshawk, flammulated owl, boreal owl, and burrowing owl would be subject to the same types of impacts as for the previous alternatives. Impact levels to these special status species would be expected to remain in the range of minor based on the amount of nesting and hunting habitat affected under Alternative IV and the continued application of NGD/NSO stipulations for the Colorado River, other riparian areas, and raptor nests (coupled with TLs during the nesting season). However, dropping the NGD/NSO protection for wildlife seclusion would increase the potential for impacts, especially for the flammulated owl.

The northern goshawk and boreal owl are typically associated with the types of habitats that occur above the rim. Therefore, the effective habitat loss of 1,659 acres in nesting and hunting areas would reduce the total habitat available by approximately 4.8 percent, a negligible to minor impact. Most of the forest habitat would be protected by various NGD/NSO stipulations associated with sensitive resources. Consequently, ground-disturbing activities would occur primarily in more open sagebrush ridgetops, which generally are less important habitats for these species. The northern harrier, ferruginous hawk, Swainson's hawk, and golden eagle could occur in open sagebrush, semi-desert scrub, and grassland/pasture habitats atop the plateau and would be more likely to be affected (minor impacts) by their preference for the type of open terrain where much of the potential oil and gas impact is likely to occur.

As with other special status species, the closure of 17 miles of existing routes above the rim, restriction to administrative access on 24 miles of existing routes, and prohibition against cross-country motorized travel, would reduce impacts associated with OHVs. This would create a greater degree of seclusion for raptors and help offset some of the impacts associated with oil and gas development.

Neotropical Migrants and Other Small Birds — For the special status small-bird species that use Douglas-fir, pinyon/juniper, sagebrush, or other habitats below the rim, the estimated 5,131 acres of effective habitat loss (using a factor of 3.5) would represent 13.2 percent of this portion of BLM lands and could reduce population sizes proportionately. The same is true for the 4.8-percent effective habitat loss above the rim in sagebrush, mountain brush, aspen, and mixed conifer habitats. These losses represent negligible to localized minor impacts to small birds (including species on the BCC list) during the 20-year period of analysis. However, since smaller species are affected by relatively small-scale impacts, avoidance of disturbance zones around the areas of direct habitat loss would be greatest during active construction, which would occur gradually over many years. Thus, the habitat loss in any one year would represent a gradual accrual of long-term impacts, plus impacts related to specific areas of construction. Fortuitously for these species, much of the riparian and conifer forest habitat would be avoided under Alternative IV due to NGD/NSO stipulations, limiting adverse impacts to species associated with these habitats.

The closure of some existing routes and restriction of motorized travel on designated routes could offset some adverse impacts. However, the lack of NGD/NSO protection under this alternative for the approximately 3,400 acres of wildlife seclusion areas would add to the impacts for several BCC and other neotropical migrant bird species because these areas offer mature, diverse, remote, and unfragmented habitat.

Bats — Due to protection of the Anvil Points cave area, the steep slope stipulation, and protection of most forest areas under various NGD/NSO and TL stipulations described previously, the direct loss of relatively small areas of habitat (2.6 percent of the BLM portion of the Planning Area) would represent negligible impacts to hunting habitat for bats. This conclusion is based on the fact that the highest-quality hunting and roosting habitat for bats — including riparian areas, mature forests, and cliff areas — would be less impacted than more open, scrubby terrain.

Carnivores — Although the lynx, wolverine, and American marten are unlikely to occur in the Planning Area, impacts to any of these species that may be present would be potentially greater under Alternative IV due to the greater amount of oil and gas development above the rim. If any of these species were present (the marten is the most likely), the loss of highland habitat would amount to only about 4.8 percent of the total highland habitat in the Planning Area. While this amount of habitat loss would appear negligible to minor, the fragmentation impact and loss of seclusion to these furtive species resulting from the increased development (including 76 miles of access roads above the rim) and deletion of special protection measures for areas having wilderness character, two ACECs, and wildlife seclusion areas could have a moderate to localized major impact. Road closures and restrictions to designated routes could help offset any potential adverse impacts from oil and gas development on these species.

Should the river otter occur, it would be expected only along the Colorado River corridor, which would remain largely unaffected by any of the proposed land uses or management actions under this alternative and protected by NGD/NSO and TL stipulations aimed at other aquatic or riparian resources (see above).

Offsite and Cumulative Impacts

As with Alternative II, offsite and cumulative impacts under Alternative IV would be associated primarily with the combined effect of oil and gas development on BLM land and on adjacent or nearby private land. Although cumulative impacts from other uses such as recreation and livestock would occur, these would be less marked than impacts from oil and gas. This conclusion is based on (1) the greater amount of direct and indirect habitat loss from oil and gas development than anticipated with other uses, (2) the proportionately lower recreational use on private lands than BLM lands, and (3) the relatively small differences among the alternatives in terms of grazing impacts, which are ongoing and expected to continue at a similar (though reduced) level.

Cumulative impacts from oil and gas development during the 20-year period of analysis would result in an estimated 6,742 acres of direct habitat loss and 23,597 acres of effective habitat loss using a factor of 3.5. The larger area would represent 18.6 percent of the public and private lands in the Planning Area. Nearly all of the private land and about 76 percent of the BLM land affected by oil and gas development would be in lower-elevation habitat types such as pinyon/juniper, sagebrush, and semi-desert scrub, with smaller areas of mountain brush, Douglas-fir, and riparian/wetland vegetation. Direct and effective habitat loss would represent approximately 14.3 percent and 50.2 percent, respectively, of these portions of the Planning Area below the rim.

For large, wide-ranging, and furtive sensitive species such as raptors and carnivores, this could represent a moderate to localized major impact during construction and over the long term. A higher impact level is not assumed despite the nearly 37-percent overall loss and more than 50-percent loss at lower elevations because the Planning Area would not represent the entire hunting habitat for a wintering bald eagle and would represent only minor hunting habitat for a peregrine falcon. A northern goshawk atop the plateau would be more likely to hunt entirely within the Planning Area, but the higher level of impact associated with construction would not occur simultaneously throughout the entire area, being spread over many years.

For smaller species such as the flammulated owl, boreal owl, and neotropical migrants, direct habitat loss would represent negligible to minor habitat loss due to their smaller home ranges and narrower zones of avoidance around areas of human activity.

Offsite impacts could also occur if future management or development actions result in reduced populations of wide-ranging species such as the bald eagle, which roosts mostly offsite but may feed onsite, and the peregrine falcon, which nests and roosts onsite but hunts offsite.

4.3.4.5 Alternative V

This alternative emphasizes development of oil and gas and other non-renewable resources. To accommodate a higher degree of energy development, this alternative would allow leasing on all portions of the Planning Area and would not include any ACEC designations or special protection for areas having wilderness character. This alternative assumes that the WSR-eligible streams atop the plateau are either found to be unsuitable for designation or suitable but not designated. Nonetheless, all wildlife-related protective stipulations described above for Alternative IV would also be applied under this alternative, except that the NGD/NSO for moderate-risk cutthroat trout habitat would be replaced by a CSU. As with Alternative IV, the wildlife seclusion areas of Alternatives I and II would not be provided NGD/NSO protection under Alternative V, and the 2-month COA-level TL for big game winter range TL would be dropped.

Direct and Indirect Impacts

Due to expected limitations of noxious weed management, populations of these species would be likely to increase, causing minor to moderate negative impacts to some plant communities. Rangeland projects and land treatments would cause native vegetation to degrade over time, with allotments managed to minimum standards and focused on forage for livestock. Both upland and riparian/wetland communities would be impacted over time, reducing the amount and quality for forage for native wildlife and reducing the cover needed for prey species.

Travel management under Alternative V would restrict motorized or mechanized use to designated routes throughout the Planning Area, including the Hubbard Mesa area (which would not be designated an SRMA). However, cross-country over-snow travel by snowmobile would be permitted, unlike Alternatives II through IV. The travel restrictions would reduce further expansion of travel routes, although not as much as under the three previous alternatives due to the availability of off-route travel by snowmobile. Nonetheless, compared to Alternative I, the non-snowmobile restrictions would reduce impacts to vegetation and seclusion, the potential for increased soil erosion and impacts to stream habitat quality, and the potential for overfishing of the Colorado River cutthroat trout. The travel restrictions would help offset adverse impacts to fish and wildlife from other management or land-use actions but would not be sufficient to compensate fully for adverse impacts.

Oil and gas development would result in an estimated 584 pads on BLM land: 175 above the rim and 409 below the rim. New or widened access roads would include an estimated 105 miles above and 245 miles below the rim. The increase in impacts compared to Alternative IV would be similar above and below the rim. The 641 acres of direct long-term habitat loss above the rim equates to 2,244 acres of effective loss using a factor of 3.5, representing 6.5 percent of the total highland habitat. Because oil and gas wells and increased traffic would occur throughout most of the highlands except for along drainage floors, the habitat loss and fragmentation would create a moderate to localized major impact on some forest-interior and habitat-specialist species.

Below the rim, the effective habitat loss of 6,489 acres (16.7 percent) using the factor of 3.5 would proportionately reduce usable nesting, resting, and feeding sites. This would be a moderate impact overall but potentially major in localized areas of concentrated development during construction. Impacts to special status species would be as follows:

Endangered Colorado River Fishes and Sensitive Non-game Fishes — No impacts are expected for these species, for the reasons discussed under Alternative I. The increased development above the rim under this alternative is not an issue because the area does not include suitable habitat and is too far removed from occupied or potential habitat along the major streams for local stream impacts to have an influence. Restricting travel to designated routes could benefit the species in terms of additional protection along lower elevation streams.

Colorado River Cutthroat Trout — Impacts would be potentially greater for Alternative V than any of the previous alternatives due to the large number of oil and gas wells atop the plateau. The continued application of NGD/NSO stipulations to high-risk trout habitat and to riparian/wetland vegetation would protect the occupied habitat and much of the adjacent watershed to some extent, but most watershed protection would be in the form of SSR/CSU stipulations, with no special mitigation areas. Therefore, impacts to the Colorado River cutthroat trout and occupied or suitable habitat would be moderate to major in localized areas if stream crossings are not minimized and if “low-water” stream crossings (instead of culverts or bridges) are permitted. Restricting motorized travel to designated routes under Alternative V would offset these impacts to some extent, but probably not enough to lower the impact estimate of moderate to localized major.

Amphibians — Impacts to the boreal toad, Great Basin spadefoot, and northern leopard frog would be similar to those for Alternative IV and would be negligible to minor, depending on whether drainages crossed by new well roads support breeding toads or have perennial pools that support frogs. Proposed mitigation measures would preclude new road crossings where feasible and require the use of culverts or bridges to reduce physical impacts to streams.

Reptiles — Potential impacts to the Utah milk snake and midget faded rattlesnake would be similar to those described for Alternative IV, but the amount of oil and gas development in lower elevations where these species might occur would be 27 percent greater. Neither species is expected above the rim. As with Alternatives II through IV, restriction of travel to designated routes would reduce the potential for direct and indirect impacts from habitat degradation and direct mortality from being run over by ATVs or bicycles.

Waterbirds — Impacts to Barrow’s goldeneye and the white-faced ibis would be similar to those for the previous alternatives due to retention of protective stipulations, except that restriction of motorized travel to designated routes would reduce the potential for disturbance impacts.

Bald Eagle — As with the previous alternatives, impacts would be none to negligible based on the Colorado River NGD/NSO stipulation and the NGD/NSO and TL stipulations for nests and winter roosts. Some loss of hunting habitat could result from oil and gas development, but this represents a small portion of likely winter hunting habitat.

Mexican Spotted Owl and Western Yellow-billed Cuckoo — Both of these Federally listed or candidate species are considered unlikely to occur. If present, impacts would be similar to Alternative I except for decreased disturbance due to limitation of OHV travel to designated routes under this alternative. Additionally, Alternative V has the potential to impact the Mexican spotted owl because it does not include the NGD/NSO stipulation for wildlife seclusion areas, which provide some of the most important potential habitat for this species through key elements of remoteness, compositional and structural diversity, and lack of fragmentation. The western yellow-billed cuckoo is a bird of riparian forests, and stipulations aimed at protecting the Colorado River corridor and other riverine areas would tend to protect habitat for this species.

Raptors — The peregrine falcon, prairie falcon, ferruginous hawk, Swainson's hawk, golden eagle, northern goshawk, northern harrier, flammulated owl, boreal owl, and burrowing owl would be subject to greater impacts under Alternative V than the previous alternatives due to more intensive oil and gas development. The peregrine falcon would probably be less affected than other raptors because of the remoteness and protection of its cliff-nesting area and the fact that it hunts primarily along the Colorado River (which would continue to be protected) and across other wide areas.

The effective habitat loss of 8,698 acres of nesting and hunting habitat on BLM land during the 20-year period of analysis would represent an 11.8-percent reduction overall. Although the percentage of the area above the rim effectively lost due to oil and gas development would represent only 6.5 percent of these higher elevation habitats, the fragmentation impact on forest species such as the northern goshawk and boreal owl could be disproportionately large. Similarly, lack of protection for wildlife seclusion areas could affect the flammulated owl. Therefore, impacts to raptors overall would be minor under this alternative, but impacts to aspen and conifer forest species could be moderate to potentially major in localized areas.

As with other special status species, raptors would benefit from the restriction of motorized travel to designated routes, except for the Hubbard Mesa OHV area. This would create a greater degree of seclusion for raptors and help offset some of the impacts associated with oil and gas development.

Neotropical Migrants and Other Small Birds — For the sensitive small-bird species occurring in Douglas-fir, pinyon/juniper, sagebrush, or other habitats below the rim, the 6,489 acres of effective habitat loss (19.7 percent of the BLM lands at these lower elevations) would have the potential to reduce population sizes proportionately. The same is true for the 6.5-percent reduction in effective habitat loss above the rim. These partial losses of nesting and feeding habitat would cause moderate to localized major impacts overall. As described previously, wildlife avoidance of disturbance zones around areas of direct habitat loss would be greatest during construction, which would occur gradually over many years. Thus, the habitat loss in any one year would represent a gradual accrual of long-term impacts, plus impacts related to specific areas of construction.

Restriction of motorized or mechanized travel to designated routes would reduce the impacts associated with disturbance away from roads and reduce the potential for increased habitat degradation and fragmentation. However, the lack of NGD/NSO protection for approximately 3,400 acres of wildlife seclusion areas would add to the impacts for many neotropical migrant and other small bird species because these areas offer mature, diverse, remote, and unfragmented habitat.

Bats — Because of protection of the Anvil Points cave area, the steep slope stipulation, and protection of some forest areas under various NGD/NSO and TL stipulations described previously, the relatively small areas of direct habitat loss (about 3.4 percent of the Planning Area during the 20-year period of analysis) would represent a negligible to minor impact. This conclusion is based on the fact that the highest-quality hunting and roosting habitat for bats — including riparian areas, mature forests, and cliff areas — would be less impacted than more open, scrubby terrain.

Carnivores — The lynx, wolverine, and American marten are unlikely onsite; if they do occur, they would be expected in aspen and conifer habitats on top of the plateau. Oil and gas activities atop the plateau at the levels possible under Alternative V would have at least moderate, and possibly major, impacts to these secretive species due to habitat fragmentation and loss of seclusion. The restriction of motorized travel to designated routes would help reduce the impacts, but it is likely that the remaining blocks of unfragmented forest habitat would be too small to support viable populations.

Should the river otter occur, none of the anticipated land use or management action impacts would be likely to affect this aquatic species because its habitat is essentially limited to the Colorado River, which is protected by various stipulations related to other riverine resources (see above).

Offsite and Cumulative Impacts

Offsite and cumulative impacts under Alternative V would be associated primarily with the combined effect of oil and gas development on BLM land and on adjacent or nearby private land. Although cumulative impacts from other uses such as recreation and livestock would occur, these would be less marked than impacts from oil and gas. This conclusion is based on (1) the greater amount of direct and indirect habitat loss with oil and gas development than other uses, (2) an assumed lower level of recreational use on private lands than BLM lands, and (3) relatively small differences among the alternatives in terms of grazing impacts, which are ongoing and expected to continue at a similar level.

Cumulative impacts from oil and gas development on private and Federal lands under Alternative V during the 20-year period of analysis would result in an estimated 7,287 acres of direct habitat loss and 25,505 acres of effective habitat loss using a factor of 3.5. These represent 5.7 and 20.1 percent, respectively, of the Planning Area. With nearly all private land impacts and 75 percent of Federal land impacts being below the rim, the direct and effective habitat loss in these areas would represent approximately 7.2 percent and 25.3 percent, respectively, of the lower elevation habitats.

For larger, wider-ranging, and more sensitive species such as raptors (bald eagle, peregrine falcon, ferruginous hawk, etc.), this would represent a moderate impact during construction and over the long term. A higher impact level is not assumed despite the 20-percent overall loss and 25-percent loss at lower elevations because the Planning Area would not represent the entire hunting habitat for a wintering bald eagle and would represent only minor hunting habitat for a peregrine falcon. A northern goshawk would be more likely to have its hunt entirely within the Planning Area, but the higher level of impact associated with construction would not occur simultaneously throughout the entire area.

For smaller species such as the flammulated owl, boreal owl, and neotropical migrants, the direct loss of habitat would represent a minor to moderate impact. The severity of impact would depend on the home range size of the particular species, its need for unfragmented habitat, and the width of any disturbance/avoidance zone around an area of human activity.

Offsite impacts could also occur if future management or development actions result in reduced populations of wide-ranging species such as the bald eagle, which roosts mostly offsite but may feed onsite, and the peregrine falcon, which nests and roosts onsite but hunts offsite. However, as described above, impacts to these two species are unlikely to be greater than negligible under Alternative V.

4.3.4.6 Summary of Impacts to Special Status Fish and Wildlife

Impacts to special status species of various management actions under the five alternatives are summarized in Table 4-19. Some impacts may represent an irreversible and irretrievable commitment of natural resources (see Section 4.6).

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.

Table 4-19. Summary of Impacts to Special Status Fish and Wildlife Species [1]

Management Action	Alternative				
	I	II	III	IV	IV
Special Stipulations for ACECs	NA	Major (+)	Moderate to Major (+)	NA	NA
Protection of WSR-eligible Streams	NA	Moderate to Major (+)	Moderate to Major (+)	Moderate (+)	Moderate (+)
Watershed Management Areas	NA	Moderate to Major (+)	Major (+)	NA	NA
Special Management for Wilderness Values [2]	NA	Moderate to Major (+)	Moderate (+)	NA	NA
Vegetation/Weed Management	Minor to Moderate (–)	Minor to Moderate (+)	Minor to Moderate (+)	Minor to Moderate (–)	Minor to Moderate (–)
Recreation/Travel Management	Moderate (–)	Moderate to Major (+)	Moderate to Major (+)	Moderate to Major (+)	Moderate (+)
Range Management	Moderate (–)	Moderate (+)	Moderate (+)	Moderate (+)	Minor (–)
Oil and Gas Development [3,4]	Negligible to Minor (–)	Minor to localized Moderate (–)	Negligible to localized Moderate to localized Major (–)	Moderate to localized Major (–)	Moderate to Major (–)

[1] *For Federally listed, proposed, or candidate threatened or endangered species, USFWS would issue a Biological Opinion (BO) addressing potential effects and required conservation measures.*

[2] *Limited to roadlessness and naturalness under Alternative III.*

[3] *Under Alternative I, oil and gas impacts for Alternative I almost entirely below cliffs due to no-lease of NOSR 1.*

[4] *Under Alternative III, development above the rim deferred until 80% of anticipated total wells below the rim during the 20-year period of analysis have been drilled. "The "negligible to localized moderate" level reflects area above the rim during and after the deferral period, estimated at 16 years.*

4.4 HUMAN ENVIRONMENT

4.4.1 Visual Resources

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 or absence of screening, and contrast with surrounding conditions. 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 five alternatives assessed by this RMPA/EIS. Although the alternatives include various resource management actions and land uses, increased levels of oil and gas development under each alternative 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.

Methods

The viewshed analysis was performed using ESRI ArcScene software and a USGS Digital Elevational Model (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 uses the DEM to identify all new pad locations that are visible from a given point or points. Roads were splined to reduce the number of vertices. Results of the viewshed analysis were combined with the analysis of potential oil and gas development under each alternative. The developable areas were assumed to have 40-acre surface spacing, consistent with the RFD (Appendix H). The GIS was then used to identify and enumerate potential well locations that would be visible within each viewshed for all five alternatives.

In adjusting from the potential maximum number of wells throughout the life of the leases to the number likely to be developed during the 20-year period of analysis of this RMPA/EIS, it was assumed that the reductions would be spread uniformly throughout the Planning Area. Thus, wells closer or farther from a viewpoint used in the viewshed analysis, and wells visible versus not visible from those locations, had equal probability of being drilled during the 20-year period. It was also assumed that wells would be drilled at 40-acre surface spacing, notwithstanding BLM's goal of encouraging clustered or collocated facilities. The impact of clustering or collocating has not been assessed due to uncertainties about whether, where, and to what degree it would be accomplished. While clustering or collocating would reduce the number of distinct development areas, each area would be larger. Therefore, depending on numerous unknowns, it is possible that clustering or collocating could result in greater, not lesser, visual impacts.

Maps 28 through 30 show the viewsheds for I-70, SH 13, and Rim Road. The colored area depicts the portion of the landscape visible from the road.

To assist further in the assessment of impacts to visual resources, the GIS classified the potentially visible well locations by distance zone, as measured from the viewer, 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** – More than 5 miles

Results of the analysis are presented in Table 4-20. The numbers shown for different viewsheds cannot be added to derive a total number of visible well locations within distance zones and among alternatives because of overlap in viewsheds (see Maps 28 through 30).

Note that for the Rim Road, numbers include wells visible below the rim in addition to those visible above the cliffs. However, not all of the wells shown in the viewshed below the rim would actually be visible from the road, although all would be visible by walking the short distance to the rim. This is an artifact of the 28.5-meter cells and the DEM contour interval used in the analysis, which creates discreet rather than continuous sight points. Table 4-20 shows the total number of well locations on top of the plateau that would be visible from the Rim Road (in parentheses behind the gross total). The wells above the rim are mostly within the close range (< 0.25 mile) and near foreground (0.25 to 1 mile) zones because of the topographic screening of the undulating terrain and the fact that the well locations are not greatly elevated above the road as in the I-70 and SH 13 viewsheds. The longer distance zones consist mostly or entirely of wells below the rim.

Additionally, the Rim Road analysis does not factor for vegetational screening, which could be significant for some locations, because clearing for a pad and access road would remove some or all of the screening available at a given well. Furthermore, the numbers do not reflect the ability of BLM to require that proposed well locations be moved up to 200 meters under the standard lease terms or by more than 200 meters under SSR/CSU stipulations to mitigate visual impacts.

Table 4-20. Number of Well Pads Potentially Visible Based on Viewshed Analysis

Viewshed	Distance Zone	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
I-70	< 0.25 mile	0	0	0	0	2
	0.25 – 1 mile	12	21	22	20	23
	1 – 3 miles	16	23	31	28	62
	3 – 5 miles	2	2	8	7	13
	> 5 miles	0	0	5	4	5
	Total	**30**	**46**	**66**	**59**	**105**
SH 13	< 0.25 mile	11	14	18	16	17
	0.25 – 1 mile	25	25	38	34	37
	1 – 3 miles	16	17	36	32	36
	3 – 5 miles	1	1	9	8	18
	> 5 miles	0	0	1	1	6
	Total	**53**	**57**	**102**	**91**	**114**
Rim Road [1]	< 0.25 mile	3	4	13	16	30
	0.25 – 1 mile	4	11	23	29	54
	1 – 3 miles	28	31	77	95	110
	3 – 5 miles	91	69	67	83	85
	> 5 miles	19	15	13	16	17
	Total	**145 (7)**	**130 (25)**	**193 (31)**	**239 (99)**	**296 (138)**

[1] *For Rim Road viewshed, numbers of visible pads include some below the rim; total pads visible above the rim in parentheses.*

Impacts to visual resources in the Planning Area under the five alternatives are described below. The viewshed analysis process did not include potential new roads or widened existing roads that would provide access to new oil and gas facilities. The access roads required to service oil and gas activities on BLM portions of the Planning Area range from an estimated 152 miles for Alternative I to 350 miles for Alternative V. These roads would represent additional impacts to visual resources, especially where they must cross a visible slope or require removal of trees.

Some of the impacts may represent an irreversible and irretrievable commitment of visual resources (see Section 4.6). Development on private lands within the Planning Area is discussed in the cumulative impact analysis portion of each alternative analysis. VRM classes under the five alternatives are shown on Maps 24 through 27; acres by VRM class are provided in Table 4-21.

Table 4-21. Acres of VRM Classes by Alternative

VRM Class	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Class I	0	37,240	925	925	0
Class II	24,039	13,428	48,752	48,752	0
Class III	37,115	14,607	15,563	15,563	63,022
Class IV	10,340	8,350	8,350	8,350	10,568
Class V	2,096	0	0	0	0
Urban	12	12	12	12	12

4.4.1.1 Alternative I

Under Alternative I, a total of 855 new wells on 254 new pads are anticipated in BLM portions of the Planning Area. The long-term surface disturbance associated with this level of development would be approximately 1,151 acres. The following viewshed analysis considers stipulations in place and shows the number of well pads that may be visible on public lands. The development assumptions (Section 2.4) yield approximately 845 wells below the rim and 10 above the rim on BLM lands.

I-70 Viewshed

Approximately 30 potential well pads may be visible on public lands along I-70. This number reflects the existing NSO and CSU stipulations to protect high sensitivity within the I-70 viewshed and Class II areas. The two closest zones (less than 1 mile) would include all but two of the well locations in the I-70 viewshed under this alternative.

The visual impact of gas development in the foreground (1 to 3 miles) would be greatest west of Rifle. More than half the BLM wells would be in this zone and relatively visible due to elevated topography and the potential for stark contrast of pads and roads to the existing pinyon/juniper in terms of color, line, and texture. A large percentage of the wells that could be developed on private lands in the Planning Area would also be in this portion of the I-70 viewshed. The rolling terrain within this distance zone provides some opportunities for locating roads and pads to reduce visual impacts.

SH 13 Viewshed

Approximately 53 well pads may be visible on public lands from SH 13. The area nearest the highway is classified as VRM Class IV, which allows a high level of modification. This area includes the two closest distance zones. Nearly 68 percent of the well sites would be within the two closest distance zones (less than 1 mile). The cliff areas to the west are designated as Class III, which also allows for some development and provides some opportunities for screening due to the rolling hills. Visual impacts within the close range and near foreground zones would be moderate.

Rim Road Viewshed

Approximately 145 well pads may be visible on public lands from the Rim Road, with all but seven below the rim. The remaining wells, all located below the rim, would be less conspicuous than indicated by the horizontal distance class in which they occur due to the additional vertical separation. The combination of vertical and horizontal separation would decrease the sensitivity level of these wells due to decreasing visual size and loss of detail in color and texture.

4.4.1.2 Alternative II

Under Alternative II, a total of 310 new pads and 905 new wells are anticipated on BLM lands in the Planning Area. The new wells would include 818 below and 87 above the rim. Total long-term disturbance associated with the new development is estimated to be 1,348 acres. The following viewshed analysis considers stipulations that would apply to development on public lands.

I-70 Viewshed

Approximately 46 well pads may be visible on public lands from the I-70 viewshed. Many of these pads would be developed within VRM Class II and VRM Class IV areas. Class II areas would have an SSR/CSU stipulation to maintain existing landscape character. Mitigation may reduce numbers of visible wells within the Class II areas by relocating them. However, Class IV allows for a high level of disturbance, and management activities can dominate the landscape. All but two of the pads on BLM lands in this viewshed would be in the close range and foreground distances zones (<0.25 mile to 3 miles).

The cliffs and areas of high visual sensitivity within the I-70 corridor would be protected through an NGD/NSO stipulation. Lands within the areas having wilderness character, which would be managed to protect those values (Appendix D), would not be leased. These areas include most of the visual values represented by the cliffs, including Anvil Points. All visual values within the Anvil Points or Magpie Gulch ACECs that are within this viewshed would be protected by an NGD/NSO to meet VRM Class I objectives.

This area would also include a substantial portion of the wells likely to be developed on private lands in the Planning Area, many within 1 mile of I-70. Gas development in the foreground west of Rifle would change the character of the existing scenery so it appears more heavily industrialized.

SH 13 Viewshed

Approximately 57 well sites may be visible on public lands from SH 13 under Alternative II. More than 68 percent of these sites would be in the close range and foreground distance zones (<0.25 mile to 3 miles). This is within VRM Class IV, which allow for a high level of disturbance and for management activities to dominate the landscape.

The cliffs and most visually sensitive lands would be protected under management prescriptions for areas having wilderness character, including a no-lease limitation. Additionally, all visual resource values within the Magpie Gulch ACEC would be protected by an NGD/NSO to meet VRM Class I objectives.

Approximately 29 wells may be visible within 1 mile of the SH 13 viewshed on private lands. The visual character of the near foreground north of Rifle would change from rural agricultural to more heavily industrialized.

Rim Road Viewshed

Approximately 130 well sites may be visible on public lands from the Rim Road, including 25 pads on top of the plateau and 105 below the rim. The new pads above the rim would be in the two closest distance zones (<0.25 to 3 miles) on lands managed as Class III. The 88 percent of the pads in the three greatest distance zones (1 to >5 miles) would be below the rim but visible from the rim, with the associated reduction in visual size and loss of detail in color and texture. New pad locations below the rim are mostly on Class IV lands.

Under this alternative, most of the Rim Road skirts VRM Class I areas and is protected from development. Since a portion of the plateau is VRM Class III, development in that area would be located adjacent to or within sight of the Rim Road. The area between the Trapper Creek ACEC and the area of East Fork Parachute Creek having wilderness character could take on an appearance of development even though Class III restrictions would be applied.

4.4.1.3 Alternative III – Preferred Alternative

The viewshed analysis for this alternative estimates 402 new pad locations and 1,761 acres of long-term surface disturbance on BLM portions of the Planning Area. The 1,324 new wells on BLM lands under this alternative include 1,273 below and 51 above the rim. The following viewshed analysis considers stipulations that would be applied to development on public lands.

I-70 Viewshed

Approximately 66 well pads may be visible on BLM lands from I-70. The concentration of visual impacts (80 percent of the pads) would be in the near foreground and foreground zones (0.25 mile to 3 miles). Many of these pads would be developed within Class II and Class IV areas. Class II areas would have an SSR/CSU stipulation to maintain the existing landscape character, while Class IV areas would allow for a high level of disturbance and visual impacts from management activities.

The cliffs and areas determined to contain high visual sensitivity within this viewshed would be protected through an NGD/NSO stipulation.

SH 13 Viewshed

Approximately 102 well pads may be visible on BLM lands from SH 13. Most of the development (87 percent) would occur in the close range through foreground distance zones (< 0.25 mile to 3 miles). These are mostly within VRM Class IV areas, which allow for a high level of disturbance and allow management activities to dominate the landscape.

The cliffs and other areas of high visual sensitivity within this viewshed would not be protected by an NGD/NSO stipulation under this alternative. Mitigation for impact to high sensitivity lands would occur through the Class II SSR/CSU, which allows gives BLM authority to require relocation surface features by more than 200 meters to minimize visual impacts.

Rim Road Viewshed

Approximately 193 potential well pads may be visible on BLM lands from the rim road, including 31 above and 154 below the rim. Most of the new pads above the rim would be on lands managed as Class II, with the remaining on Class III. These new sites would occur in the close range to foreground distance zones (<0.25 mile to 3 miles), primarily less than 1 mile.

New pads below the rim would mostly occur on Class IV lands, which would allow for a high level of disturbance and for management activities to dominate the landscape. The total area of the viewshed from the Rim Road is vast due to its elevated position, resulting in the relatively large number of wells. However, these would be viewed from greater distances (often more than 3 miles and with considerable vertical separation, greatly reducing their visual impact.

4.4.1.4 Alternative IV

The viewshed analysis for this alternative estimates 449 new pad locations and 1,940 acres of long-term surface disturbance on BLM portions of the Planning Area. The 1,324 new wells on BLM lands under this alternative include 1,156 below and 168 above the rim. The following viewshed analysis considers stipulations that would be applied to development on public lands.

I-70 Viewshed

Approximately 59 well pads may be visible on public lands from I-70. The concentration of visual impacts (70 percent of the pads) would be in the near foreground and foreground zones (0.25 mile to 3 miles). Many of these pads would be developed within Class II and Class IV areas. Class II areas would have an SSR/CSU stipulation to maintain the existing landscape character, while Class IV areas allow for a high level of disturbance and visual impacts from management activities.

The cliffs and areas determined to contain high visual sensitivity within this viewshed would be protected through an NGD/NSO stipulation.

SH 13 Viewshed

Approximately 91 well pads may be visible on public lands from SH 13. Most of the development (90 percent) would occur in the close range through foreground distance zones (< 0.25 mile to 3 miles). These are mostly within VRM Class IV areas, which allow for a high level of disturbance and allow management activities to dominate the landscape.

The cliffs and other areas of high visual sensitivity within this viewshed would not be protected by an NGD/NSO stipulation under this alternative. Mitigation for impact to high sensitivity lands would occur through the Class II SSR/CSU, which gives BLM authority to require relocation of proposed surface features by more than 200 meters to minimize visual impacts.

Rim Road Viewshed

Approximately 239 potential well pads may be visible on public lands from the Rim Road, including 99 above and 140 below the rim. Most of the new pads above the rim would be on lands managed as Class II, with the remainder Class III. New sites would occur in the close range to foreground distance zones (<0.25 mile to 3 miles), primarily less than 1 mile.

New pads below the rim would mostly occur on Class IV lands, which would allow for a high level of disturbance and for management activities to dominate the landscape. The total area of the viewshed from the Rim Road is vast due to its elevated position, resulting in the relatively large number of wells. However, these would be viewed from greater distances (often more than 3 miles and with considerable vertical separation, greatly reducing their visual impact.

4.4.1.5 Alternative V

Alternative V is estimated to result in 584 new pads and 1,582 new wells on BLM portions of the Planning Area. The new wells would include 1,348 below and 234 above the rim. Total long-term disturbance from this new oil and gas development is estimated to be 2,495 acres. The following viewshed analysis considers stipulations that would be applied to development on public lands.

I-70 Viewshed

Approximately 105 well pads may be visible on public lands from I-70. Almost all of the development within this viewshed under Alternative II would be in Class III, with some development on the eastern edge of the viewshed occurring in Class IV. More than half (59 percent) of the well sites would be within the foreground zone (1 to 3 miles), with another 22 percent in the near foreground (0.25 mile to 1 mile).

Gas development in the foreground west of Rifle would change the character of the existing scenery, creating a more heavily industrialized appearance.

SH 13 Viewshed

Approximately 114 well pads may be visible on public lands from SH 13. Nearly 80 percent of the development would occur in the close range through foreground distance zones (<0.25 mile to 3 miles) in VRM Class III and IV areas. These allow for a high level of disturbance, and management activities are allowed to dominate the landscape.

Gas development at distances closer than 3 miles along SH 13 north of Rifle would change the character of the rural agricultural landscape, creating a more heavily industrialized appearance.

Rim Road Viewshed

Approximately 296 well pads may be visible on public lands from Rim Road, with 138 above and 158 below the rim. All development above the rim would be in Class III, while development below the rim would be in both Class III and IV. Wells above the cliffs would mostly be viewed at distances of less than 1 mile. Wells in portions of the viewshed below the rim, while numerous, would mostly be viewed at distances of 3 miles or greater and with considerable vertical separation.

4.4.1.6 Effects Common to All Alternatives

While many management activities can affect visual values and alter the landscape, oil and gas development is the dominant ground-disturbing activity being analyzed. It represents an irretrievable commitment of resources that can create the most significant long-term impact to visual values. Therefore, while the impact analysis considers other land uses and management actions, oil and gas development is the focus of the analysis. Cumulative impact assumptions include development on private land in the Planning Area as well as development beyond the 20-year period of analysis on BLM lands. Current VRM classes (Alternative I) were assigned to reflect the inventory process for the 1988 GSRA RMP. VRM classes for the remaining alternatives were changed to reflect resource allocation objectives and are not based on a resource inventory process for determining visual values. Therefore, discussion of visual values reflects impacts to existing visual values and focuses on impacts to the existing landscape and VRM Class objectives, by alternative.

Disturbed VRM Class V areas would be eliminated and would be managed under the VRM Class area directly adjacent to the disturbance under all but Alternative I.

Short-term visual effects within the landscape during the construction period would be altered by the presence of construction vehicles, dust, equipment, lighting, personnel, and emerging new oil and gas facilities, roads, and pipelines. These impacts would be most visible to the adjacent communities of Parachute, Rifle, Battlement Mesa, Morrisania Mesa, and Holms Mesa, and to travelers along the I-70 and SH 13 corridors.

After construction of oil and gas wells and associated facilities is completed, long-term visible impacts would be from access roads, pipelines, power lines, well pads, and other supporting infrastructure. These landscape alterations have the combined effect of changing overall landscape character to a more industrial appearance. While most development would occur at elevations higher than I-70 and SH 13, long-term cumulative impacts would occur in varying degrees by alternative.

4.4.1.7 Management, Cumulative Impacts, and Mitigation

Alternative I

Management — With no new leases or land-use activities on top of the plateau, impacts to visual values would be limited to small surface-disturbing projects mostly resulting from managing travel, recreation, and livestock. VRM Classes would be managed under existing VRM management objectives. The largest impacts to visual values are likely to occur below the rim from oil and gas activities, utility corridors, and ROW authorizations.

With the anticipated oil and gas development below the rim on lands available for lease, all viewsheds would be affected by surface disturbances; the highest concentration of wells and roads would occur in the near foreground and foreground distance zones. Development over the 20-year period of analysis is estimated at 2,328 new wells on 756 new pads, causing an estimated long-term disturbance of 3,319 acres. The current stipulations developed in the 1999 FSEIS would protect visual resources within the I-70 viewshed on lands available for lease and would not apply to the cliffs or any lands atop the plateau.

Lands designated as Class II that are not available for lease would be managed to maintain the existing character and would create minimal visual impacts due to steep terrain, which limits impacts from recreation, travel, or grazing management. Class II areas have high scenic quality and a high variety of landscape features. They are highly visible and highly sensitive to landscape modification. Class II areas that are available for lease would have a CSU stipulation to maintain the existing landscape character. However, Class II objectives may be exceeded where opportunities for mitigation are limited by valid existing rights on old leases, or because the landscape would not allow for mitigation under CSU.

Class III areas have moderate landscape variety and a few outstanding features. They may be moderately to highly visible, with moderate visual sensitivity. Lands managed as VRM Class III have no mitigation for visual values, and levels of change in the landscape may be moderate to evident. Long-term impacts in the overall landscape can be assumed to be negligible to minor above the rim due to no leasing. However, lands below the rim in Class III could experience a moderate level of change due to anticipated oil and gas activities, utility corridors, open travel designation, and grazing management. While the topography may screen many land uses, changes in the landscape can be expected.

Lands designated as Class IV would allow for moderate to major levels of modification in the existing landscape. The RMPA/EIS analysis projects the highest level of development within this area. These lands also have the highest level of visual exposure and sensitivity and are within the close range and foreground views of SH 13 and the town of Rifle.

Disturbed areas (Class V) would be managed toward reclamation and restoration so the area could at least meet a Class IV objective.

Cumulative Effects — Visual impacts would continue to become more noticeable as oil and gas pads, roads, recreation use, utility corridors, communication sites, and other management activities change the natural landscape. New impacts to visual values from future development on both private and public lands would be concentrated in the near foreground and foreground viewsheds of I-70 and SH 13 and would contribute the most to the change in overall landscape character.

Existing landscape modifications to date are characteristic of rural agricultural and ranching lands. Utility corridors, residential and commercial uses, and gas field development are becoming increasingly more noticeable from I-70 within the near foreground. VRM Class objectives are likely to be exceeded where opportunities for mitigation are limited by valid existing rights on old leases or because the landscape would not allow for mitigation under CSU stipulations.

The Roan Plateau serves as a scenic backdrop and is the major landscape feature to many communities. Public scoping has indicated that residents want this scenic viewshed protected, not only for their community aesthetics but also to maintain their real estate values. Both the real estate values of private property and the aesthetic values of public lands are likely to be increased or decreased depending on how well these scenic values are protected.

Economists recognize that tourism and recreation in Colorado is big business and is based on visitors that are attracted to opportunities for recreating and sightseeing in the Rocky Mountains (USFS 2002). Scenic landscapes help determine the success of recreation and tourism. I-70 serves as Colorado's main east-west transportation corridor, with more than 5.5 million vehicles traveling on it yearly (CDOT 2002). As the availability of natural landscapes and scenic open spaces decreases, the value of irreplaceable visual open spaces will increase.

Mitigation — In addition to stipulations in place, mitigation for ground-disturbing activities could include the application of COAs to all new ground-disturbing activities (including existing leases) to lessen visual impacts, including measures such as:

- avoiding ridgelines;
- using low-profile tanks;

- locating new disturbances within existing disturbances;
- collocating new roads, pipelines, powerlines, and other facilities;
- reducing areas of cut-and-fill;
- painting with colors that blend with surroundings;
- avoiding straight lines in road construction; and
- using special design and reclamation for visual resources such as vegetation screening and berms.

The VRM contrast rating process should be used in accordance with BLM Manual H-8431-1 to analyze potential visual impacts from proposed projects and activities, with follow-up monitoring of reclamation and mitigation measures to provide opportunities to evaluate success and recommend changes if necessary.

Alternative II

Management — This alternative emphasizes protection of visual values and natural-appearing landscapes within special designation areas (WSRs, ACECs, areas having wilderness character) and areas of high visual sensitivity while allowing for some changes to the existing landscape character outside the special designation areas. The ACECs and areas having wilderness character would be designated VRM Class I, which allows for very limited landscape modifications (WO-IM-2000-096). Emphasis would be given to preserving and protecting areas with high scenic quality such as East Fork Canyon and the sensitive viewsheds of I-70 and SH 13.

Most impacts to visual values would be limited to lands below the rim and outside special designation areas within the near foreground and foreground distance zones. The majority would occur on private lands. Disturbance from the predicted level of development would occur in Class II, III, and IV areas.

Areas having wilderness character would not be available for lease, and NGD/NSO stipulations would apply in VRM Class I areas and on lands proposed for ACEC designation. An SSR/CSU stipulation would apply to all VRM Class II lands above and below the rim. In addition, most Class II lands within the I-70 and SH 13 viewsheds would have an NGD/NSO stipulation on slopes over 30 percent and on areas of high visual sensitivity. However, Class II objectives may be exceeded from cumulative impacts and where opportunities for mitigation are limited by valid existing rights on old leases, or because the landscape would not allow for mitigation under SSR/CSU. Additional impacts on private lands would likely occur within close range and foreground viewsheds of I-70 and SH 13.

Lands managed as Class III would allow for evident changes within the landscape. Landscape modifications from oil and gas activities are likely to occur above the rim on Class III lands between the areas with special management designations.

Class IV lands would experience the highest level of gas development. Modifications within the landscape from oil and gas activities and utility corridors are likely to be moderate to major and will affect the overall landscape character. These lands have the highest level of visual exposure and are within the close range and foreground views. These are also the lands that receive the highest intensity of use.

Recreation and travel management activities would not impact visual values above or below the rim due to travel limitations on a system of designated routes. Recreation would be managed for dispersed recreational activities with no emphasis on project or site developments. Grazing is also not likely to affect visual resources adversely, because most of the allotments are within special designation areas with mitigation for new developments.

Disturbed areas (VRM Class V) would be managed under the VRM Class areas directly adjacent to the disturbance.

Cumulative Effects — Visual impacts to public lands would be reduced in the overall landscape with the preservation of high-quality scenic areas and sensitive viewsheds. Adjacent communities, tourists, recreationists, and travelers along I-70 and SH 13 would experience long-term benefits, both onsite and offsite, from the preservation of sensitive viewsheds and retention of overall landscape character above the rim. With increased urbanization along the I-70 corridor and a decrease of natural landscapes within the viewshed, preservation of this irreplaceable resource would be significant. The protection of East Fork Parachute Creek Canyon would preserve an area of high scenic quality that is unique, irreplaceable, and vulnerable to adverse change.

The highest number of new well sites and likely visual impacts would occur on both private and public lands concentrated in the foreground and midground viewsheds of SH 13 where VRM Class IV objectives would allow for high levels of modification in the landscape.

Development within the I-70 corridor would be mitigated on public lands; however, development on private property is occurring and can be expected to increase within the close range and near foreground zones. While SSR/CSU stipulations mitigate most site-specific projects on public lands, VRM Class II objectives are likely to be exceeded due to cumulative disturbances or because the landscape would not allow for successful mitigation under an SSR/CSU.

The Planning Area would retain its overall landscape character with changes in the close range and near foreground zones to a more industrialized appearance. Long-term large-scale landscape modifications such as roads, utility corridors, and cumulative surface disturbances would contribute the most to the change in overall landscape outside of special designation areas below the rim.

Mitigation — In addition to stipulations in place, mitigation for ground-disturbing activities could include the measures listed for Alternative I, above.

Alternatives III and IV

These alternatives allow limited changes and retains visual values in areas with high sensitivity, high scenic quality, and where natural landscapes and associated values are important. A Class I designation would be maintained by an NGD/NSO stipulation with limited exceptions to protect the high scenic quality of East Fork Parachute Creek Canyon. An NGD/NSO stipulation would also be applied to the sensitive viewshed along I-70.

Most of the Planning Area would be designated Class II under these alternatives, providing for special mitigation measures to retain the existing landscape character. Most Class II lands within the I-70 viewshed with high sensitivity would have an NGD/NSO on slopes over 30 percent. However, lands with high sensitivity within the SH 13 viewshed would not have an NSO; oil and gas development could cause these areas to exceed VRM Class II objectives.

Lands managed as Class III would allow for evident changes within the landscape which would occur throughout the distance zones above the rim. Projected development in these areas is predominantly based on 20-acre surface spacing, which would allow the existing landscape character to undergo extensive changes.

Class IV lands would be managed the same as under Alternative II. Class IV lands would experience the highest level of oil and gas development under this alternative. This would create moderate to major modifications within the existing landscape and is likely to affect the overall landscape character. These lands have the highest level of visual exposure and are within the close range and foreground views. These are also the lands that receive the highest intensity of use.

Recreation and travel would have limited impacts to visual values above the rim through limiting travel to designated roads and trails. Recreation would be managed for dispersed recreational activities, with no emphasis on project or site development. Grazing management is also unlikely to affect visual resources adversely because most of the allotments are within areas containing mitigation for all new surface developments.

Disturbed areas (VRM Class V) would be eliminated and managed under the VRM Class areas directly adjacent to the disturbance.

Cumulative Effects — Changes in the overall landscape would be limited in the short term, with most of the Planning Area managed as Class II. Protection though an NGD/NSO for East Fork Parachute Creek Canyon and high-sensitivity areas within the I-70 corridor would provide long-term protection for these important visual resources.

Special mitigation measures would be implemented within Class II areas to retain the existing landscape character while allowing for land uses. However, while Class II areas have an SSR/CSU stipulation to mitigate for site-specific locations, this does not account for cumulative disturbances resulting from increased development. In time, these areas would exceed Class II objectives.

Adjacent community residents, tourists, recreationists, and travelers along I-70 would experience short-term benefits both onsite and offsite from the retention of the viewshed and overall landscape character through NGD/NSO stipulations. However, without permanent protection or special designation, these stipulations are revocable through additional planning efforts.

The sensitive lands within the SH 13 viewshed are protected through an SSR/CSU stipulation. With increased urbanization along I-70 and SH 13 and decreased natural landscapes, visual open spaces would become a valued and irreplaceable resource. Mitigation on a site-by-site basis through SSR/CSU would not retain these sensitive landscapes into the future. Cumulative effects from irretrievable management commitments and landscape modifications would exceed VRM Class II objectives under this alternative within these sensitive viewsheds.

New impacts to visual values would occur throughout the Planning Area on both private and public lands. Most noticeable impacts would occur on lands managed as Class IV, in which disturbances can dominate the landscape. Most disturbances would be concentrated in the near close range through foreground distance zones near the town of Rifle.

In summary, long-term, large-scale, and cumulative landscape modifications would contribute the most to the change in overall landscape character. Mitigation and reclamation efforts for long-term disturbance totaling 3,923 acres would reduce impacts. However, cumulative impacts would likely exceed objectives for VRM Class II and III areas. The overall landscape character outside the I-70 sensitive viewshed and East Fork Canyon would change to a more industrialized appearance.

Mitigation — In addition to stipulations in place, mitigation for ground-disturbing activities could include the measures described under Alternative I, as well as the following additional measure:

- Consider ACEC designation for protection for the high sensitivity areas within the I-70 and SH 13 viewsheds and the area of high scenic quality within the East Fork Parachute Creek Canyon viewshed.

Alternative V

Management — Alternative V allows for long-term changes to existing landscape character and to visual values throughout the Planning Area. Oil and gas development under Alternative V would result in a major level of modification throughout the landscape. The management direction would allow for significant impacts to areas of high scenic quality and to sensitive viewsheds where modifications would dominate the landscape. No special management protection to preclude visual impacts would be utilized.

The top of the plateau, the cliffs, East Fork Parachute Creek Canyon, and sensitive viewsheds would be designated VRM Class III, which allows for management activities that may be moderate and evident within the landscape. The existing landscape character would be changed.

Remaining lands would be designated Class IV, which allows changes in the landscape to dominate the viewshed. The impacts would be the same as portions of Alternative I where the level of development is projected to be high. These lands also have a high level of visual exposure and sensitivity and are within the close range and foreground distance zones (<0.25 mile to 3 miles) as viewed from SH 13 and the town of Rifle.

Cumulative Effects — Long-term irretrievable impacts (based on the life of a lease) to visual values within the existing landscape would be significant for the entire Planning Area. Management direction under this alternative would allow for irreversible impacts to areas of high scenic quality, sensitive viewsheds, and the overall landscape character within and outside the Planning Area.

Impacts to public users, adjacent communities, and both onsite and offsite travelers could be far-reaching. Economic losses could occur from loss of recreation, hunting, and tourism opportunities (USFS 2002). Adjacent communities could experience reduced property values. The long-term impacts resulting from permanent loss of visual open spaces and natural landscapes are far-reaching and represent an irretrievable commitment of resources (CEQ Req. Sec.1502.16).

Mitigation — To reduce impacts to visual values, mitigation for ground-disturbing activities could include the measures described for Alternative I, above.

4.4.2 Cultural Resources

Introduction

Cultural resources, in the broadest terms, include the built environment, artifacts, and landscapes. Cultural resources are the products of man living on the earth and interacting with the earth to produce the goods and services that sustain and improve life. Cultural resources can range from a prehistoric arrowhead to an historic building to a landscape held sacred by a group of people who live on and work the land.

Consideration of cultural resources by Federal agencies is mandated by a number of Federal statutes. The National Historic Preservation Act (NHPA) of 1966 as amended (16 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 36CFR800 between the BLM, Advisory Council for Historic Preservation, and the National Conference of State Historic Preservation Officers and 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 Archaeological Resources Protection Act (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 are 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,
- not eligible to the NRHP, or
- potentially eligible to the NRHP.

Traditional cultural properties are eligible for nomination to the NRHP. Potentially eligible sites require additional study to make a definitive eligibility determination and are protected as significant resources until a determination can be made.

The following discussion evaluates the known sites in the Planning Area in terms of impacts. Sites are non-renewable resources that can be irretrievably lost if subject to certain actions. In general, any activity that destroys or irreversibly alters an historic property is an "adverse effect." Adverse effects can be mitigated by a variety of methods. The type of site and proposed action affects the chosen method(s) and is determined by consultations between the Federal agency, SHPO, and the Advisory Council on Historic Preservation. Applicable Native American tribes and the public are included in these consultations as necessary. Native American consultation requirements are outline in BLM Manual 8160 and H-8160-1.

A number of assumptions were used to guide the analysis of alternatives. The first assumption is that additional mineral leasing will be the primary impact agent. Activities such as recreation, grazing, hunting, etc. will increase or decrease in relation to the amount of mineral leasing. Most new impacts will be from ground-disturbing activities associated with oil and gas exploration and development. The second assumption is that any new roads built in the Planning Area will increase the probability that cultural resources will be adversely affected, either directly and indirectly. The third assumption is that only lands with BLM surface estate and/or Federal mineral estate are subject to this analysis, except for the utility corridor, which contains some private lands. Finally, initial acreage disturbed (acres disturbed prior to revegetation) was used to calculate probable impacts to cultural resources.

The effects or potential effects of each alternative were determined by analyzing the number, type, significance, and density of cultural resources in each alternative. Since 58 percent of the Planning Area has been surveyed for cultural resources and 429 resources have been recorded, reasonable estimates of the impact of each alternative can be determined. The 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). The data used to compile the overview were obtained from the files and GIS data of the Glenwood Springs Field Office of BLM, the Colorado Historical Society Office of Archaeology and Historic Preservation, and 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 can be used to compare the numbers of known cultural resources in each alternative. The density of cultural resources in 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 impacted in 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) (Table 32), in which 18 percent of the documented cultural resources in the Planning Area were evaluated as eligible or potentially eligible to the NRHP.

The following analysis is concerned with three types of impacts. Direct and indirect impacts may cause adverse effects to individual cultural resources. Cumulative impacts result in incremental loss of cultural resources in the Planning Area. These impacts are defined as:

- **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 five alternatives are described below. Some impacts may represent an irreversible and irretrievable commitment of cultural resources (see Section 4.6).

4.4.2.1 Alternative I

Alternative I would maintain the current management situation in the Planning Area. Under this alternative, most of the upland area above the rim is not open to oil and gas leasing. The area below the rim would be open to leasing with various stipulations. This development would directly affect an estimated 1,901 acres of land, including both long-term impacts (1,151 acres) and short-term impacts (750 acres). Other activities that may impact cultural resources include grazing, recreation (including hunting), cross-country travel, and the development of coal and oil shale resources. Grazing and range management would follow current management practices, cross-country motorized or mechanized travel would be allowed throughout the Planning Area, and no coal or oil shale leasing would be allowed.

Direct Impacts

A cultural resources inventory has been conducted on 80.4 percent of the acreage closed to leasing (35,574 acres) and 45.6 percent (13,376 acres) of the current lease area. Within the no-lease area, 181 known cultural resources have been documented; 32 are eligible or potentially eligible for nomination to the NRHP. In the lease area, 135 known cultural resources have been documented; 19 are eligible or potentially eligible for nomination to the NRHP. Tables 4-22 and 4-23 list the types and NRHP eligibility classification for no-lease and leasable areas under this alternative.

The resource density (sites and isolated finds) in the lease area is one site per 99 acres. The calculated disturbance acreage for the lease area is 1,901 acres, including both long-term and short-term impacts. This indicates that 19 cultural resources may be affected under the current management scenario. If 18 percent of the sites in the Planning Area are eligible or potentially eligible for the NRHP (Hoefer et al. 2002), three to four eligible or potentially eligible sites may be affected in Alternative I.

Indirect Impacts

Under current management, the existing 259 miles of routes and trails would remain open to public or administrative access. Continued unfettered access to an area increases the probability that cultural resources will be looted and/or vandalized (Nickens et al. 1981). Erosion caused by oil and gas construction and maintenance, increased access and recreational traffic, and continued cross-country travel may increase the probability of damaging cultural resources outside the direct impact areas. Another indirect impact is the effect of development on private lands. Siting of roads and pipelines on Federal lands may influence the route these developments take across private lands. This may impact an unknown number of cultural resources on private lands.

Table 4-22. Cultural Resources in the Alternative I No-Lease Area

Component Type	Resource Type	NRHP Eligibility			Total
		Eligible	Potentially Eligible	Not Eligible	
Prehistoric	Isolated Find	0	0	56	**56**
	Lithic Scatter	3	6	25	**34**
	Open Camp	15	6	33	**54**
	Other Prehistoric	1	0	0	**1**
Historic	Isolated Find	0	0	1	**1**
	Habitation	0	1	10	**11**
	Aspen Art	0	0	21	**21**
	Ditch/Water Control	0	0	0	**0**
	Road	0	0	0	**0**
	Mine	0	0	0	**0**
	Artifact Scatter	0	0	1	**1**
	Other Historic	0	0	2	**2**
Total		19	13	149	**181**

Table 4-23. Cultural Resources in the Alternative I Lease Area

Component Type	Resource Type	NRHP Eligibility			Total
		Eligible	Potentially Eligible	Not Eligible	
Prehistoric	Isolated Find	0	0	63	**63**
	Lithic Scatter	1	1	12	**14**
	Open Camp	4	5	19	**28**
	Other Prehistoric	0	1	4	**5**
Historic	Isolated Find	0	0	1	**1**
	Habitation	0	1	8	**9**
	Aspen Art	0	0	0	**0**
	Ditch/Water Control	2	0	2	**4**
	Road	1	1	0	**2**
	Mine	1	0	2	**3**
	Artifact Scatter	0	0	3	**3**
	Other Historic	0	1	2	**3**
Total		9	10	116	**135**

Cumulative Impacts

Cumulative impacts cannot be directly measured. Since they are non-renewable, damaged or destroyed cultural resources are an irretrievable resource loss. Cumulative impacts under Alternative I would primarily occur from oil and gas development and cross-country travel. Over time, these activities will impact resources. If the impact is not mitigated, an irretrievable loss will occur.

4.4.2.2 Alternative II

Alternative II would allow oil and gas leasing in NOSR 1, but large areas would remain unavailable for leasing, primarily in the East Fork Parachute Creek drainage and in some areas along the cliffs. Most of the area below the rim and the Northwater and Trapper Creek drainages atop the plateau would be open to leasing with various stipulations. This alternative also includes a utility corridor along the eastern side of the Planning Area. The no-lease area covers 21,382 acres (29.1 percent) of BLM lands in the Planning Area, and the area open to leasing covers 51,220 acres (69.6 percent). The utility corridor covers 6,827 acres of Federal and private lands. An estimated 310 well pads would be developed during the 20-year period of analysis. These facilities would directly affect 2,262 acres of land, creating both long-term and short-term impacts.

Grazing, range management, and recreation (including hunting) could also impact cultural resources. Travel would be restricted to designated corridors throughout the Planning Area, with an SRMA for OHV recreation in the Hubbard Mesa area. A total of 216 miles of existing routes and trails would be open to public or administrative use. Range management would rely on administrative actions, although some on-the-ground activities would occur. No coal or oil shale leasing would be allowed.

Direct Impacts

A cultural resources inventory has been conducted on 59 percent of the no-lease area (13,204 acres), 69.8 percent (35,746 acres) of the proposed lease area, and 16.3 percent (1,116 acres) of the utility corridor. Within the proposed no-lease area are 59 known cultural resources; 12 are eligible or potentially eligible for nomination to the NRHP. The lease area contains 257 known cultural resource sites, of which 39 are eligible or potentially eligible for nomination to the NRHP. It is likely that the portion of the lease area on top of the plateau contains additional cultural resources. Heavy vegetation cover in this portion of the Planning Area is probably obscuring additional cultural resources (Hoefer et al. 2002). The utility corridor contains 43 known cultural resources, of which six sites are eligible or potentially eligible for nomination to the NRHP. Tables 4-24 and 4-25 list the types and NRHP eligibility classification for no-lease and leasable areas under Alternative II. Table 4-26 provides information for the utility corridor.

The resource density in the proposed lease area and utility corridor is one resource per 123 acres. Under the current management scenario, 18 resources may be affected within the combined 2,262 acres of long-term and short-term impacts. Assuming that 18 percent of the sites in the Planning Area are eligible or potentially eligible to the NRHP (Hoefer et al. 2002), approximately three eligible or potentially eligible sites could be impacted under Alternative II.

Table 4-24. Cultural Resources in the Alternative II No-Lease Area

Component Type	Resource Type	NRHP Eligibility			Total
		Eligible	Potentially Eligible	Not Eligible	
Prehistoric	Isolated Find	0	0	22	**22**
	Lithic Scatter	1	0	9	**10**
	Open Camp	7	3	6	**16**
	Other Prehistoric	1	0	0	**1**
Historic	Isolated Find	0	0	1	**1**
	Habitation	0	0	5	**5**
	Aspen Art	0	0	3	**3**
	Ditch/Water Control	0	0	0	**0**
	Road	0	0	0	**0**
	Mine	0	0	0	**0**
	Artifact Scatter	0	0	0	**0**
	Other Historic	0	0	1	**1**
Total		**9**	**3**	**47**	**59**

Table 4-25. Cultural Resources in the Alternative II Lease Area

Component Type	Resource Type	NRHP Eligibility			Total
		Eligible	Potentially Eligible	Not Eligible	
Prehistoric	Isolated Find	0	0	97	**97**
	Lithic Scatter	3	7	28	**38**
	Open Camp	12	8	46	**66**
	Other Prehistoric	0	1	4	**5**
Historic	Isolated Find	0	0	1	**1**
	Habitation	0	2	13	**15**
	Aspen Art	0	0	18	**18**
	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	3	**4**
Total		**19**	**20**	**218**	**257**

Table 4-26. 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**

Indirect Impacts

The 216 miles of open roads would represent a 16.6-percent decrease compared to Alternative I. Further, the closure of the entire area (including the Hubbard Mesa SRMA) to cross-country travel would decrease the probability that cultural resources will be looted and/or vandalized (Nickens et al. 1981). However, any public access into an area creates the potential for damage to cultural resources. Erosion caused by oil and gas construction and maintenance may increase the probability of damaging cultural resources outside the direct impact areas. Another indirect impact is development on private lands. Siting of roads and pipelines on Federal lands may influence the route these developments take across private lands. This may impact an unknown number of cultural resources on private lands.

Cumulative Impacts

Cumulative impacts cannot be directly measured. Since they are non-renewable, damaged or destroyed cultural resources are an irretrievable resource loss. Cumulative impacts under Alternative II would primarily occur from oil and gas development, expansion of recreational opportunities below the rim, and the establishment of the Hubbard Mesa SRMA. If impacts are not mitigated, an irretrievable loss would occur.

4.4.2.3 Alternative III – Preferred Alternative

Under this alternative, all BLM surface lands and Federal mineral estate lands would be eligible for leasing, and a utility corridor would extend through the eastern side of the Planning Area. Development of the lease area atop the plateau would be deferred for a number of years until the area below the rim attains 80-percent development. The lease area covers 73,602 acres of BLM land, and the utility corridor covers 6,827 acres of Federal and private lands. An estimated 402 well pads would be developed, resulting in 2,948 acres of long-term and short-term disturbance. This total would include 241 miles of new or improved access roads

Grazing, range management, and recreation (including hunting) could also impact cultural resources. A total of 233 miles of existing routes would remain open for public or administrative use. However, cross-country motorized or mechanized travel would not be allowed, except for the Hubbard Mesa SRMA. Range management would use a combination of administrative and physical measures (e.g., additional stock watering ponds). Coal or oil shale development would be allowed under this alternative but are considered very unlikely to occur during the 20-year period of analysis.

Direct 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. Heavy vegetation cover in this portion of the Planning Area is probably obscuring additional sites (Hoefer et al. 2002). In the utility corridor are 43 known cultural resources, of which six are eligible or potentially eligible for nomination to the NRHP. Table 4-27 lists the types and NRHP eligibility classification for the Alternative III (and) IV lease area. See Table 4-26 regarding sites in the utility corridor.

Table 4-27. Cultural Resources in the Alternative III and IV Lease Areas

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**

4.4.2.4 Alternative IV

Under this alternative, all BLM surface lands and Federal mineral estate lands would be eligible for leasing — without the deferred leasing and development atop the plateau as described for Alternative III — and a utility corridor would extend through the eastern side of the Planning Area. The lease area covers 73,602 acres of BLM land, and the utility corridor covers 6,827 acres of Federal and private lands. An estimated 449 well pads would be developed, resulting in 3,269 acres of long-term and short-term disturbance.

Grazing, range management, and recreation (including hunting) could also impact cultural resources. A total of 233 miles of existing routes and trails would remain open for public or administrative use, but cross-country motorized or mechanized travel would not be allowed, except within the Hubbard Mesa SRMA. Range management would use a combination of administrative and physical measures (e.g., additional stock watering ponds). Coal or oil shale development is considered very unlikely during the 20-year period of analysis.

Direct 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. Heavy vegetation cover in this portion of the Planning Area is probably obscuring additional cultural resources (Hoefer et al. 2002). In the utility corridor are 43 known cultural resources, of which six are eligible or potentially eligible for nomination to the NRHP. Table 4-27 lists the types and NRHP eligibility classification for the lease area under Alternative IV, which are the same as under Alternative III (the deferral of oil and gas leasing and drilling on top of the plateau does not affect these numbers). See Table 4-26 for information regarding the utility corridor.

Resource density in the proposed lease area and utility corridor is one resource per 155 acres. Under current management, 21 resources could be affected within the estimated 3,269 acres of long-term and short-term impacts. If 18 percent of the sites in the Planning Area are eligible or potentially eligible to the NRHP (Hoefer et al. 2002), four eligible or potentially eligible sites may be impacted under Alternative IV.

Note that this impact level is identical to that for Alternative III, reflecting the fact that deferred leasing and development of oil and gas on top of the plateau would not affect potential impacts to cultural resources. Instead, the impact level is driven by acres of ground-disturbing activities, which this RMPA/EIS assumes would not differ between these two alternatives. If deferred leasing results in an increase or decrease in the number of pads or miles of new or widened access roads over the 20-year period of analysis, the potential for impacts to cultural sites would be affected proportionally.

Table 4-28. Cultural Resources in the Alternative IV Lease Area

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**

Indirect Impacts

Under Alternative IV, the 233 miles of roads to remain open for public use represents a 7.9-percent increase over Alternative II but a 10-percent decrease from Alternative I. Closure of the Planning Area to cross-country motorized or mechanized travel (including off-route travel by snowmobile) would decrease the probability that cultural resources will be looted and/or vandalized (Nickens et al. 1981). However, any public access into an area creates some opportunity for damage to cultural resources. Erosion caused by road and pipeline construction and cross-country travel in the Hubbard Mesa SRMA may increase the probability of damaging cultural resources outside direct impact areas. Another indirect impact is the effect of development on private lands. Siting of roads and pipelines on Federal lands could influence the route these developments take across private lands, adversely affecting an unknown number of cultural resources on private lands.

Cumulative Impacts

Cumulative impacts cannot be directly measured. Since they are non-renewable, damaged or destroyed cultural resources are an irretrievable resource loss. Cumulative impacts under Alternative IV would primarily occur from oil and gas development, limited development of recreational opportunities throughout the Planning Area, establishment of the Hubbard Mesa SRMA, and possibly coal and oil shale leasing activities. Over time, these activities will impact resources. Without mitigation, irretrievable loss will occur.

4.4.2.5 Alternative V

Under this alternative, all BLM lands would be eligible for leasing, again without deferred leasing atop the plateau, and resources would be protected from mineral development by focused mitigation. This alternative also includes a utility corridor along the eastern side of the Planning Area. The lease area covers 73,602 acres of BLM land, and the utility corridor covers 6,827 acres of both Federal and private lands. An estimated 584 well pads would be developed during the 20-year period, resulting in 4,211 acres of long-term and short-term impacts.

Grazing, range management, and recreation (including hunting) could also impact cultural resources. A total of 259 miles of existing routes and trails would be open for public or administrative access, but the entire area would be closed to cross-country motorized or mechanized travel (except for off-route travel by snowmobile). Range management would include a combination of administrative and physical projects (e.g., additional stock ponds). Coal and oil shale leasing would be allowed but are very unlikely during the 20-year period.

Direct 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, with 51 eligible or potentially eligible for nomination to the NRHP. It is likely that the portion of the lease area on the plateau above the rim contains additional cultural resources. Heavy vegetation cover in this portion of the Planning Area is probably obscuring additional cultural resources (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 4-29 lists the types and NRHP eligibility classification for the leasable area under Alternative V. See Table 4-26 for information regarding sites in the utility corridor.

Table 4-29. Cultural Resources in the Alternative V Lease Area

Resource Type	NHRP Eligibility			Total
	Eligible	Potentially Eligible	Not Eligible	
Isolated Find	0	0	117	**117**
Lithic Scatter	4	7	37	**48**
Open Camp	19	11	52	**82**
Other Prehistoric	1	1	5	**7**
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**

Resource density in the proposed lease area and utility corridor is one resource per 155 acres. The potential disturbance acreage for the lease area is 4,211 acres, including both long-term and short-term impacts. Twenty-seven cultural resources could be impacted under this alternative. If 18 percent of the sites in the Planning Area are eligible or potentially eligible to the NRHP (Hoefer et al. 2002), approximately 5 eligible or potentially eligible sites could be impacted under Alternative V.

Indirect Impacts

Under Alternative V, 259 miles of existing routes and trails would remain open to public use — the same as in Alternative I but with no cross-country travel. The length of open roads and routes represents an increase of 19.9 percent over Alternative II and 11.1 percent over Alternative IV. Public access increases the probability that cultural resources will be looted and/or vandalized (Nickens et al. 1981), although the prohibition against cross-country travel reduces this risk. Erosion caused by oil and gas construction and maintenance, and increased recreational traffic, may increase the probability of damaging cultural resources outside the direct impact areas. Another indirect impact is the effect of development on private lands. Siting of roads and pipelines on Federal lands may influence the route these developments take across private lands, affecting an unknown number of sites on private lands.

Cumulative Impacts

Cumulative impacts cannot be directly measured. Since they are non-renewable, damaged or destroyed cultural resources are an irretrievable resource loss. Cumulative impacts under Alternative V would primarily occur from oil and gas development, greater development of recreational opportunities throughout the Planning Area, and possibly coal and oil shale leasing activities. Over time, these activities would impact resources. If the impact is not mitigated, an irretrievable loss would occur.

4.4.2.6 Traditional Cultural Properties

Traditional cultural properties are sites, locations, areas, and landscapes that may be important to certain groups. No traditional cultural properties have been identified in the Planning Area.

4.4.2.7 Comparison of Alternatives

Each alternative could 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. The potential for significant cultural properties to be directly impacted increases slightly from Alternative I through Alternative IV. The potential for impacts increases in Alternative V, under which 29 percent more cultural resources and 25 percent more significant cultural resources may be impacted than under Alternatives III and IV. The potential lease areas on top of the plateau for Alternatives II through V may contain additional cultural resources that are now obscured by vegetation cover. If this is the case, then the estimates of the potential number of directly impacted cultural resources in Alternatives II through V are too low. Alternatives I and V would have the most indirect impact. Tables 4-30 and 4-31 compare the number of cultural resources by NRHP eligibility category and potential numbers of affected resources. In terms of cumulative impacts, Alternatives II through IV would have the least effect and Alternative V the most effect.

4.4.2.8 Mitigation Strategies

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 Advisory Council on Historic Preservation (ACHP) consult to determine the appropriate mitigation measures, according to the terms of the BLM National Programmatic Agreement (PA).

Table 4-30 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 4-31 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 & Gas Leasing	Potential Number of Affected Cultural Resources	Potential Number of Affected Significant Cultural Resources
I	1,901 acres	1 per 99 acres	19	3.5
II	2,262 acres	1 per 123 acres	18	3.3
III	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

Native American groups, and the public are consulted as necessary.

To further integrate BLM cultural resource policy with the goals and policies of other resources, BLM issued an 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 frst five categories are subject to management actions that preserve and protect the resource. Those that are 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 cultural resource per 538 acres.

4.4.2.9 Management Actions

Management actions for each use allocation and sensitivity area are discussed below. Sensitivity area recommendations are summarized in Table 4-32, followed by recommendations for data collection, monitoring, geoarchaeological investigations, site evaluation policies, and impacts to private lands.

Table 4-32. 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. Consultation with tribes should be conducted 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. It is recommended that the public, especially historical societies and educational institutions, 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 will 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 will require testing to refine NRHP eligibility further.

Eligible Sites — NRHP-eligible sites within the area of potential effect that cannot be avoided will 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, will require testing to refine NRHP eligibility further.

Eligible Sites — NRHP-eligible sites within the area of potential effect that cannot be avoided will 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, will require testing to refine NRHP eligibility futher.

Eligible Sites — NRHP-eligible sites within the area of potential effect that cannot be avoided will require formulation and implementation of a data recovery plan.

Ineligible Sites — No further work is recommended.

4.4.2.10 Policy Recommendations

Data Collection Policy

Temporal information is not currently being collected in the study area. 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 sherds that can be dated by thermoluminescent methods. 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. (2000:29) 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

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, prohibit cross-country travel in all or parts of the Planning Area, and manage areas having wilderness character to maintain their wilderness values — could change the recreational experience in the area, which in turn could alter the pattern of local expenditures for recreation equipment and supplies.

The 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. Table 4-33 summarizes the socioeconomic impacts under each alternative.

The impact assessment standards used in this analysis are described below. Because impact assessment is a professional judgment, often based on contradictory elements, the standards should be viewed only 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 management proposal may bring about temporary, short-term, or marginal changes that are unlikely to be noticed by or 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 management proposal may bring about permanent or temporary changes that would not substantially alter socioeconomic conditions but could be noticed by and be of interest to some of the general public. If the impact indicator could be quantified, it would be between 1 and 5 percent of the current or future level of that indicator.
- **Moderate** – The management proposal is likely to bring about permanent or long-term changes that alter socioeconomic conditions and would be noticed by and be of interest to the general public. If the impact indicator could be quantified, it would be between 5 and 15 percent of the current or future level of that indicator.
- **Major** – The management proposal is likely to bring about permanent or long-term changes that substantially alter socioeconomic conditions and would be noticed by and be of great interest to the general public. If the impact indicator could be quantified, it would be over fifteen percent of the current or future level of that indicator; e.g., a change in total employment of more than 15 percent on a long-term or permanent basis.

Table 4-33. Socioeconomic Impacts of the Four RMP Alternatives, 20-year Period of Analysis

	Alternative I	Alternative II	Alternative III	Alternative IV	Alternative V
Wells Drilled per Year	43	45	66	66	79
Employment in 2025					
Oil and Gas Employment	151	160	234	234	280
Recreation Employment [1]	0	12	– 3	– 3	– 6
Indirect Employment	151	172	231	231	274
Total Employment	302	344	462	462	548
Percent Change	0.7%	0.7%	1.0%	1.0%	1.2%
Population in 2025					
Number of People	544	619	832	832	986
Percent Change	0.6%	0.7%	1.0%	1.0%	1.1%
Cumulative Gas Development					
Total Wells Drilled	855	906	1,324	1,324	1,582
Gas Production (BCF) in 20 Years	504	535	781	781	933
Households Heated in 20th Year	268,324	284,330	415,511	415,511	496,479
Cumulative Fiscal Impact					
Value of Gas Production (million $)	1,512	1,605	2,343	2,343	2,799
Federal Royalty (million $)	189	201	293	293	350
State Share of Royalty (million $) [2]	95	101	146	146	175
Property Tax Revenue (million $) [3]	69.5	73.7	107.7	107.7	128.6

[1] *Assumes 5% and 10% decreases in recreation under Alternatives IV and V, respectively, due to oil and gas.*

[2] *Wouldbe reduced by an estimated $40 million due to provisions of the transfer act for NOSRs 1 and 3.*

[3] *Assumes a mill levy of 50.*

Note that the same terms are applied in a more relative sense to describe beneficial impacts.

Environmental justice review during an environmental analysis requires that each Federal agency identify any "disproportionately high and adverse human health or environment effects of its programs, policies, and activities on minority populations and low-income populations." Under all of the alternatives analyzed in this RMPA/EIS, no minority or low-income populations would suffer a disproportionately severe effect. The only minority population of note is the Hispanic community, representing about 17 percent of the Garfield County population. The low-income population of Garfield County is dispersed, although more people receiving assistance tend to be located in the vicinity of Rifle and Parachute. No evidence suggests that the Hispanic community or low-income population would be affected by BLM management decisions in the Planning Area to a greater or lesser degree than any other population segment.

Results of the interviews with community leaders, government representatives, and private citizens supported this conclusion. When these individuals were asked about the potential for disproportionately adverse impacts on any population, the Hispanic community was usually cited as the only identifiable minority population. Respondents generally indicated that this population would be affected by BLM management decisions to the same degree and in the same manner as the majority population. The same opinions were expressed regarding the County's low-income population.

4.4.3.1 Alternative I

Alternative I would continue existing land uses and resource management. No oil and gas leasing would occur on the 44,267 acres of transferred lands that have not already been leased. Leasing and development would occur for the remaining 29,333 acres of Federal mineral estate in the Planning Area. BLM would continue to provide opportunities for motorized, mechanized, and non-motorized travel within the framework of existing management, including cross-country travel. No additional management designations would alter the conditions under which people recreate or pursue commercial opportunities on BLM lands in the Planning Area.

Impacts from Oil and Gas Development

Under this alternative, approximately 855 new wells would be drilled on public lands that are currently leased or available for lease, eventually recovering reserves estimated at 983 BCF of gas. During the 20-year life of the plan, about 504 BCF would be produced. By the 20th year of the plan, the production rate would supply the annual natural gas needs of nearly 270,000 households. At $3.00/MCF, the value of gas produced would be $1.5 billion, generating Federal mineral royalties of $189 million.

Up to half the Federal royalties, or nearly $95 million, could be disbursed to Colorado for allocation to various jurisdictions within the State, including local governments in Garfield County. However, the amount of Federal royalty monies that jurisdictions in Colorado could receive would be reduced by a provision of the transfer act. This act specifies that none of the Federal royalty monies generated by lease of lands in the former NOSRs (in this alternative, only the leases in NOSR 3) are to be disbursed to Colorado until the Federal government recoups DOE's cost for gas development in NOSR 3 and the cost to BLM of environmental restoration in NOSRs 1 and 3. The recouped costs could amount to $40 million or more. Oil and gas production in the Planning Area would increase Garfield County's assessed property valuation, yielding an estimated $70 million in property tax revenue over the 20 year period of analysis. Availability of the Planning Area royalties to the Federal government would be a negligible impact. However, to Colorado and jurisdictions within Colorado, the disbursement of Federal royalties and generation of additional property tax revenues would constitute a moderate beneficial impact.

Job growth under this alternative would depend on the extent to which drilling in the Planning Area is in addition to ongoing activity instead of replacing drilling that would otherwise occur in areas outside the Planning Area. Assuming that all Planning Area oil and gas activity would be new drilling, the assumed average of 43 wells per year (Appendix H) could lead to direct employment of 151 workers in the oil and gas industry. This increased direct oil and gas employment would in turn cause a similar increase in jobs indirectly tied to this growth. Together, the new jobs would increase the population of the area by 544 people, including direct and indirect employees and family members. Most of the new jobs and the population increase would be located in Garfield County, but Mesa County and perhaps Rio Blanco County would also see some growth. Table 4-33 assumes that all new jobs and new residents would be located in Garfield County.

In some parts of western Colorado, a population increase of 544 people would be a major change. However, population growth in Garfield County has been substantial for a number of years and is expected to remain so into the future. Consequently, the additional population brought about by this alternative would be less than one percent of the projected 2025 Garfield County population. The same is true for County employment. Because the percentage change is so small, the impact would be negligible to minor.

Impacts from Other Proposed Management Actions

Hunting and other forms of dispersed recreation within the planning unit would continue to exert the same influence on local socioeconomic conditions as before, subject to changes in external factors such as CDOW hunting regulations, regional population growth, and changes in numbers of deer and elk. Grazing would continue in the Planning Area under the same management as at present and would generate the same impacts. No additional jobs, population levels, or public revenues would be generated.

Impacts on Quality of Life

The new wells drilled on Federal mineral estate would primarily be in the southern and eastern portions of the Planning Area. Drilling in the southern portion would intensify impacts that are already occurring. Drilling in the eastern portion would expand oil and gas development into areas west and north of Rifle that have seen little activity to date. The effect on quality of life would depend to some extent on the degree to which the oil and gas industry is perceived as being a "good neighbor."

Beyond that, the introduction of industrial features in the landscape of the newly developed area would begin a transformation of the visual character that residents value so highly. This transformation could induce some residents to conclude that their quality of life is being adversely affected. The effect would be minor to moderate.

4.4.3.2 Alternative II

This alternative would focus public land management on the enhancement of visual resource values, natural processes, and the wilderness character of the area. In addition to managing over 21,000 acres to maintain wilderness values, four ACECs would be established, 43 miles of existing roads would be closed to motorized or mechanized travel, another 43 miles would be open only for administrative use, and cross-country travel would be prohibited throughout the Planning Area, including over-snow travel by snowmobiles. More than 52,000 acres of Federal mineral estate would be available for oil and gas leasing.

Impacts from Oil and Gas Development

This alternative would result in an estimated 905 new wells on public lands that are currently leased or would be made available for lease, eventually recovering reserves estimated at 1,041 BCF of gas. By the 20th year of the plan, about 535 BCF would be produced, supplying the annual natural gas needs of approximately 285,000 households. At $3.00/MCF, the value of the gas produced would be $1.6 billion, generating Federal mineral royalties of $201 million.

Up to half the Federal royalties, or about $101 million, could be disbursed to Colorado for allocation to various jurisdictions within the State, including local governments in Garfield County. However, the amount of Federal royalty monies that jurisdictions in Colorado could receive would be reduced by a provision of the transfer act. It requires that none of the Federal royalty monies generated by lease of lands in the former NOSRs will be disbursed to Colorado until the Federal government recoups DOE's cost for gas development in NOSR 3 and the cost to BLM for environmental restoration in NOSRs 1 and 3. The recouped costs could amount to $40 million or more. Gas production in the Planning Area would increase Garfield County's assessed property valuation, yielding an estimated $74 million in property tax revenue over the 20-year plan. Availability of Planning Area royalties to the Federal government would be a negligible impact. To Colorado and jurisdictions within Colorado, the disbursement of Federal royalties and the generation of additional property tax revenues would constitute a moderate impact.

Drilling an average of 45 wells per year would require an increase in oil and gas industry employment of 160 workers. The increased oil and gas employment would in turn cause an increase of a comparable number of jobs indirectly tied to the oil and gas growth. The new jobs, together with employment increases generated by changes in recreation management, would bring about a population increase of 619 people. Most of the new jobs and the population increase would be located in Garfield County, but Mesa County and, to a lesser extent, Rio Blanco County would see some change. For comparison purposes, Table 4-33 assumes that all new jobs and new residents would be located in Garfield County.

In some parts of western Colorado, a population increase of 619 would be a major change. However, population growth in Garfield County has been substantial for a number of years and is expected to remain so into the future. Consequently, the additional population brought about by this alternative would be less than one percent of the projected 2025 Garfield County population. The same is true for County employment. Because the percentage change is so small, the impact would be negligible to minor.

The development of oil and gas at the levels anticipated under Alternative II would run counter to those recommendations aimed at enhancing a backcountry recreation experience. This is especially true above the rim, where new access roads for gas drilling would not be in accord with efforts to maintain a backcountry setting. This effect would tend to reduce the socioeconomic benefits of attracting a more diverse group of recreationists.

The increased forage created by reclamation of oil and gas well pads could be seen as a short-term benefit by grazing permittees.

Impacts from Other Proposed Management Actions

The character of hunting and other forms of dispersed recreation within the Planning Area could change as restrictions on motorized use and a new emphasis on non-motorized recreation begins to attract a different group of recreationists. The number of hunters would probably stay about the same, depending more on CDOW regulations than BLM management. However, over time, hunting success might improve, which could induce more hunters to try the area. The change in emphasis would have a negligible impact on the local economy, as spending patterns would simply shift to accommodate the equipment and supply needs of the new group of hunters.

The continued maintenance of wilderness values within the planning unit would tend to attract a new and different group of recreationists over time. In particular, recreational use outside the hunting season would be likely to grow. This new use has the potential to generate a minor impact as total sales of goods and services increase and as sales are spread over a longer season. Local employment could increase by as many as twelve jobs.

Grazing would continue in the Planning Area under much the same management as before, but fewer rangeland improvement projects could be constructed and maintenance of many existing projects would be complicated by the new limitations on motorized travel. The economic effect would be adverse but negligible.

Impacts on Quality of Life

The new wells drilled on Federal mineral estate would be in the southern and eastern portions of the Planning Area and, to a limited extent, on top of the plateau. Drilling in the southern portion would intensify impacts that are already occurring. Drilling in the rest of the Planning Area would expand the area of oil and gas development to areas west and north of Rifle and on top of the plateau that have seen little activity to date. The effect of this expansion on quality of life would depend to some extent on the degree to which the oil and gas industry is perceived as being a "good neighbor."

Beyond that, the introduction of industrial features in the landscape of the newly developed areas would begin a transformation of the visual character that residents value so highly. This transformation could induce some residents to conclude that their quality of life is being adversely affected. Maintenance of wilderness values and the extensive use of NSO stipulations under this alternative would help to ensure the visual quality of the Roan Plateau. This would be a welcome development to the many area residents who value highly the visual character of the Planning Area, and would reduce the negative visual impact of oil and gas development. The overall effect of this alternative on perceptions of quality of life would be moderate and negative.

4.4.3.3 Alternative III – Preferred Alternative

Under this alternative, public land management would aim for a balance between mineral resource development and non-renewable resources. A total of 26 miles of existing roads would be closed to motorized or mechanized travel, another 24 miles would be open only to administrative use, and cross-country travel would be prohibited through the Planning Area. The cross-country prohibition would not apply to off-route travel by snowmobile.

No special protection would be given to areas having wilderness character, but a total of 9,006 acres would be managed in ways that would protect roadlessness and naturalness (Map 36). Additionally, two ACECs would be designated, and WSR-eligible streams would be protected. The entire 73,602 acres of Federal mineral estate in the Planning Area would be made available for lease, but development above the rim would be deferred until 80 percent of anticipated wells below the rim have been completed.

Impacts from Oil and Gas Development

This alternative would result in an estimated 1,324 new wells on public lands that are currently leased or would be made available for lease, eventually recovering reserves estimated at 1,523 BCF of gas. By the 20th year of the plan, about 781 BCF of natural gas would be produced, supplying the annual needs of approximately 415,000 households. At $3.00/MCF, the value of gas produced would be more than $2.3 billion, generating Federal mineral royalties of $293 million. Up to half the Federal royalties, or about $146 million, could be disbursed to Colorado for allocation to various jurisdictions within the State, including local governments in Garfield County. However, the amount of Federal royalty monies that jurisdictions in Colorado could receive would be reduced by a provision of the transfer act. It requires that none of the Federal royalty monies generated by lease of lands in the former NOSRs will be disbursed to Colorado until the Federal government recoups DOE's cost for gas development in NOSR 3 and the cost to BLM of environmental restoration in NOSRs 1 and 3. The recouped costs could amount to $40 million or more. Gas production in the Planning Area would increase Garfield County's assessed property valuation, yielding an estimated $108 million in property tax revenue over the 20-year period of analysis. Availability of the Planning Area royalties to the Federal government would be a negligible impact. To Colorado and jurisdictions within Colorado, the disbursement of Federal royalties and the generation of additional property tax revenues would constitute a moderate impact.

Drilling an average of 66 wells per year would require an increase in oil and gas industry employment of 234 workers. Increased oil and gas employment would in turn cause an increase of a similar number of jobs indirectly related to oil and gas growth. The new jobs, together with employment changes generated in the recreation sector, would bring about a population increase of 832 people. Most of the new jobs and the population increase would be located in Garfield County, but Mesa County and Rio Blanco County would see some change. For comparison purposes, Table 4-33 assumes that all new jobs and new residents would be located in Garfield County.

In some parts of western Colorado, a population increase of 832 would be a major change. However, population growth in Garfield County has been substantial for a number of years and is expected to remain so into the future. Consequently, the additional population brought about by this alternative would be only about 1 percent of the projected 2025 Garfield County population. The same is true for County employment. Because the percentage change is so small, the impact would be minor.

Development of oil and gas at the levels anticipated would run counter to other program recommendations, especially above the rim, where new access roads for gas drilling would not be in accord with efforts to limit motorized activity. Hunting and other forms of dispersed recreation within the planning unit could eventually be affected by the substantial drilling activity atop the Roan Plateau. The number of new roads and the greatly increased traffic on those roads and roads leading into the area could diminish hunting success and reduce the attractiveness of the area to many recreationists. This could affect local employment slightly, costing an estimated three jobs. However, the overall economic impact would be negligible.

The increased forage created by reclamation of oil and gas well pads could be seen as a short-term benefit by grazing permittees.

Impacts from Proposed Management Actions

The character of hunting and other forms of dispersed recreation within the planning unit could change if limitations on motorized use and increased opportunities for non-motorized recreation begin to attract a different group of recreationists. The number of hunters would probably stay about the same, depending more on CDOW regulations than BLM management. If hunting success improves, it could induce more hunters to visit the area. The socioeconomic impact of any change is likely to be negligible as spending patterns would not increase or decrease but would simply shift to accommodate the varying equipment and supply needs of a different mix of recreationists. The overall socioeconomic impact of these changes would be negligible.

Grazing would continue in the Planning Area under much the same management as before but motorized access would be reduced. The economic effect would be negligible.

Impacts on Quality of Life

New wells would be drilled on Federal mineral estate throughout the Planning Area. Drilling in the southern portion would intensify impacts that are already occurring; drilling in the rest of the Planning Area would expand the area of oil and gas development to areas west and north of Rifle and on top of the plateau that have seen little activity to date. The effect of this expansion on quality of life would depend to some extent on the degree to which the oil and gas industry is perceived as being a “good neighbor.”

Beyond that, the introduction of industrial features in the landscape of the newly developed areas would be extensive and would bring about a transformation of the visual character that residents value so highly. This transformation could induce many residents to conclude that their quality of life is being adversely affected. The effect would be moderate to major.

Certainly the deferral of oil and gas development on top of the plateau until an estimated 16 years into the 20-year period would postpone the negative impacts in this part of the Planning Area, which is of special importance to much of the public. It is not known whether the intervening period would allow the development of more efficient, less impactful drilling and recovery techniques that would lead to less impact on quality of life than if drilling above the cliffs were to begin sooner.

4.4.3.4 Alternative IV

Under this alternative, public land management would aim for a balance between mineral resource development and non-renewable resources. A total of 26 miles of existing roads would be closed to motorized or mechanized travel, another 24 miles would be open only to administrative use, and cross-country travel would be prohibited, except within the Hubbard Mesa SRMA and over-snow travel by snowmobile. No special protection would be given to areas having wilderness character. However, two ACECs would be designated, and WSR-eligible streams would be protected. The entire 73,602 acres of Federal mineral estate in the Planning Area would be made available for lease.

Impacts from Oil and Gas Development

This alternative would result in an estimated 1,324 new wells on public lands that are currently leased or would be made available for lease, eventually recovering reserves estimated at 1,523 BCF of gas. By the 20th year of the plan, about 781 BCF of natural gas would be produced, supplying the annual needs of approximately 415,000 households. At $3.00/MCF, the value of the gas produced would be more than $2.3 billion, generating Federal mineral royalties of $293 million.

Up to half the Federal royalties, or about $146 million, could be disbursed to Colorado for allocation to various jurisdictions within the State, including local governments in Garfield County. However, the amount of Federal royalty monies that jurisdictions in Colorado could receive would be reduced by a provision of the transfer act. It requires that none of the Federal royalty monies generated by lease of lands in the former NOSRs will be disbursed to Colorado until the Federal government recoups DOE's cost for gas development in NOSR 3 and the cost to BLM for environmental restoration in NOSRs 1 and 3. The recouped costs could amount to $40 million or more. Gas production in the Planning Area would increase Garfield County's assessed property valuation, yielding an estimated $108 million in property tax revenue over the 20-year period of analysis. Availability of Planning Area royalties to the Federal government would be a negligible impact. To Colorado and jurisdictions within Colorado, the disbursement of Federal royalties and the generation of additional property tax revenues would constitute a moderate impact.

Drilling an average of 66 wells per year would require an increase in oil and gas industry employment of 234 workers. Increased oil and gas employment would in turn cause an increase of a similar number of jobs indirectly related to oil and gas growth. The new jobs, together with employment changes generated in the recreation sector, would bring about a population increase of 832 people. Most of the new jobs and the population increase would be located in Garfield County, but Mesa County and Rio Blanco County would see some change. For comparison purposes, Table 4-33 assumes that all new jobs and new residents would be located in Garfield County.

In some parts of western Colorado, a population increase of 832 would be a major change. However, population growth in Garfield County has been substantial for a number of years and is expected to remain so into the future. Consequently, the additional population brought about by this alternative would be only about 1 percent of the projected 2025 Garfield County population. The same is true for County employment. Because the percentage change is so small, the impact would be minor.

The development of oil and gas at the levels anticipated would run counter to other program recommendations, especially above the rim, where new access roads for gas drilling would not be in accord with efforts to limit motorized activity. Hunting and other forms of dispersed recreation within the planning unit could eventually be affected by the substantial drilling activity atop the Roan Plateau. The number of new roads and the greatly increased traffic on those roads and roads leading into the area could diminish hunting success and reduce the attractiveness of the area to many recreationists. This could affect local employment slightly, costing an estimated three jobs. However, the overall economic impact would be negligible.

The increased forage created by reclamation of oil and gas well pads could be seen as a short-term benefit by grazing permittees.

Impacts from Proposed Management Actions

The character of hunting and other forms of dispersed recreation within the planning unit could change if limitations on motorized use and increased opportunities for non-motorized recreation begin to attract a different group of recreationists. The number of hunters would probably stay about the same, depending more on CDOW regulations than BLM management. If hunting success improves, it could induce more hunters to visit the area. The socioeconomic impact of any change is likely to be negligible as spending patterns would not increase or decrease but would simply shift to accommodate the varying equipment and supply needs of a different mix of recreationists. The overall socioeconomic impact of these changes would be negligible.

Grazing would continue in the Planning Area under much the same management as before but motorized access would be reduced. The economic effect would be negligible.

Impacts on Quality of Life

New wells would be drilled on Federal mineral estate throughout the Planning Area. Drilling in the southern portion would intensify impacts that are already occurring; drilling in the rest of the Planning Area would expand the area of oil and gas development to areas west and north of Rifle and on top of the plateau that have seen little activity to date. The effect of this expansion on quality of life would depend to some extent on the degree to which the oil and gas industry is perceived as being a "good neighbor."

Beyond that, the introduction of industrial features in the landscape of the newly developed areas would be extensive and would bring about a transformation of the visual character that residents value so highly. This transformation could induce many residents to conclude that their quality of life is being adversely affected. The effect would be moderate to major.

4.4.3.5 Alternative V

Under this alternative, public land management would focus on maximizing mineral resource development while maintaining some essential protections for non-renewable resources. No ACECs or WSRs would be established, areas having wilderness character would not be given special protection, and the existing 259 miles of roads and routes would remain open. However, cross-country travel would be prohibited, except for over-snow travel by snowmobile. The entire 73,602 acres of the Federal mineral estate in the Planning Area would be made available for lease. A substantial difference between this alternative and others is the removal of NSO stipulations to protect viewsheds and the CSU stipulation to protect VRM Class II areas. These changes were presumably made to increase the potential for extraction of oil and gas.

Impacts from Oil and Gas Development

Under this alternative, an estimated 1,582 new wells would be drilled on public lands that are currently leased or would be made available for lease, eventually recovering reserves estimated at 1,819 BCF of natural gas. By the end of the 20-year life of the plan, about 933 BCF would be produced, supplying the annual needs of an average of approximately 496,000 households. At $3.00/MCF, the value of gas produced would be $2.8 billion, generating Federal mineral royalties of $350 million.

Up to half the Federal royalties, or about $175 million, could be disbursed to Colorado for allocation to various jurisdictions within the State, including local governments in Garfield County. However, the amount of Federal royalty monies that jurisdictions in Colorado could receive would be reduced by a provision of the transfer act. It requires that none of the Federal royalty monies generated by lease of lands in the former NOSRs will be disbursed to Colorado until the Federal government recoups DOE's cost for gas development in NOSR 3 and the cost to BLM of environmental restoration in NOSRs 1 and 3. The recouped costs could amount to $40 million or more. Gas production in the Planning Area would increase Garfield County's assessed property valuation, yielding an estimated $129 million in property tax revenue over the 20-year period of analysis. Availability of the Planning Area royalties to the Federal government would be a negligible impact. To Colorado and jurisdictions within Colorado, the disbursement of Federal royalties and the generation of additional property tax revenues would constitute a moderate impact.

Drilling an average of 79 wells per year would require an increase in oil and gas industry employment of 280 workers. The increased oil and gas employment would in turn cause a comparable increase in jobs indirectly tied to the oil and gas growth. The new jobs, together with employment changes generated in the recreation sector, would bring about a population increase of 986 people. Most of the new jobs and the population increase would be located in Garfield County but Mesa County and Rio Blanco County would see some change. For comparison purposes, Table 4-33 assumes that all new jobs and new residents would be located in Garfield County.

In some parts of western Colorado, a population increase of 986 would be a major change. However, population growth in Garfield County has been substantial for a number of years and is expected to remain so into the future. Consequently, the additional population brought about by this alternative would be only about one percent of the projected 2025 Garfield County population. The same is true for County employment. Because the percentage change is so small, the impact would be minor.

The development of oil and gas at the levels anticipated for Alternative V would have a detrimental effect on some current recreation activities in the Planning Area, particularly hunting. The number of new roads created by gas drilling activities and the greatly increased traffic on those roads could diminish hunting success and reduce the attractiveness of the area to many recreationists. This could affect local employment slightly, costing an estimated six jobs. However, the overall impact would be negligible.

The increased forage created by reclamation of oil and gas well pads could be seen as a short-term benefit by grazing permittees.

Impacts from Other Proposed Management Actions

The character of hunting and other forms of dispersed recreation within the planning unit would not change much because of the limitation on travel to designated roads and trails. Absent any changes caused by oil and gas drilling, the number of hunters would probably stay about the same depending more on CDOW regulations than BLM management. The socioeconomic impact would be negligible.

Grazing would continue in the Planning Area under much the same management as before but motorized access would be reduced. The economic effect would be negligible.

Impacts on Quality of Life

The new wells drilled on Federal mineral estate would be sited throughout the Planning Area. Drilling in the southern portion would intensify impacts that are already occurring. Drilling in the rest of the Planning Area would expand the area of oil and gas development to areas west and north of Rifle and on top of the plateau that have seen little activity to date. The introduction of industrial features in the landscape of the newly developed areas would be extensive and would bring about a transformation of visual character. The removal of NSOs to protect viewsheds and the CSU to protect VRM Class II areas would increase the rate at which the area's visual character iss altered as cuts into the slopes of the Roan Cliffs for access roads and drill pads become visible at a distance. Area residents would see the transformation of the visual character of the Planning Area as a regional, rather than a local, impact. Many residents would conclude that their quality of life is substantially diminished, representing a major impact.

4.4.3.6 Indirect, Offsite, and Cumulative Impacts

The socioeconomic changes underway in Garfield County and the Roan Plateau impact area are expected to continue. The Colorado State Demography Section projects that the year 2025 population of Garfield County will be nearly double the 2000 population level, growing from 44,267 to almost 87,000 (CoLA 2003b) The 2.8 percent average rate of annual population growth during this period would be well ahead of the growth rate for the entire State of Colorado, 1.7 percent. The number of jobs is also projected to grow at a rapid pace, increasing from 28,501 in the year 2000 to about 46,000 in 2025.

Figures 4-1 and 4-2 display the projected changes in baseline employment and population, as well as the population and employment impacts of Alternative V. Only the impacts of Alternative V are displayed because they represent the greatest impacts that might result from oil and gas development of BLM lands in the Planning Area.

The kind of continued growth projected for the County is high by historical standards and will challenge local governments and service providers to meet the additional infrastructure requirements of area residents. The area's housing stock, water treatment capacity and sewage treatment capacity all must expand in concert with population growth. So too must the law enforcement, fire protection, and social service sectors of local governments. The transportation system within the County will need continuous expansion and improvement. New schools and more teachers will be needed.

The increase in demand for developed and dispersed recreation opportunities could even exceed the rate of population growth.

This substantial socioeconomic change will continue to occur regardless of BLM management decisions for the Planning Area. However, rather than diminishing the significance of the impacts of BLM management, the growth casts a different light on those impacts. The employment and resultant population growth that could be produced by oil and gas development in the Planning Area is described in Table 4-33 as generally less than 1 percent of the employment and population projected for 2025. Although a seemingly insignificant share of the total, the impact should still be recognized as yet another addition to an already rapidly growing population base with its own additional demands for government and social services. On the other hand, while Table 4-33 describes substantial additions to local property tax revenues, the significance of that additional revenue is heightened when considered in light of all the government service needs for the next 25 years.

The role that public lands play in defining quality of life for area residents may especially be affected by demographic changes in the future. As private property becomes more fully developed, public lands will become increasingly important as remaining reservoirs of open space and as providers of increasingly highly valued visual quality. To the extent that perceptions of quality of life are tied to visual quality and the maintenance of open space, BLM decisions that affect those elements become more important.

4.4.4 Transportation and Access

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 3-25 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.

Figure 4-1: Employment Projection
Garfield County, 2000-2025

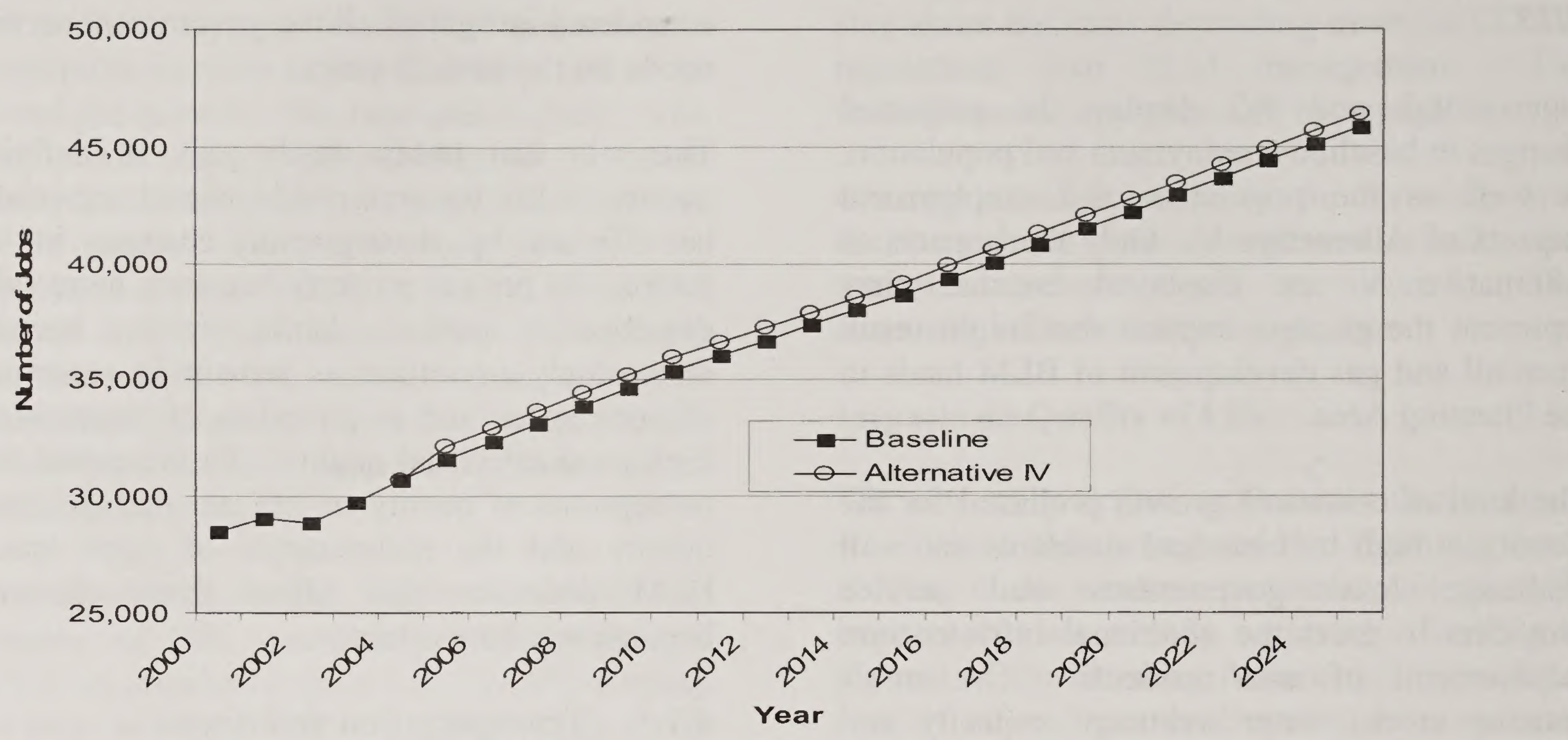
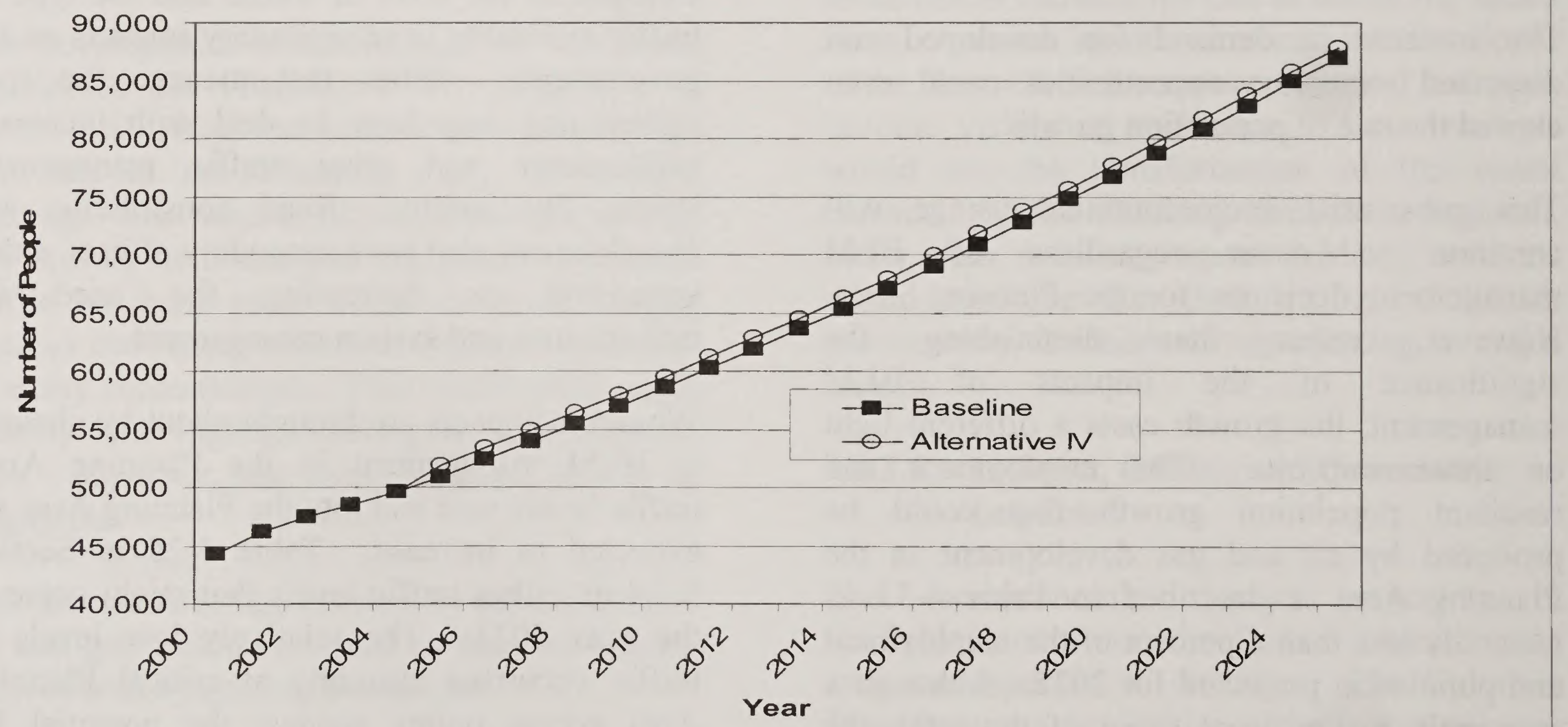


Figure 4-2: Population Projection
Garfield County, 2000-2025



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 former NOSRs. As many as 234 new wells could be drilled above the rim and 1,348 below the rim under Alternative V.

The RFD (Appendix H) describes the assumed number of wells per year that are likely to be drilled in areas below the rim, based on recent historical drilling rates in the Planning Area and vicinity by Williams Production and Encana, the two major lessees. This estimate ranges from about 43 wells per year under Alternative I to 79 wells per year under Alternative V. On average, about 10 to 15 percent of the new wells in any given year would be atop the plateau (except for Alternative III, which defers drilling there). 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 5-month season) (Appendix H).

The traffic generated by the assumed drilling of 80 wells per year is described in Table 4-34. The table includes the number of vehicle trips required to develop a single well, the number required for an assumed maximum of 80 wells per year, and the average daily traffic gnerated by 80 wells. These numbers are derived from data used previously by Notar (1998) in modeling air quality impacts from oil shale development on the NOSRs.

Table 4-34. Typical Vehicular Traffic Required To Drill Gas Wells

Vehicle Class	Total Number of Trips for One Well	Number of Trips for 80 Wells	Average Daily Trips for 80 Wells [1]
16-wheel Tractor-Trailers	88	7,040	235
10-wheel Trucks	216	17,280	576
6-wheel Trucks	452	36,160	1,205
Pickups	404	32,320	1,077
Total	**1,160**	**92,800**	**3,093**

[1] *Assumes an average 30 days to complete one well (see RFD, Appendix H).*

In addition to increases in traffic volume, oil and gas development has a substantial impact from the construction of new roads or widening of existing roads to access well pads. These newly constructed or improved roads are the source of much of the environmental impact of gas drilling as vegetation is removed and the risk of soil erosion increases, especially over the long term. Construction or widening of access roads can also affect visual quality, impact surface water and aquatic habitat at stream crossings, and increase emission of fugitive dust. Potentially, new or widened roads can also affect wildlife through increased disturbance (louder noise and larger size) and habitat fragmentation and can impact paleontological and cultural resources.

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 will 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.

4.4.4.1 Alternative I

Impacts from Proposed Management Actions

This alternative would maintain existing management, and no new BLM roads or road abandonments are planned. The BLM road network would remain at 259 miles, with about 162 miles above the rim and about 97 miles below the rim (Table 4-35). Potential additions to this system would occur as new or access roads become necessary for oil and gas development. Traffic on existing roads and trails would increase incrementally over time, possibly requiring more maintenance on some roads. The impact would be negligible.

Table 4-35. Roan Plateau Travel Management Designations by Alternative

		Alternative				
		I	II	III	IV	IV
Travel Designation		Acres				
Open		66,934	0	2,460	2,460	0
Limited		0	45,552	64,474	64,474	66,934
Closed		0	21,382	0	0	0
Route Management		Miles				
Open to Motorized or Mechanized Use	Atop the Plateau	162	75	113	113	162
	Below the Rim	97	98	96	96	97
Administrative Access Only	Atop the Plateau	0	43	24	24	0
	Below the Rim	0	0	0	0	0
Closed to Motorized or Mechanized Use	Atop the Plateau	0	34	17	17	0
	Below the Rim	0	9	0	0	0

Impacts from Oil and Gas Development

Development of the Federal oil and gas mineral estate under this alternative would occur solely on the 29,331 acres of BLM mineral estate not within NOSR 1 and the unleased portion of NOSR 3. Eventually, the road network could include as much as 152 miles of new or widened access roads based on the RFD assumption of 0.6 mile of access road per pad (Appendix H). This per-well assumption is probably conservative because of the current road network within the Planning Area and the goal of BLM to encourage clustering or collocation of facilities. The estimated 4 miles of new roads above the rim would be a negligible impact, but the 148 miles below the rim would approximately double the current amount. This would require substantial management by BLM to oversee maintenance, maintain closures, and monitor use.

The amount of traffic due to oil and gas development would depend on the rate of development, but any period of intense development would impact the major points of access into the Planning Area. For example, the assumed annual average of 43 wells drilled per year would result in approximately 1,624 additional vehicle trips per day, most by large (larger than pickup-size) vehicles. If half of this traffic were to go through the intersection of SH 13 and US 6 at Rifle, the result would be a 38-percent increase over current levels and a 28-percent increase over the projected baseline in 2003 (Table 3-25). The actual distribution of traffic cannot be predicted because the exact rate of drilling and distribution within the Planning Area is both unknown and likely to vary from year to year.

Indirect, Offsite, and Cumulative Impacts

It is unlikely that the County road system within the Planning Area would grow because dispersed private lands within the Planning Area are already served by County roads. The road network on private lands created to serve oil and gas development would continue to grow, adding as much as 884 miles of roads, assuming that the per-well average of 0.6 mile used in the RFD for BLM lands also applies to private lands and unless clustering, collocation, and consolidation of facilities reduces this average. Any increase in roads on private lands would be in addition to the estimated 152 miles on BLM lands.

County road maintenance costs would reflect the increased level of activity on County roads.

4.4.4.2 Alternative II

Impacts from Proposed Management Actions

This alternative would emphasize landscape management, natural values and wilderness character, featuring the area's ecological richness and unique ecosystem values. BLM recommendations to enhance and protect those values would include management of three areas having wilderness character to protect those values, as well as protective management of four ACECs and the WSR-eligible streams. In support of those and other program recommendations, BLM would close and rehabilitate 43 miles of roads and routes and limit another 43 miles to administrative use. The 43 miles to be closed to motorized or mechanized use would include 34 above and 9 below the rim.

The impact on the transportation system above the rim would be moderate in terms of closures. In the short term, BLM would have to pay for rehabilitation of the roads closed above the rim, but maintenance costs would be reduced sharply in the long term.

Traffic on the roads and trails remaining open 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 an emphasis on non-motorized recreation, might in fact reduce overall use of roads above the rim.

Impacts from Oil and Gas Development

Development of Federal oil and gas mineral estate under this alternative would occur throughout the Planning Area, except on 21,382 acres managed to protect wilderness characteristics. Eventually, the road network above the rim might grow by as much as 40 miles due to gas drilling, versus 87 miles of existing roads to be closed to motorized or mechanized use. Below the rim, up to 146 miles of roads might be added to the existing 98 miles of open roads, a major change in the BLM road network in this area. These changes would require substantial management on BLM's part to oversee maintenance, maintain closures, and monitor use.

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 45 wells drilled per year under this alternative would result in 1,740 additional trips per day, mostly by vehicles larger than pickups. If the number of wells drilled annually in areas above and below the rim were in the same proportion as assumed in the RFD (Appendix H), about four wells would be drilled annually at the higher elevations. If all this traffic were to travel via Cow Creek Road via SH 13 to CR 5 in Rio Blanco County, the impact in 2023 of the additional 155 vehicle trips per day would represent a 4-percent increase on SH 13 north of Rifle and a 38-percent increase on CR 5. If all of the pickup truck traffic were to travel via the JQS Road, the impact on that road would be 54 trips per day, a 48-percent increase in 2023. BLM currently intends to preclude use of JQS Road for oil and gas activities that involve heavy or oversize vehicles, and the County may elect to establish other use restrictions on oil and gas travel using pickup trucks or other smaller vehicles. The latter restrictions, if established, could be based on safety concerns and interference with other uses (e.g., recreational travel).

Indirect, Offsite, and Cumulative Impacts

It is unlikely that the County road system within the Planning Area would grow because the dispersed private lands within the Planning Area are already served by County roads. The road network on private lands created to serve oil and gas development would continue to grow, adding as much as 884miles of new access roads to the area in addition to 186 miles on lands. This assumes that the per-well average of 0.6 mile used in the RFD for BLM lands also applies to private lands.

County road maintenance costs would reflect the increased level of activity on County roads.

4.4.4.3 Alternative III – Preferred Alternative

Impacts from Proposed Management Actions

This alternative would emphasize a variety of multiple resources, specifically allowing for oil and gas development where feasible. BLM program recommendations would include the WSR-eligible streams and two of the four ACECs proposed for Alternative II, but not the areas having wilderness character. BLM would close and rehabilitate 26 miles of existing roads, including 17 miles above and 9 miles below the rim. A total of 113 miles of road above the rim would remain open to motorized or mechanized travel, and an additional 24 miles would be limited to administrative use. Below the rim, 96 miles of roads would remain open to motorized or mechanized 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.

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.

Impacts from Oil and Gas Development

Development of Federal oil and gas mineral estate under this alternative would occur throughout the Planning Area. Eventually, the road network above the rim might change by the addition of 23 miles of roads due to oil and gas development. This would add substantially to the 113 miles to remain open to public motorized or mechanized use and 24 miles to remain open only to administrative use above the rim. Below the rim, up to 194 miles of roads might be added to the 96 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 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 66 wells drilled per year under this alternative would result in 2,552 additional trips per day, mostly by vehicles larger than pickups. Based on the number of wells drilled annually in areas above and below the rim assumed in the RFD (Appendix H), about seventeen wells would be drilled annually at the higher elevations following the estimated 16-year deferral period. If all of this traffic were to travel via Cow Creek Road via SH 13 to CR 5 in Rio Blanco County, the impact in 2023 of an additional 624 vehicle trips per day would represent a 16-percent increase on SH 13 north of Rifle and a 154-percent increase on CR 5. If all of the pickup truck traffic were to travel via the JQS Road, the impact on that road would be 218 trips per day, a 194-percent increase in 2023. BLM currently intends to preclude use of JQS Road for oil and gas activities involving heavy or oversize vehicles, and the 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.

Indirect, Offsite, and Cumulative Impacts

It is unlikely that the County road system within the Planning Area would grow because the dispersed private lands within the Planning Area are already served by County roads. The road network on private lands created to serve oil and gas development would continue to grow, adding as much as 1,200 miles of new or widened access roads to the area. This assumes that the per-well estimate of 0.6 mile used in the RFD for BLM lands also applies to private lands. Any increase in roads on private lands would be in addition to the estimated 241 miles of new or widened access oil and gas roads on BLM lands under this alternative.

County road maintenance costs would reflect the level of increased activity on County roads.

4.4.4.4 Alternative IV

Impacts from Proposed Management Actions

This alternative would emphasize a variety of multiple resources, specifically allowing for oil and gas development where feasible. BLM program recommendations would include WSR-eligible streams and two of the four ACECs proposed for Alternative II, but not the areas having wilderness character. BLM would close and rehabilitate 26 miles of existing roads, including 17 miles above and 9 miles below the rim. A total of 113 miles of road above the rim would remain open to motorized or mechanized travel, and an additional 24 miles would be limited to administrative use. Below the rim, 96 miles of roads would remain open to motorized or mechanized use. Cross-country travel would be allowed within the Hubbard Mesa SRMA.

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.

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.

Impacts from Oil and Gas Development

Development of the Federal oil and gas mineral estate under this alternative would occur throughout the Planning Area. Eventually, the road network above the rim might change by the addition of 76 miles of new or widened/improved roads due to oil and gas development. This would add substantially to the 113 miles to remain open to public motorized or mechanized use and 24 miles to remain open only to administrative use above the rim. Below the rim, up to 194 miles of new or widened/improved road might be added to the 96 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 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 66 wells drilled per year under this alternative would result in 2,552 additional trips per day, mostly by vehicles larger than pickups. If the number of wells drilled annually in areas above and below the rim were in the same proportion as assumed in the RFD (Appendix H), about 8 wells would be drilled annually at the higher elevations. If all of this traffic were to travel via Cow Creek Road via SH 13 to CR 5 in Rio Blanco County, the impact in 2023 of an additional 309 vehicle trips per day would represent an 8-percent increase on SH 13 north of Rifle and a 76-percent increase on CR 5. If all of the pickup truck traffic were to travel via the JQS Road, the impact on that road would be 108 trips per day, a 96-percent increase in 2023. BLM currently intends to preclude use of JQS Road for oil and gas activities involving heavy or oversize vehicles, and the 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.

Indirect, Offsite, and Cumulative Impacts

It is unlikely that the County road system within the Planning Area would grow because the dispersed private lands within the Planning Area are already served by County roads. The road network on private lands created to serve oil and gas development would continue to grow, adding as much as 844 miles of roads to the area. This assumes that the per-well estimate of 0.6 mile used in the RFD for BLM lands also applies to private lands. Any increase in roads on private lands would be in addition to the estimated 270 miles of new or widened access roads on BLM lands under this alternative.

County road maintenance costs would reflect the level of increased activity on County roads.

4.4.4.5 Alternative V

Impacts from Proposed Management Actions

This alternative would emphasize energy development and other non-renewable resources. Few recommendations would be made to enhance or protect renewable resources or ecosystem values. The BLM road network of 259 miles, about 162 miles above the rim and 97 below the rim, would remain open. Potential additions to this system would occur as new roads become necessary for oil and gas development. Traffic on existing roads and trails would increase incrementally over time, possibly requiring more maintenance on some roads. The impact would be negligible.

Impacts from Oil and Gas Development

Development of the Federal oil and gas mineral estate under this alternative would occur throughout the Planning Area. Eventually, the road network above the rim might grow by as much as 105 miles of new or widened/improved roads due to oil and gas development. This would cause a substantial increase in the road system. Below the rim, as much as 245 miles of new roads might be added to the existing 97 miles. Although all new oil and gas roads would be open only to administrative use, the increase in the road network would require substantial management by BLM to oversee maintenance, maintain closures, and monitor use.

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 79 wells drilled per year under this alternative would result in approximately 3,093 vehicle trips per day as shown for 80 wells in Table 4-34. Most of this traffic would be vehicles larger than pickups. If the number of wells drilled annually in areas above and below the rim were in the same proportion as assumed in the RFD (Appendix H), about 12 wells would be drilled at the higher elevations. If all of this traffic were to travel via Cow Creek Road via SH 13 to CR 5 in Rio Blanco County, the impact in 2023 of an additional 464 vehicle trips per day would represent an 11-percent increase on SH 13 north of Rifle and a 145-percent increase on CR 5. If all of the pickup truck traffic were to travel via the JQS Road, the impact on that road would be 162 trips per day, a 143-percent increase in 2023. BLM currently intends to preclude use of JQS Road for any oil and gas activities involving heavy or oversize vehicles, and the County may elect to establish restrictions for oil and gas travel involving pickup trucks or other smaller vehicles. The latter restrictions would be based on safety concerns and interference with other uses (e.g., recreational travel).

Indirect, Offsite, and Cumulative Impacts

It is unlikely that the County road system within the Planning Area would grow because the dispersed private lands within the Planning Area are already served by County roads. The road network on private lands created to serve oil and gas development would continue to grow, adding as much as 884 miles of new roads to the area, assuming that the per-well average of 0.6 mile of access road per pad used in the RFD for BLM lands would also apply to private lands. The 350 miles of new or widened access roads on BLM lands would be in addition to this total.

County road maintenance costs would reflect the level of increased activity on County roads.

4.5 MANAGEMENT ENVIRONMENT

4.5.1 Lands and Realty

4.5.1.1 Alternative I

This alternative calls for the continuation of existing management. The principal element of this alternative for the lands and realty program is continued maintenance of the two withdrawals used to establish NOSRs 1 and 3 in 1916 and 1924, respectively. Continuation of the withdrawals means that the 54,485 acres of the former NOSRs would not be available for actions that could result in the land going to patent — i.e., being transferred to a private entity under the Mining Law of 1872 or being included in a land exchange between BLM and another public or private entity.

BLM would be able to authorize land uses that do not call for patenting public land, such as rights-of-way, on the former NOSRs. Those lands and the remaining 12,452 acres of public land in the Planning Area would be available for location of utilities, roads, and communication and other facilities (such as wind power generation facilities) and would be dealt with on a case-by-case basis. No utility corridor for electric transmission lines and pipelines would be designated along SH 13.

All lands listed as Category I (Disposal) in the 1988 revised GSRA RMP would remain as such, and all lands except the former NOSRs would remain as Category II (Exchange). The former NOSRs would remain as Category III (Retention) lands. A 40-acre parcel adjacent to the Rifle Sportsmen's Club would not be designated as potentially suitable for R&PP lease and patent.

All direct impacts upon the lands and realty program would be administrative in nature; there would be no direct environmental impacts. Other programs and resources would be affected by failure to revoke the NOSR withdrawals, by the maintenance of current land tenure categories, by failure to clarify the availability of land near the Rifle Sportsmen's Club for R&PP lease, and by failure to designate formal utility corridors.

This alternative would not have indirect, offsite, or cumulative environmental impacts on the lands and realty program.

4.5.1.2 Alternative II

Under this alternative, 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 1988 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 former 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, or within the Hubbard Mesa SRMA would preclude their consideration for exchange or sale.

The utility corridor along the west 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 upon the lands and realty program.

4.5.1.3 Alternative III – Preferred Alternative

The recommendations of the lands and realty program under this alternative would be the same as under Alternative II except that the acreage classified as Category III would be reduced because this alternative includes only two of the four ACECs proposed under Alternative II and no special protection for areas having wilderness character. However, 9,006 acres would be managed in ways that would protect roadlessness and naturalness (Map 36). The Hubbard Mesa SRMA would be classified as Category III under this alternative.

All direct impacts upon the lands and realty program would be administrative in nature, with no direct environmental impacts. The deferment of oil and gas leasing for a period of time could have reduce the demand for off-lease rights-of-way for pipelines and access roads until lands atop the plateau are leased. 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 cause indirect, offsite, or cumulative environmental impacts to the lands and realty program.

4.5.1.4 Alternative IV

The recommendations of the lands and realty program under this alternative would be the same as under Alternative II except that the acreage classified as Category III would be reduced because this alternative includes only two of the four ACECs proposed under Alternative II and no special protection for areas having wilderness character. The Hubbard Mesa SRMA would be retained under this alternative.

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, the change in land tenure categories, the availability of land near the Rifle Sportsmen's Club for R&PP lease, and the designation of formal utility corridors.

This alternative would not cause indirect, offsite, or cumulative environmental impacts to the lands and realty program.

4.5.1.5 Alternative V

The recommendations of the lands and realty program under this alternative would be the same as under Alternative II except that no lands would be placed in Category III (Retention). The Hubbard Mesa OHV area would not be designated an SRMA, no lands would be designated as ACECs, and no special protection would be made for areas having wilderness character or specific wilderness values. Thus, all of those lands could be made available for exchange. With the exception of 268 acres classified as Category I (Disposal), the entire Planning Area would be classified as Category II (Exchange).

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 have indirect, offsite, or cumulative environmental impacts on the lands and realty program.

4.5.2 Onsite Travel Management

Introduction

Travel management in the Planning Area would vary among the five alternatives, depending on the area included in each of the three travel management designations; that is, according to the acreage that would be open to motorized or mechanized cross-country travel, or limited to designated routes, or closed to motorized and mechanized travel. Additionally, the alternatives vary in the degree to which available routes are open to public use, versus administrative use only or closed to all use.

Table 4-35 in Section 4.4.4 summarizes the OHV designations and route management by alternative. Over-snow travel by snowmobile would be allowed throughout the Planning Area under all alternatives, except that Alternative II would limit snowmobiles to designated routes.

Under all five alternatives, access to the area atop the plateau for oil and gas development would be via the existing Cow Creek Road, which enters the area from Rio Blanco CR 5 to the north, or from an approved route on private land. The closer access route from Rifle, the JQS Road (Garfield CR 242) would not be available for oil and gas use involving heavy or oversize vehicles. This decision by BLM is based on the steep, narrow, and winding nature of the JQS road, the highly erodible soil through which it passes, the unacceptable visual impacts that would accompany any attempts to improve the road for use by large vehicles, and the unacceptable level of interference with travel by other users when it is passable.

Also under all five alternatives, future closure of any existing routes would include 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 will be placed across the roads to prevent public access.

4.5.2.1 Alternative I

Under Alternative I, existing management and current uses would continue. No oil and gas leasing would occur on NOSR 1 and on portions of NOSR 3 that have not already been leased. BLM would continue to provide opportunities for non-motorized, mechanized, and motorized travel within the framework of existing management. Because the interim travel management designations on the transferred lands are temporary, contingent on land use planning, those designations would be vacated and travel management would return to the system in place when BLM receives jurisdiction. The entire 66,934 acres of public surface land in the Planning Area would be open to motorized or mechanized cross-country travel, and all 259 miles of existing routes would be open to public use (Table 4-35 and Map 31).

Impacts on travel management are summarized below by resource management program. If a program is not listed, it means that program is not expected to affect the system of roads and trails.

Impacts of Recreation Management

Continuation of existing management is likely to result in a continued, gradual increase in the amount of motorized and mechanized use as the local population increases and as the popularity of the Hubbard Mesa area as a year-round OHV area grows. Travel above the rim would continue to be greatest during hunting season. Hunters using ATVs and high-clearance vehicles to hunt, set up camps, and retrieve game would continue to rely on existing trails and to pioneer new trails. Hunting and other recreation uses would result in creation of additional routes over the long term. Problems created by driving on wet roads or cross-country travel, such as tearing up road surfaces or creating ruts across open meadows, would continue to require road maintenance, reclamation, and rehabilitation. The unregulated nature of travel in the Planning Area would result in a minor impact in the short term, as changes in the number, type, and use of roads would be imperceptible at first. In the long term, impacts would be moderate to major as the accumulation of routes and the increase in motorized and mechanized use begins to limit the opportunities for non-motorized activities.

Impacts of Oil and Gas Development

Where public mineral estate is currently leased or available for lease, oil and gas drilling and production would eventually result in as much as 152 miles of new or improved/widened road, all but 4 miles of which would be below the rim. Although new oil and gas roads would be limited to administrative use, the industrial traffic would cause associated generation of noise and dust, diminution of visual quality, and changes in wildlife use.

Section 4.4.4 discusses impacts to traffic volumes associated with oil and gas development, including an estimated 1,160 total vehicle trips and 39 average daily vehicle trips to complete a single well — and not including trips during operation and maintenance. Road segments shared by oil and gas lessees and recreational travel, whether vehicular or non-motorized and non-mechanized, would represent a conflict for the latter group in terms of traffic, noise, safety, and quality of the experience.

Impacts of Livestock Management

Over the long term, livestock management could periodically require construction of fences, ponds, springs, and other range improvement projects. Each of these could require a new road or trail which would continue to be available for maintenance of range improvements and would also be available for motorized or mechanized use by the public.

Impacts of Wildlife and Special Status Species Management

Seasonal restrictions to protect wildlife, special status species, or their habitat can limit use and, temporarily, the construction of roads and trails. Other applicable stipulations could limit the construction of new roads or trails. Exceptions could be granted based on approval by the authorized officer.

Impacts of Weeds

Roads and trails serve as conduits for introduction and spread of invasive plants, including State-listed noxious weeds (see Section 4.3.3). 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 plant (and, indirectly, wildlife) species. Roads and trails are ideal corridors for weed dispersal because they damage or destroy the native vegetation, create patches of bare soil 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. Vehicle tires, boot laces, and livestock hoofs can serve as vectors for weeds once they become established.

Impacts on Riparian Zones and Wetlands

To maintain or improve the functioning of riparian zones, existing roads and trails may be rerouted, repaired (e.g., a culvert installed), or removed. New routes would be constructed to avoid impacts to riparian zones and wetlands. Exceptions could be granted by the authorized officer.

Indirect, Offsite, and Cumulative Impacts

The estimated 152 miles of new roads for oil and gas development would be in addition to any new roads or trails constructed for grazing and range management and any new routes created by cross-country travel. The road network on private lands created to serve oil and gas development would also continue to grow, adding as much as 884 miles of new or widened access roads to the Planning Area, assuming that the per-pad average of 0.6 mile used in the RFD for BLM lands would also apply to private lands.

In addition to multiple secondary impacts on natural resources and ecosystem values, the increased road network would generate additional routes and trails pioneered by motorized recreationists using the open access roads. This would be a natural consequence of the cross-country travel that would be permitted on BLM land under this alternative.

Indirect impacts on resources and management programs would be created by the expanded road system as previously isolated areas of public land would be opened up to motorized and mechanized use. New oil and gas roads would be closed to public use. However, the visual and ecological impacts of new and widened/improved roads and the increased generation of dust and noise from oil and gas vehicles could reduce the quality of the recreational experience on designated routes.

Oil and gas traffic in previously isolated areas would change their character from predominantly recreational use to motorized industrial use. Many of the recreationists who make use of these areas because of the isolation and quiet would be displaced.

4.5.2.2 Alternative II

This alternative would emphasize landscape management, natural values, and wilderness character, featuring the area's ecological richness and unique ecosystem values. The 21,382 acres in the three areas having wilderness character would be closed to motorized and mechanized travel. The remaining 45,552 acres would be limited to designated routes, including over-snow conveyance. A total of 43 miles of existing roads would be closed and rehabilitated, including 34 miles above the rim and 9 miles below (Table 4-35 and Map 32). Another 43 miles above the rim would be limited to administrative uses. A total of 173 miles would be open, 75 miles above the rim and 98 below the rim. Of the latter, 35 miles would be in the Hubbard Mesa SRMA. Unlike Alternative I, new routes associated with oil and gas development would be limited to administrative access only.

Impacts are summarized below by resource management program. If a program is not listed, it means that program is not expected to affect the system of roads and trails.

Impacts of Recreation Management

Implementation of this alternative would result in a reduction of 21,382 acres in the area available for OHV use and would prohibit cross-country travel. A total of 43 miles of existing roads and trails would be closed and rehabilitated, reducing the supply for motorized recreation. Closure of the entire Planning Area to cross-country motorized or mechanized travel would prevent or limit the gradual, incremental growth of the road and trail network due to pioneering of new routes. The overall result of these changes would be a more balanced offering of motorized and non-motorized opportunities on public lands.

Impacts of Oil and Gas Development

The 21,021 acres within the Planning Area that would be available for oil and gas development under this alternative could result in up to 186 miles of new or improved/widened access roads, including 40 miles above the rim. New roads would be designated for administrative access only, but existing roads would remain open to the public unless otherwise identified for closure. This growth in the road system would allow vehicular traffic into previously isolated areas of public land. Although new roads would be limited to administrative use, the industrial traffic would cause associated generation of noise and dust, diminution of visual quality, and changes in wildlife use.

Section 4.4.4 discusses impacts to traffic volumes associated with oil and gas development, including an estimated 1,160 total vehicle trips and 39 average daily vehicle trips to complete a single well — and not including trips during operation and maintenance. Road segments shared by oil and gas lessees and recreational travel, whether vehicular or non-motorized and non-mechanized, would represent a conflict for the latter group in terms of traffic, noise, safety, and quality of the experience.

Impacts of Areas having Wilderness Character

Identifying and providing special (protective) management prescriptions for areas having wilderness character under this alternative would impact travel management by closing 43 miles of routes to motorized and mechanized use. Conversely, several large reservoirs of non-motorized recreational opportunities would become available.

Impacts of ACEC Designation

Designation of four ACECs would require limitation of motorized and mechanized traffic to designated roads and trails.

Impacts of Visual Resource Management

The principal VRM proposal in this alternative that would affect travel routes is the use of NGD/NSO stipulations to maintain VRM Class I standards and protect visually sensitive areas in the I-70, SH 13, and East Fork Parachute Creek viewsheds. These NGD/NSO areas represent about 50,000 acres in which new roads or trails could be developed if in line with the management prescription of the special designation or a proposed mitigation activity. If outside a special designation area, such as a VRM Class I area, roads and trails could be developed only if they maintain the natural character and scenic quality of the landscape. Limited activities may be allowed if the basic landscape elements are repeated and natural appearing.

Impacts of Livestock Management

Over the long term, livestock management would require periodic construction of fences, ponds, springs, and other range improvement projects. Each of these may well require a new road or trail that would continue to be available for maintenance of range improvements. Those roads would not be built in the areas having wilderness character or areas protected by NGD/NSO stipulations. New roads for this use would be open only for administrative uses.

Impacts of Wildlife and Special Status Species Management

Seasonal restrictions to protect wildlife, special status species, or their habitat could limit use and, temporarily, the construction of roads and trails. Other applicable stipulations could limit construction of new roads or trails. Exceptions could be granted based on approval by the authorized officer.

Impacts of Weeds

Roads and trails serve as conduits for the introduction and spread of invasive plants, including State-listed noxious weeds (see 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 damage or destroy the native vegetation, create patches of bare soil 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 and dust accumulation, or (if magnesium chloride is used as a dust suppressant) create a zone of saline conditions. Vehicle tires, bootlaces, and livestock hoofs can serve as vectors for weeds once they become established.

Impacts on Riparian Zones and Wetlands

To maintain or improve the functioning of riparian zones, existing roads and trails may be rerouted, repaired (e.g., a culvert installed), or removed. New routes would be constructed to avoid impacts to riparian zones and wetlands. Exceptions may be granted by the authorized officer.

Indirect, Offsite, and Cumulative Impacts

Adding up to 186 miles of new roads to the existing 259 miles due to oil and gas drilling would be offset to some extent by closing and rehabilitating 43 miles of existing roads. The road network on private lands would also continue to grow, adding as much as 884 miles of new or improved/widened roads to the area assuming that the RFD estimate of 0.6 mile per pad applies to these lands.

Oil and gas access roads would have multiple secondary impacts on natural resources and ecosystem values because of physical disturbance from construction and increased vehicular use in areas of public and private land that had previously been isolated. Limiting new roads on public lands to administrative access, while beneficial, would not eliminate secondary impacts.

4.5.2.3 Alternative III – Preferred Alternative

Under Alternative III, motorized and mechanized travel in portions of the Planning Area with BLM surface — a total of 66,934 acres — would be limited to designated routes, including snowmobiles. A total of 26 miles of existing road would be closed and rehabilitated; another 24 miles would be limited to administrative uses, and 209 miles would be open, of which 35 miles are in the Hubbard Mesa SRMA (Table 4-35 and Map 33). New roads associated with oil and gas development would be designated for administrative use only.

Impacts are summarized below by resource management program. If a program is not listed, it means the program is not expected to affect the system of roads and trails.

Impacts of Recreation Management

Implementation of this Alternative would not reduce the area available for OHV use but would halt cross-country motorized or mechanized travel. The gradual, incremental growth of the road and trail network due to pioneering of new routes cross-country should be greatly reduced. It is expected that enforcement needs may grow and that maintenance needs may also grow as BLM attempts to maintain a system of designated routes.

Impacts of Oil and Gas Development

With the entire Planning Area available for lease (although deferred atop the plateau), oil and gas drilling would eventually occur over the entire area and would result in up to 241 miles of new or widened access roads, including 23 miles above the rim. All new roads would be designated for administrative access only. Despite this limitation, the 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.

Section 4.4.4 discusses impacts to traffic volumes associated with oil and gas development, including an estimated 1,160 total vehicle trips and 39 average daily vehicle trips to complete a single well — and not including trips during operation and maintenance. Road segments shared by oil and gas lessees and recreational travel, whether vehicular or non-motorized and non-mechanized, would represent a conflict for the latter group in terms of traffic, noise, safety, and quality of the experience.

Impacts of ACEC Designation

Special management stipulations associated with designation of two ACECs would require limitation of motorized and mechanized traffic to designated roads and trails.

Impacts of Visual Resource Management

The principal VRM proposal in this alternative that would affect the system of roads and trails and route management is the NGD/NSO stipulation to protect visually sensitive areas in the I-70, SH 13, and East Fork Parachute Creek viewsheds. This NGD/NSO represents about 15,000 acres in which new roads or trails could be developed in line with the management prescription of the special designation or a proposed mitigation activity. If outside a special designation area, such as a VRM Class I area, roads and trails could be developed only if they maintain the natural character and scenic quality of the landscape. Limited activities could be allowed if the basic landscape elements are repeated and natural appearing.

Impacts of Livestock Management

Over the long term, livestock management would require periodic construction of fences, ponds, springs, and other range improvement projects. Each of these may well require a new road or trail which would continue to be available for maintenance of range improvements. Those roads would not be built in areas protected by NGD/NSO stipulations. Any new roads for this use would be open only for administrative uses.

Impacts of Wildlife and Special Status Species Management

Seasonal restrictions to protect wildlife, special status species, or their habitat could limit use and, temporarily, construction of roads and trails. Other applicable stipulations could limit construction of new roads or trails. Exceptions could be granted based on approval by the authorized officer.

Impacts of Weeds

Roads and trails serve as conduits for introduction and spread of invasive plants, including State-listed noxious weeds (see 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 damage or destroy the native vegetation, create patches of bare soil 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. Vehicle tires, bootlaces, and livestock hoofs can serve as vectors for weeds once they become established.

Impacts on Riparian Zones and Wetlands

To maintain or improve the functioning of riparian zones, existing roads and trails could be rerouted, repaired (e.g., a culvert installed), or removed. New routes would be constructed to avoid impacts to riparian zones and wetlands. Exceptions could be granted by the authorized officer.

Indirect, Offsite, and Cumulative Impacts

Adding up to 241 miles of new roads to the existing 259 miles due to oil and gas drilling would be offset only slightly by closure and rehabilitation of 26 miles of existing roads. New roads or trails built for range improvements would add to the oil and gas total. The road network on private lands would continue to grow, adding as much as 884 miles based on the per-well average of 0.6 mile used in RFD for BLM lands.

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.

4.5.2.4 Alternative IV

The analyses and resulting impacts of Alternative IV are the same as Alternative III.

4.5.2.5 Alternative V

Under Alternative V, motorized and mechanized travel would be limited to designated routes in all portions of the Planning Area having BLM surface — a total of 66,934 acres — except that this restriction would not apply to over-snow travel by snowmobile. None of the existing roads or trails would be closed and rehabilitated, and the entire 259-mile network would be open to motorized and mechanized uses (Table 4-35 and Map 34). New routes associated with oil and gas development would be designated for administrative use only.

Impacts are summarized below by resource management program. If a program is not listed, it is not expected to affect the system of roads and trails.

Impacts of Recreation Management

Implementation of this alternative would prohibit cross-country travel but would continue to permit motorized access to all parts of the Planning Area. This would greatly reduce or prevent the gradual, incremental growth of the road and trail network due to pioneering of new routes by cross-country travel. It is expected that enforcement and maintenance needs may grow as BLM attempts to maintain a system of designated routes.

Impacts of Oil and Gas Development

All Federal mineral estate within the Planning Area would be available for lease and development. Oil and gas drilling would eventually occur on most of that land and would result in up to 350 miles of new or improved/ widened roads, including 105 miles above the rim. New roads would be designated for administrative access only. However, the growth in the road system would cause previously isolated areas of public land to be opened to motorized use. The limitation to administrative use of new roads would be beneficial but would not eliminate the generation of noise and dust, diminution of visual quality, or changes in wildlife use.

Section 4.4.4 discusses impacts to traffic volumes associated with oil and gas development, including an estimated 1,160 total vehicle trips and 39 average daily vehicle trips to complete a single well — and not including trips during operation and maintenance. Road segments shared by oil and gas lessees and recreational travel, whether vehicular or non-motorized and non-mechanized, would represent a conflict for the latter group in terms of traffic, noise, safety, and quality of the experience.

Impacts of Livestock Management

Over the long term, livestock management would from time to time require construction of fences, ponds, springs, and other range-improvement projects. Each could require a new road or trail which would continue to be available for maintenance of range improvements and for public use. Any new roads for this use would be open only for administrative uses.

Impacts of Wildlife and Special Status Species Management

Seasonal restrictions to protect wildlife, special status species, or their habitat could limit use and, temporarily, construction of roads and trails. Other applicable stipulations could limit construction of new roads or trails. Exceptions could be granted based on approval by the authorized officer.

Impacts of Weeds

Roads and trails serve as conduits for the introduction and spread of invasive plants, including State-listed noxious weeds (see 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 damage or destroy the native vegetation, create patches of bare soil 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 or dust accumulation, or (if magnesium chloride is used as a dust suppressant) create a zone of saline conditions. Vehicle tires, bootlaces, and livestock hoofs can serve as vectors for weeds once they become established.

Impacts on Riparian Zones and Wetlands

To maintain or improve the functioning of riparian zones, existing roads and trails could be rerouted, repaired (e.g., a culvert installed), or removed. New routes would be constructed to avoid impacts to riparian zones and wetlands. Exceptions could be granted by the authorized officer.

Indirect, Offsite, and Cumulative Impacts

Adding as many as 350 miles of roads to the existing 259 miles due to oil and gas drilling could more than double the road network on BLM land in the Planning Area. New roads for range improvements would add to that total. The road network on private lands created to serve oil and gas development would continue to grow, adding as much as 884 miles of new or improved/widened roads based on the RFD assumption of 0.6 mile of new roads per pad.

Oil and gas access roads would have multiple secondary impacts on natural resources and ecosystem values, not only because of physical disturbance during construction but also because the expanded road network would increase vehicular traffic in areas that had previously been isolated. Limiting new roads on public lands to administrative access would not eliminate secondary impacts.

4.5.3 Recreation

Introduction

Assumptions — Public lands are increasingly crucial for neighboring communities as "close-to-home" open spaces and recreation opportunities are disappearing. The recreation management challenge is formidable, whether preserving existing recreational opportunities, intermingling the desired recreational opportunities of new/different users, or commingling recreation with other land uses.

All five alternatives offer dispersed recreation opportunities consistent with the management of other priority land uses. The activity, settings, and experience/outcome opportunities vary among the five alternatives in terms of quantity, quality, and distribution. If recreation settings change too much, some recreational opportunities will be lost and some visitors will likely be displaced.

Recreation Opportunity Spectrum (ROS) — Planners must consider the short-term and long-term effects of a resource activity to determine the impacts on the recreational opportunity (Clark and Stankey 1979). Changing the physical, social, and administrative characteristics of the recreational setting provides different opportunities for recreation.

The ROS (shown in Maps 39 through 42) is an analytical tool for portraying the existing character of recreational settings and prescribing desired future conditions. The areas of various ROS classes located on public lands within the Planning Area are summarized in Table 4-36. The relationship between on-the-ground actions, consequent changes to setting structure, and the activity and experience opportunities produced enables recreation managers to shift from managing only for activities to managing for explicitly stated recreation outcomes (Driver et al. 1991).

Table 4-36. Acres of ROS Classes for Public Lands (Surface Ownership) [1]

Class	Existing	Alternative				
		I [2]	II	III	IV	V
Urban	0	0	0	0	0	0
Rural	2,826	8,372	8,372	8,372	8,372	8,372
Front Country	19,076	14,319	36,635	57,295	57,295	58,053
Middle Country	24,539	24,133	21,345	684	684	9
Back Country	20,493	20,110	583	583	583	500
Primitive	0	0	0	0	0	0

[1] *ROS mapping and acreage estimates were based on foreseeable development and use according to management scenarios for each alternative.*

[2] *Eventually, cross-country travel would create unestimated reductions in backcountry and increase middle-country settings under Alternative I due to no restrictions on cross-country motorized or mechanized travel.*

Impacts Common to All Alternatives — Recreation managers are interested in the benefits of recreation (Driver et al. 1991, Driver 1995, Driver and Bruns 1999), specifically how management actions and setting conditions facilitate the creation of recreation opportunity outputs and realization of outcomes in the form of improved conditions (i.e., satisfying experiences and benefits) (Lee and Stein 1995). The combination of management, marketing, and monitoring actions are the means by which collaborating partners effect necessary setting conditions and produce desired recreation opportunities (i.e., for activities, experiences, and improved/worsened conditions for individuals, communities, their economies and the environment. Visitor or community surveys have not been conducted; little objective data is available regarding specific visitor and community preferences or demand that could be used to evaluate reasonably foreseeable significant impacts. The deficiency is relevant because it hinders the objective assessment of the positive (beneficial) and negative (adverse) outcomes of recreation management versus other resource uses or the differences in outcomes among alternatives. However, qualitative data generated from scoping provide a basis for some qualitative evaluations.

Activities, settings, and experience/benefit outcomes are consequential to people who live in adjoining communities and those who recreate in the Planning Area. Since recreation is not a management focus but an allowable multiple use, the effects to participants and their recreation opportunities are inconsequential to achieving the general management objective of any alternative.

Recreation Management Guidelines to Meet Standards for Public Land Health in Colorado. In February 1997, Standards for Public Land Health in Colorado (Appendix F) were approved by the Secretary of the Interior and adopted as decisions in all of BLM's resource management plans. The standards describe natural resource conditions needed to sustain land health and encompass upland soils, riparian systems, plant and animal communities, threatened or endangered and other special status species, and water quality. The standards relate to all uses of public lands. Based on the increased awareness and understanding of the environmental impacts of outdoor recreation, recreation management guidelines (Appendix E) were developed to help achieve and maintain healthy public lands. The guidelines are tools, methods, and techniques that help managers maintain or meet the standards.

Effects on Recreation from Oil and Gas Development. Oil and gas development and production facilities often adversely impact recreation opportunities through physical/visual disturbance, noise, 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.

Oil and gas facilities, including pads, pipelines, compressors, and new or widened access roads, would fragment leased lands, including the Hubbard Mesa OHV riding area. Maintenance and improvement of the road system is critical for accessing gas wells but improvements can ruin the opportunity for challenge and the thrill of driving on rough four-wheel drive roads. Having a mixed system of routes in which some are open only for administrative use by oil and gas companies and some are open to the public would create confusion and would require a more intensive field presence to monitor and manage use.

Oil and gas development is likely to displace big game by distances of 0.25 to 0.5 mile from roads, depending on traffic, road quality, topography, and density of vegetation cover near the road (Noss 2002). Changes in big game habitats and habits would alter the experience or even displace people who visit because they enjoy the wildlife, scenery, views, and aesthetics of the area. Onsite outfitter/guide operations would be affected. Offsite changes would likely involve reduced economic contributions from hunting-related tourism to the towns of Rifle, Silt, New Castle, Meeker, and Parachute, as well as Garfield County.

Effects on Recreation from Wildlife and Special Status Species Management. Wildlife management would directly affect recreation settings and opportunities. Access changes, in both type and mode, to protect wildlife or special status species habitat would concentrate motorized recreationists on fewer miles of open routes. Those same changes would expand recreation opportunities for people desiring to escape the sights and sounds of motorsport activities. Depending on the activity, the recreational experiences — such as escaping everyday responsibilities and other people; enjoying frequent access to outdoor physical activity; and enjoying area wildlife, scenery, views, and aesthetics — would be altered positively or negatively. Timing restrictions and seasonal closures during sensitive periods such as winter would temporarily displace visitors to other areas.

Effects on Recreation from Livestock Grazing. 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. Visitors who prefer a livestock-free experience yet choose to visit areas that are actively grazed are most keenly affected.

Effects on Recreation from Travel Management. Recreational roads and trails enhance the quality of life for many community residents by providing convenient access to the outdoors for enjoyment and relaxation while promoting health and fitness. A system of designated routes would reduce recreation impacts on other resources and could reduce recreational trespass on adjacent private lands. However, visitors who enjoy freedom of access and movement would be displaced. Directional signing assists visitors in finding their destinations but distracts from naturalness. Travel and transportation directly affects setting remoteness, naturalness, site management, and social encounters. Hunting, wildlife viewing, outfitters, and tourism would be negatively affected by an increase in cross-country travel if big game animals are displaced or habitats are fragmented.

Effects on Recreation from Transportation Management and Access. Maintenance of the road system is critical for recreational access but can ruin the challenge and thrill of driving on rough four-wheel drive roads. Having a mixed system of routes where some are open only for administrative uses (e.g., livestock permittees, oil and gas companies) and some are open to the general public would create confusion and require a more intensive field presence to monitor and manage use. It would also necessitate better informational signing and brochures. Since the Planning Area is open country, it is unlikely that gating roads would be a successful way to manage users. Hunting, wildlife viewing, outfitters, and tourism would be negatively affected by an increase in the transportation system routes and access whenever big game animals are displaced or habitats are fragmented.

4.5.3.1 Alternative I

All public lands would remain part of the custodially managed Glenwood Springs ERMA. Continued custodial recreation management with the proposed land uses would allow incremental and cumulative changes to the physical, social, and managerial recreational settings and current recreation opportunities. Cross-country travel would allow freedom of access and movement but create unplanned reductions in the backcountry and increased middle-country recreational settings (Map 39). Resource problems and conflicts with owners of adjacent private lands would likely rise with anticipated increases in recreational use and landscape-wide unrestricted travel.

Public lands within existing oil and gas leases would be further developed consistent with existing lease rights and shift toward a more rural recreation setting. This alternative would represent the lowest amount of cumulative change to current recreation activities, settings, and outcomes area-wide.

The development of recreational facilities is not probable unless determined necessary on a case-by-case basis to protect resources. Recreation management could be accomplished with current staffing and funding levels.

4.5.3.2 Alternative II

Most public lands would remain part of the custodially managed Glenwood Springs ERMA. Generally, this alternative provides decreased opportunities for people seeking backcountry and middle-country recreational settings and increased opportunities for people seeking front-country and rural settings. Depending on the setting preferences of visitors, the recreational opportunities would be altered positively or negatively.

Within moderate densities appropriate to the ROS class, effectively designed and implemented oil and gas development could be compatible with maintaining recreational settings and opportunities. However, the direct and indirect impacts of the anticipated oil and gas development, plus other land-use activities, limiting travel to designated routes, rerouting around private lands, and an overall increase in visitor use would cumulatively shift recreation toward a more front-country/rural setting.

Management challenges would arise if mechanized and motorized users want to be separated on designated routes. A system of designated routes would reduce recreational trespass on adjacent private lands and protect other resources from indiscriminant OHV use.

The development of recreational facilities is unlikely unless necessary on a case-by-case basis to protect resources. Recreation administrators would need additional field staff and funding to implement and manage travel and the combination of land uses.

Areas having wilderness character usually support non-motorized activities and backcountry experiences in relatively unmodified settings. However, because these areas are mixed with areas that are open for oil and gas leasing, the overall effect is an acreage reduction of the backcountry ROS class (Table 4-36 and Map 40). Road improvements and the presence of gas facilities would alter the recreational experience by decreasing remoteness and naturalness. Consequently, visitors would not be able to attain setting-dependent experiences/outcomes that normally go hand-in-hand with areas having wilderness character.

Hubbard Mesa SRMA

Alternative II delineates a 2,460-acre OHV/biking SRMA to be managed for motorized and mechanized sports (Appendix E). Administratively, an inconsistency exists between identifying an SRMA for concentrated recreation use and managing for intensive oil and gas development. SRMAs are normally defined to direct recreation funding and personnel to lands where a commitment has been made to provide specific recreation activities, settings, and desired experience/outcome opportunities. Alternative II does not propose a long-term commitment to managing the physical, social, and managerial settings to sustain the current and targeted recreational experience/outcome opportunities (Appendix E). Furthermore, SRMAs usually identify a need for major investments in facilities, visitor services, or funding. None is identified under this alternative.

From a visitor's point of view, changes in the front-country recreation setting need not be balanced within a natural-appearing environment (Appendix E). The proposed oil and gas development alone will cause observable and long-term physical and social changes and shift the SRMA to a more rural recreation setting. This will inherently change the recreational experience/outcomes. Recreationists who prefer the current or targeted recreation setting will likely be displaced.

Managerially, traveling on a system of designated routes will offer a recreational experience no different from that found elsewhere in the Planning Area. Since no other riding/driving area comparable to Hubbard Mesa exists locally on public land, the recreation opportunities currently afforded on Hubbard Mesa will be lost.

4.5.3.3 Alternative III – Preferred Alternative

Most public lands will remain part of the custodially managed Glenwood Springs ERMA. This alternative represents decreased opportunities for people seeking backcountry or middle-country recreational settings and increased opportunities for people seeking front-country and rural settings (Table 4-36 and Map 41).

Atop the plateau, the deferment of oil and gas leasing for an estimated 16 years would delay the transformation of recreation opportunity settings from the current backcountry and middle-country settings to the largely front-country setting that would become established after oil and gas development. During the deferral period, the closure of some existing roads and the limitation of motorized and mechanized travel to designated routes would increase the likelihood of current settings being maintained. This would permit continued opportunities on the top of the plateau for people seeking backcountry or middle-country recreational settings.

After development begins atop the plateau, the transformation to a front-country setting would begin. Depending on the setting preferences of visitors, recreational opportunities would be altered positively or negatively. The rate of change from backcountry to front-country could be slower and not as complete as if it were to occur earlier in the planning period. Improvements in drilling and production technology and management could reduce the number of well pads and the amount of traffic, either of which might work toward maintenance of a middle-country setting. However, the direct and indirect impacts of anticipated oil and gas development, plus other land-use activities, limiting travel to designated routes, rerouting around private lands, and an overall increase in visitor use would still tend to shift the recreation setting toward a more front-country or rural setting.

Most public lands would remain part of the custodially managed Glenwood Springs ERMA. This alternative represents decreased opportunities for people seeking backcountry or middle-country recreational settings and increased opportunities for people seeking front-country and rural settings (Table 4-36 and Map 41).

Management challenges would arise if mechanized and motorized users want to be separated on designated routes. A system of designated routes would reduce recreational trespass on adjacent private lands and protect other resources from indiscriminant OHV use.

Hubbard Mesa SRMA

Alternative III delineates a 2,460-acre OHV/biking SRMA to be managed for motorized and mechanized sports (Appendix E). Administratively, an inconsistency exists between identifying an SRMA for concentrated recreation use and managing for intensive natural gas development. SRMAs are normally defined to direct recreation funding and personnel to lands where a commitment has been made to provide specific recreation activities, settings, and desired experience/outcome opportunities. Alternative III does not propose a long-term commitment to managing the physical, social, and managerial settings to sustain the current and targeted recreational experience/outcome opportunities (Appendix E). Furthermore, SRMAs usually identify a need for major investments in facilities, visitor services, or funding. None are identified.

From a visitor's point of view, there is no recognition that front-country recreation setting changes must be balanced within a natural-appearing environment (Appendix E). The proposed gas development alone will cause observable and long-term physical and social changes and shift the SRMA to a more rural recreation setting. This would inherently change the recreational experience/outcomes. Recreationists who prefer the current or targeted recreation setting would likely be displaced.

Since no other riding/driving area comparable to Hubbard Mesa exists locally on public land, the recreation opportunities currently afforded on Hubbard Mesa will be lost.

4.5.3.4 Alternative IV

Most public lands will remain part of the custodially managed Glenwood Springs ERMA. This alternative represents decreased opportunities for people seeking backcountry or middle-country recreational settings and increased opportunities for people seeking front-country and rural settings (Table 4-36 and Map 4-41).

Oil and gas development would cause the most change in recreation opportunities. Within moderate densities appropriate to the ROS class, effectively designed and implemented oil and gas development can be compatible with maintaining recreation settings and recreational opportunities. However, the direct and indirect impacts of anticipated oil and gas development, plus other land-use activities, limiting travel to designated routes, rerouting around private lands, and an overall increase in visitor use will cumulatively shift the recreation setting toward a more front-country/rural setting.

The development of recreational facilities is unlikely unless determined necessary on a case-by-case basis to protect resources. Recreation administrators will need additional field staff and funding to implement and manage travel and the combination of land uses.

Hubbard Mesa SRMA

Alternative IV delineates a 2,460-acre SRMA OHV/biking area to be managed for motorized and mechanized sports (Appendix E). Under this alternative, off-route travel would be allowed. Administratively, an inconsistency exists between identifying an SRMA for concentrated recreation use and managing for intensive natural gas development. SRMAs are normally defined to direct recreation funding and personnel to lands where a commitment has been made to provide specific recreation activities, settings, and desired experience and outcome opportunities. Alternative IV does not propose a long-term commitment to managing the physical, social, and managerial settings to sustain current and targeted recreational experience/outcome opportunities (Appendix E). Further, SRMAs usually identify a need for major investments in facilities, visitor services, or funding. None are identified.

From a visitor's point of view, there is no recognition that front-country recreation setting changes must be balanced within a natural-appearing environment (Appendix E). The proposed gas development alone will cause observable and long-term physical and social changes and shift the SRMA to a more rural recreation setting. This would inherently change the recreational experience and outcomes. Recreationists who prefer the current or targeted recreation setting would likely be displaced.

Since no other riding/driving area comparable to Hubbard Mesa exists locally on public land, the recreation opportunities currently afforded on Hubbard Mesa will be lost.

4.5.3.5 Alternative V

All public lands would become part of the Glenwood Springs ERMA. Continued custodial recreation management and proposed land uses under this alternative would allow unavoidable changes to the physical, social, and managerial recreational settings and current recreation opportunities. The result would be decreased opportunities for people seeking backcountry or middle-country recreational settings and increased opportunities for people seeking front-country and rural settings (Table 4-36 and Map 42). A system of designated routes will reduce recreational trespass on adjacent private lands and protect other resources from indiscriminant OHV use. The direct and indirect impacts of oil and gas development would cause the most change in recreation activities, settings, and outcome opportunities. Landscape-wide, Alternative V would cause the greatest cumulative change in recreation opportunities by allowing the greatest modification to the current physical, social, and managerial conditions of the recreational setting.

Visitors who enjoy freedom of access and movement would be displaced. Since no other riding/driving area comparable to Hubbard Mesa exists locally on public land, the recreation opportunities currently afforded by Hubbard Mesa would be lost. Management challenges would arise if mechanized and motorized users want to be separated on different designated routes. A system of designated routes would reduce recreational trespass on adjacent private lands and protect other resources from indiscriminant OHV use.

The development of recreational facilities is unlikely unless found to be necessary on a case-by-case basis. Recreation administrators would need additional field staff and funding to implement and manage travel and the combination of land use issues.

4.5.3.6 Cumulative Impacts

The demand for recreational activities and the associated recreation settings/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

4.5.3.7 Mitigation Common to All Alternatives

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. Within the SRMA, mitigation will be useful only if surface development and disturbance are clustered to reduce impacts to the physical and social settings needed for targeted recreation opportunities.

4.5.3.8 Managing, Monitoring, and Marketing

The decision to designate an SRMA under Alternatives II through IV means that intensive and coordinated resource management will be required if BLM is to offer targeted recreational opportunities (objectives). A subsequent SRMA plan that addresses managing, marketing, and monitoring will be necessary to outline how BLM and its partners will specifically manage the recreation activities and settings to offer the targeted SRMA objectives (Appendix E).

4.5.4 Rangeland Management and Health

Introduction

A number of proposed management actions for the Planning Area as part of this RMPA/EIS have the potential to impact rangeland management and health. Two categories of actions are described and assessed, by alternative:

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 rangeland health are defined primarily in terms of forage production. These impacts may be negative, resulting in disruption or removal of vegetation, or positive, resulting in increased forage quantity, quality, or availability. Direct impacts to range management are defined as those that affect the allotment permittees in terms of lease conditions such as allowable AUMs (animal-unit months, see Section 4.5.4), and season of use.

A number of indirect impacts to rangeland management and health are possible as a result of proposed management actions. Indirect impacts associated with surface disturbance are assumed to occur in proportion to the relative amount of disturbance. These 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 impacts to soils and vegetation, and closure of specific areas to livestock to protect or enhance another resource. Livestock may be harassed by on- or off-road vehicular traffic, human visitors, and their dogs. Introduction or expansion of noxious weeds through various vectors can poison livestock but more commonly replaces palatable species with unpalatable 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 weeds,.

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 primarily as a resource that supports productivity requirements of livestock nutrition. However, the plants and plant communities in the Planning Area are also managed for their intrinsic values. Colorado Public Land Health Standards #2 and #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 corridors would enhance the vegetation (and associated fish and wildlife) values but would reduce the amount and quality of forage for livestock and force grazing permittees to provide 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. (1955): "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." These conflicts are addressed throughout this analysis; additional ramifications to vegetation are discussed in Section 4.3.1.

Vegetation is also a resource for wild herbivores, ranging in size from mice to elk. Wildlife species must compete directly with livestock for the forage and thermal cover this vegetation provides, as well as for space and water. Any changes in livestock or wild herbivore use of these resources necessarily affects the other — and, 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.

Some of the alternatives analyzed in this RMPA/EIS incorporate management actions that skew this situation in favor of one type of herbivore over another. 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 large native herbivores 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, large native herbivores 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 stipulations and other restrictions on use to protect specific resource values. These protective stipulations and other restrictions are listed and defined in Section 2.2. Note that NGD/NSO stipulations do not affect use of an area for grazing but would affect the ability of a permittee to construct a stockpond or other ranching-related facility. This is also true of the SSR/CSU stipulations 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. Similarly, the SSR/CSU and special mitigation designations (the latter applied as a condition of approval of a permit) may require that a grazing permittee undertake supplemental ("non-standard") mitigation as part of a proposed action. Examples include:

- A higher standard of revegetation for restoring temporarily disturbed areas, including a requirement to use native species, plant woody species, or use a biodegradable erosion-control fabric to enhance germination and seedling establishment

- A requirement that revegetation use drill-seeding at a rate of 100 seeds per square foot (or double that rate for broadcast-seeding or hydroseeding) and be preceded by adequate site preparation, including decompaction of soil and control of annual or biennial weeds

- A requirement that all revegetated areas be fenced to exclude livestock for at least two full growing seasons

- Use of a culvert for any new road constructed across a stream

- Construction of fences and gates to ensure that livestock do not enter areas being protected for another resource that would be diminished by grazing or trampling

- Construction of alternative water sources to disperse livestock use and reduce dependence on natural streams and riparian corridors

Note that TL stipulations (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.

Under all alternatives, the continuing authorization of livestock grazing in the Planning Area 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 rangeland management and health are defined in terms of these standards and guidelines.

The following terms are used in this RMPA/EIS to describe levels of adverse impacts to range condition and livestock grazing:

- **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 important 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 under the five alternatives. Impacts are summarized in Table 4-37 at the end of this section.

4.5.4.1 Alternative I

Under Alternative I, the general objectives for range are to ensure that all land uses and management actions are authorized in a manner that would meet, or make progress toward, land health standards. Current ecological values and processes and biological diversity would be maintained through existing management direction and activities.

Rangeland projects and administrative solutions (season-of-use revisions, stock level adjustments, pasture exclusions, and utilization stipulations) would be implemented to meet these general resource objectives. High-intensity monitoring would occur on allotments where land health assessments or previous monitoring have identified resource conflicts. Allotment management plans would be developed for administrative units that are not meeting, or have identified concerns with, land health standards. However, land treatments are required only for allotments not meeting a minimum ecological condition rating of 40 percent (failing standards).

As under all other alternatives, projects that do not function to meet management objectives would be abandoned and rehabilitated.

Direct and Indirect Impacts

Rangeland Management and Health — This alternative is expected to result in static to general and gradual long-term improvements to range condition and trend. These actions would be expected to result in negligible to minor positive impacts to range resources. Under continuing management actions, no impacts to permittees are expected.

Resource Development and Other Management Actions — Some upland plant communities below the rim would continue in fair to poor condition with a declining ("decreasing") trend. This would result in negligible to minor negative impacts to range resources in these areas as well as negligible to minor negative impacts to the permittees with allotments in these areas due to potential adjustments to stocking levels and/or season of use.

Most riparian-wetland areas would be expected to be at PFC, or FAR in a static or upward trend and making progress toward meeting land health standards. This assumes that precipitation is adequate, riparian restoration projects are implemented, and rangeland improvements continue to be realized. Negligible to minor positive impacts to range resources would be expected.

Under a continuation of existing noxious weed management (Section 3.3.1), such populations are expected to increase in frequency, density, and diversity over the 20-year period of this analysis. This presents the potential for minor negative impacts to rangeland resources.

Although no new oil and gas, coal, or oil shale leasing would occur on top of the plateau, an estimated seven new oil and gas pads would be developed on existing leases, resulting in approximately 31 acres of long-term disturbance. The remaining area, representing more than 99 percent of BLM lands atop the plateau, would not be subject to these impacts. This would result in negligible impacts to rangeland resources above the rim.

Below the rim, 28 percent of the Planning Area (10,912 acres) would remain unleased, resulting in no impacts from oil and gas. Continued development of areas currently leased for oil and gas development would cause an estimated 1,120 acres of long-term impacts to areas below the rim, representing 2.9 percent of this part of the Planning Area. An additional 730 acres (1.9 percent) of short-term impacts would be expected. The combined 4.8 percent of long-term plus short-term surface disturbance in areas below the rim under this alternative would result in minor impacts to rangeland resources.

Alternative I would place NGD/NSO stipulations on 13,912 acres and SSR/CSU stipulations on 8,256 acres. Potential positive impacts could include improved forage conditions in NGD/NSO areas due to fewer long-term ground-disturbing activities than would occur outside these areas. The remaining 7,167 acres of the Planning Area would be available to oil and gas with standard lease terms.

This alternative would allow the most unrestricted travel throughout the Planning Area, all of which would be open to motorized or mechanized cross-country travel. Based on current levels of use in the Hubbard Mesa area and expected increased recreational OHV use throughout the Planning Area, this could be expected to result in increasing numbers of pioneered roads. Continued dispersed recreation and OHV use is likely to result in gradual decreases in range condition and trend in areas of concentrated use and to have minor negative impacts to range vegetation resources. Negligible indirect impacts from disturbance of livestock could also increase.

Offsite and Cumulative Impacts

The general condition of rangeland resources throughout the Planning Area would be expected to remain static or continue an upward trend under specific management actions for this alternative. However, this would be somewhat ameliorated by continuation of fair to poor condition with a declining trend in some upland vegetation below the rim. Rangeland health would also be negatively impacted by continued increases in noxious weeds throughout the Planning Area. The overall impact would be negligible to minor.

4.5.4.2 Alternative II

The general objectives under this alternative are to protect ecological values and processes and biological diversity and promote natural ecosystem processes and functions in all systems. Administrative rangeland management actions (season-of-use revisions, stock level adjustments, pasture exclusions, and utilization stipulations) would be emphasized over rangeland projects as the preferred solution to meet these objectives.

In addition, this alternative provides for high-intensity monitoring of highest-priority allotments and allotments not meeting land health standards. Allotment management plans would be developed for several situations, including (1) not meeting or having identified issues in meeting standards and (2) direct conflicts with wildlife, watershed, riparian/wetland, botanical, or wilderness values. Land treatments would be required for allotments not meeting a minimum ecological rating of 70 percent.

As under all other alternatives, projects that do not function to meet management objectives would be abandoned and rehabilitated.

Direct and Indirect Impacts

Rangeland Management and Health — Implementation of administrative rangeland actions could be expected to result in faster progress towards meeting or achieving land health standards in terms of long-term improvements to range condition and trend than under the other four alternatives. This would result in minor to moderate positive impacts to rangeland resources. Individual grazing permittees would be subject to more administrative solutions, which could result in minor to moderate impacts to permittees from adjustments to potential stock levels and/or season of use.

Resource Development and Other Management Actions — Vegetation would be managed with a specific focus on achieving goals for diverse native composition and production on upland sites, including using only native species in revegetation seed mixes and emphasizing natural processes to rehabilitate or restore natural plant communities. The condition of upland vegetation communities throughout the Planning Area would be expected to continue to be good, moving in an upward trend under management actions for this alternative and having minor positive impacts to rangeland resources over time.

Riparian areas and river corridors and associated aquatic habitat would be protected and managed. This includes a specific objective for maintaining proper hydrologic function and protecting areas adjacent to these resources. Due to these protections and specific management actions, a large number of riparian reaches would be expected to return to PFC over time, resulting in minor positive impacts to rangeland resources.

Due to protection of range resources in riparian areas and river corridors, individual grazing permittees may be subject to more administrative solutions than under Alternatives I. This could result in minor impacts to affected permittees from potential adjustments to stock level and/or season of use.

This is the only alternative with a stated 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 a number of important 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.

Oil and gas development under Alternative II would allow an estimated 310 new pads and 1,348 acres of new long-term disturbance (1.9 percent of the BLM lands) during the 20-year analysis period (Table 4-2b). An additional 916 acres of short-term impacts (1.2 percent) would also be expected, for a total anticipated disturbance of up to 3.0 percent. Minor negative impacts to range resources would be expected from these activities.

A total of 21,382 acres (29 percent of BLM lands in the Planning Area) would remain unleased for oil and gas due to special management designations. The 31,200 acres (41.4 percent of the Planning Area) with NGD/NSO stipulations could have minor impacts to grazing permittees due to limits on rangeland projects. An additional 7,015 acres would be designated as SSR/CSU, while standard restrictions and limitations would apply to 14,006 acres, primarily below the rim. A small area carrying standard restrictions and limitations would be located near the northern edge of the Planning Area. If short-term disturbances in the SSR/CSU and special mitigation areas were revegetated using the special mitigation actions described above, these would result in negligible impacts to range resources and permittees.

OHV use could be expected to decrease due to restrictions on off-road vehicle use, and would be likely to result in minor increases in range condition and trend and decreased livestock disturbance. Designation of an SRMA for OHV recreation in Hubbard Mesa could necessitate a stock level adjustment, resulting in minor to moderate impacts to affected permittees. Potential increases in recreational use of areas with wilderness character could result in negligible impact to livestock grazing.

Offsite and Cumulative Impacts

The general condition of rangeland vegetation throughout the Planning Area would be expected to continue with an upward trend under management actions for this alternative. Due to specific focus on achieving goals for diverse native composition and production on upland sites, including using only native species in revegetation seed mixes, this improvement in range condition would not be expected to affect vegetation negatively. In addition, specific emphasis on noxious weed inventory, detection, monitoring, and specific project actions would contribute to this upward trend. These actions could have minor to moderate positive impacts to range condition, although they could have negligible to minor negative impacts on permittees in terms of adjustments to stocking levels, restrictions on particular sites, and season of use.

4.5.4.3 Alternative III – Preferred Alternative

Under Alternative III, the most important ecological values and processes would be protected by developing and implementing management prescriptions that would limit ground-disturbing activities, implement active management, and mitigate effects of disturbances. Appropriate management actions would be implemented on a landscape basis and would result in meeting land health standards with an emphasis on intensive management.

In terms of range management, Alternative III would use a combination of range improvements and administrative solutions (season-of-use revisions, stock level adjustments, pasture exclusions, and utilization stipulations) to make progress towards meeting land health standards. Only native species would be used for revegetation seeding. However, land treatments would be required only within allotments identified as not meeting a minimum ecological condition rating of 50 percent. Alternative III also provides for development of allotment management plans for several situations, including direct conflicts with wildlife, watershed, riparian-wetland, botanical, or wilderness values.

As under all other alternatives, projects that do not function to meet management objectives would be abandoned and rehabilitated.

Direct and Indirect Impacts

Rangeland Management and Health — Because of its emphasis on improving vegetation to increase range utilization, this alternative is expected to result in more rapid general improvements to range condition and trend than Alternative I and similar improvements as under Alternatives II, IV, and V. Generally improving conditions could produce minor to moderate positive impacts to rangeland resources

Individual grazing permittees could be subject to more administrative solutions than under Alternative I, less than under Alternative II, and the same as under Alternatives IV and V. This could result in negligible to minor impacts to permittees from potential adjustments to stock level and season of use.

Resource Development and Other Management Actions — Under proposed management actions, condition of upland vegetation communities above the rim would be expected to continue to be good except for an expected increase in noxious weed population frequency, density, and diversity. Some communities below the rim would probably continue in fair to poor condition with a decreasing trend. Noxious weeds would be expected to increase below the rim to an even greater extent, given current conditions. Over time, this would result in minor to moderate negative impacts to most of the range resources of these communities. Minor negative impacts to permittees with allotments in these areas due to potential adjustments to stocking levels and/or season of use would also be expected.

As in Alternative II, riparian areas and river corridors would be a focus of protection and management under this alternative. This includes a specific objective for maintaining proper hydrologic function and protecting areas adjacent to these resources. Due to these protections and specific management actions, a large number of riparian reaches would be expected to return to PFC over time, resulting in minor positive impacts to rangeland resources.

As a result of protection of range resources in riparian areas and river corridors, individual grazing permittees could be subject to more administrative solutions for these areas than under Alternatives I and V. This could result in negligible to minor impacts to affected permittees from potential adjustments to stock level and/or season of use.

Under a continuation of existing noxious weed management, such populations would be expected to increase in frequency, density, and diversity over the 20-year period of analysis. This presents the potential for minor negative impacts to rangeland resources.

Approximately 1,761 acres (2.4 percent of BLM lands) of long-term surface disturbance related to oil and gas activities are anticipated under Alternative III. These ground-disturbing activities include road, pipeline, and facilities construction and would make this area unavailable for grazing. In addition, 1,187 acres (1.6 percent) of short-term impacts could negatively affect rangeland resources and range health. A portion of the short-term impact acreage would be fenced to allow for successful revegetation, resulting in short-term loss of livestock forage. Successful reclamation of surface disturbances could result in increased forage production compared to the undisturbed condition. Reduction in available livestock forage could necessitate stock level adjustments on affected allotments to prevent over-grazing of remaining range. In some allotments this could have minor to moderate impacts The overall impact of oil and gas activities on rangeland resources and health would be minor to moderate due to loss of forage, disturbance of livestock, and livestock management problems associated with oil and gas development.

Based on the surface-use stipulations included in this alternative, specific rangeland impacts could be anticipated. Approximately 30,928 acres of NGD/NSO stipulations (42.0 percent of BLM lands in the Planning Area) could result in negligible to minor impacts due to access restrictions, inability to use a specific area for range improvement projects, and potential livestock exclusion. The 27,486 acres of SSR/CSU stipulations could result in negligible to minor impacts to permittees.

This alternative would restrict travel to designated routes throughout the Planning Area, including the Hubbard Mesa SRMA but excepting over-snow travel by snowmobile. 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, although access for livestock management and maintenance of range improvements may result in a minor impact to allotment permittees.

Offsite and Cumulative Impacts

The general condition of rangeland resources throughout the Planning Area would be expected to show an upward trend under specific management actions for this alternative, particularly if they are enacted early in the estimated 16-year deferral period atop the plateau. However, the magnitude of improvement would be diminished by impacts from several other management actions. These include continuation of fair to poor condition with a declining trend in some upland vegetation below the rim and near the proposed Hubbard Mesa SRMA. Rangeland health would also be negatively affected by continued increases in noxious weeds throughout the Planning Area. In addition, oil and gas development would negatively affect the range resources to a minor to moderate degree.

4.5.4.4 Alternative IV

Under Alternative IV, the most important ecological values and processes would be protected by developing and implementing management prescriptions to limit ground-disturbing activities, implement active management, and mitigate effects of disturbances. Appropriate management actions would be implemented on a landscape basis and result in meeting land health standards with an emphasis on intensive management.

In terms of range management, Alternative IV would use a combination of range improvements and administrative solutions (season-of-use revisions, stock level adjustments, pasture exclusions, and utilization stipulations) to make progress towards meeting land health standards. In addition, Alternative IV would require that only native species be used for revegetation seeding. However, land treatments would be required only within allotments identified as not meeting a minimum ecological condition rating of 50 percent. This alternative also provides for development of allotment management plans for several situations, including direct conflicts with wildlife, watershed, riparian-wetland, botanical, or wilderness values.

As under all other alternatives, projects that do not function to meet management objectives would be abandoned and rehabilitated.

Direct and Indirect Impacts

Rangeland Management and Health — Because of its emphasis on improving vegetation to increase range utilization, this alternative would be expected to result in more rapid general improvements to range condition and trend than Alternative I and similar improvements under Alternatives II and III. Generally improving conditions could produce minor to moderate positive impacts.

Individual grazing permittees could be subject to more administrative solutions than under Alternative I, less than under Alternative II, and about the same as under Alternatives III and V. This could result in negligible to minor impacts to permittees from potential adjustments to stock level and season of use.

Resource Development and Other Management Actions — Under proposed management actions, condition of upland vegetation communities above the rim would be expected to continue to be good except for an expected increase in noxious weed population frequency, density, and diversity. Some communities below the rim would probably continue in fair to poor condition with a decreasing trend. Noxious weeds would be expected to increase below the rim to an even greater extent, given current conditions. Over time, this would result in minor to moderate negative impacts to most of the range resources of these communities. Minor negative impacts to the permittees with allotments in these areas due to potential adjustments to stocking levels and/or season of use would also be expected.

As in Alternative II, riparian areas and river corridors would be a focus of protection and management. This includes a specific objective for maintaining proper hydrologic function and protecting areas adjacent to these resources. Due to these protections and specific management actions, a large number of riparian reaches would be expected to return to PFC over time, resulting in minor positive impacts to rangeland resources.

As a result of protection of range resources in riparian areas and river corridors, individual grazing permittees could be subject to more administrative solutions than under Alternatives I and IV. This could result in negligible to minor impacts to affected permittees from potential adjustments to stock level and/or season of use.

Under a continuation of existing noxious weed management, such populations are expected to increase in frequency, density, and diversity over the 20-year period of analysis. This presents the potential for minor negative impacts to rangeland resources.

Approximately 1,940 acres (2.6 percent) of long-term surface disturbance related to oil and gas activities would be anticipated. These ground-disturbing activities include road, pipeline, and facilities construction and would make this area unavailable for grazing. In addition, 1,329 acres (1.8 percent) of short-term impacts could negatively affect rangeland resources and range health. A portion of the short-term impact acreage would be fenced to allow for successful revegetation, resulting in short-term loss of livestock forage. Successful reclamation of surface disturbances could result in increased forage production compared to the undisturbed condition. Reduction in available livestock forage may necessitate stock level adjustments on affected allotments to prevent over-grazing of remaining range resources. These could have minor to moderate impacts in some allotments. The overall impact of oil and gas activities on rangeland resources and health would be minor to moderate due to loss of forage, disturbance of livestock, and livestock management problems associated with the oil and gas development.

Based on the surface-use stipulations included in this alternative, the following rangeland impacts are anticipated. Approximately 30,928 acres of NGD/NSO stipulations (42.0 percent of BLM lands in the Planning Area) could result in negligible to minor impacts due to access restrictions, inability to use a specific area for range improvement projects, and potential livestock exclusion. The 27,486 acres of SSR/CSU stipulations could result in negligible to minor impacts to permittees.

This alternative would restrict travel to designated routes, except that cross-country travel would be permitted in the SRMA for OHV recreation on Hubbard Mesa. 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, although access for livestock management and maintenance of range improvements may result in a minor impact to allotment permittees.

Offsite and Cumulative Impacts

The general condition of rangeland resources throughout the Planning Area would be expected to show an upward trend under specific management actions for this alternative. However, the magnitude of improvement would be diminished by impacts from several other management actions. These include continuation of fair to poor condition with a declining trend in some upland vegetation below the rim and near the proposed Hubbard Mesa SRMA. Rangeland health would also be negatively affected by continued increases in noxious weeds throughout the Planning Area. In addition, oil and gas development would negatively affect the range resources to a minor to moderate degree.

4.5.4.5 Alternative V

Under Alternative V, modifications to ecological values and processes and biological diversity would result from ground-disturbing activities related to more intensive oil and gas development while ensuring that mitigation or management conditions are imposed to lessen impacts to identified key resources.

Rangeland projects and land treatments would be emphasized as the preferred solution to meeting resource management objectives – making significant progress, where practical, toward meeting land health standards. This would emphasize planning and implementing structural rangeland projects and land treatments to improve forage availability. Proposed management actions would include rehabilitation and revegetation of communities not meeting desired range conditions due to dominance of annual or weedy species. This would include using seed mixes with forage-producing perennials that support livestock production and other commodity values. Use of native species would not be required.

Like Alternative I, this alternative would include high-intensity monitoring of allotments where resource conflicts have been identified. However, land treatments would be required only for allotments not meeting a minimum ecological condition rating of 40 percent (failing standards). Conflicts with other resources such as watershed, wetland/riparian, or botanical would not require management plans.

As under all other alternatives, projects that do not function to meet management objectives would be abandoned and rehabilitated.

Direct and Indirect Impacts

Rangeland Management and Health — Alternative V is expected to result in the most rapid and broadest improvements to range condition and trend; minor to moderate positive impacts to rangeland resources would be expected. Individual grazing permittees may be subject to more administrative solutions than under Alternative I, and fewer than under Alternatives II through IV. This could result in negligible to minor impacts to permittees from potential adjustments to stock level and/or season of use.

Because of the emphasis on forage production and availability, improvements in general range resources would not result in corresponding improvements for native upland and riparian/wetland conditions.

Resource Development and Other Management Actions — Some plant communities below the rim would be likely to degrade on a steeper downward trend under this alternative, because they are already in fair to poor condition and contain larger areas of noxious weeds. In the long term, this could result in localized minor to moderate negative impacts to range resources.

The condition of many riparian/wetland areas could be expected to decline due to continued expansion of noxious weed populations and more intensive, focused livestock grazing in these areas. In the long term, this could result in localized minor to moderate negative impacts to rangeland resources.

Under a continuation of existing noxious weed management (Section 3.3.1), such populations would be expected to increase in frequency, density, and diversity over the 20-year period of analysis. This presents the potential for minor negative impacts to range resources.

Approximately 2,495 acres (3.4 percent of BLM lands in the Planning Area) of long-term ground-disturbing activities related to oil and gas would be anticipated under this alternative. These include road, pipeline, and facilities construction that would make this area unavailable for grazing. In addition, 1,726 acres of short-term impacts could negatively affect rangeland resources. A portion of the short-term impact acreage would be fenced to allow for revegetation, resulting in short-term loss of livestock forage. Successful reclamation of surface disturbances could result in increased forage production compared to the undisturbed condition. Reduction in available livestock forage could necessitate stock level adjustments on affected allotments to prevent over-grazing of remaining range resources. This could have minor to moderate impacts in some allotments. The overall impact of oil and gas activities on range resources and health would be minor to moderate due to loss of forage, disturbance of livestock, and livestock management problems associated with oil and gas development.

Table 4-37. Summary of Impacts by Alternative to Rangeland Management and Health

Action	Alternative				
	I	II	III	IV	V
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 (–)
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
Noxious Weed Management	*Resources:* Minor Minor to Moderate (–) *Permittees:* None	*Resources:* Minor to Moderate (+) *Permittees:* None	*Resources:* Minor to Moderate (–) *Permittees:* None	*Resources:* Minor to Moderate (–) *Permittees:* None	*Resources:* Minor to Moderate (–) *Permittees:* None
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 (some):* Minor to Moderate (–)	*Resources:* Minor to Moderate (–) *Permittees(some:* Minor to Moderate (–)
Special Land Use Management and Designation	*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 (–)
Travel and Recreation Management	*Resources:* Minor (–) *Permittees:* None	*Resources:* Minor (+) *Permittees: (some):* Minor to Moderate (–)	*Resources:* Minor (+) *Permittees (some):* Minor to Moderate (–)	*Resources:* Minor (+) *Permittees (some):* Minor to Moderate (–)	*Resources*: Minor (+) *Permittees (some):* Minor (–)

Based on the surface-use stipulations included in this alternative, specific rangeland impacts could be anticipated. Approximately 21,609 acres of NGD/NSO stipulations could result in minor impacts due to inability to use particular areas for range improvement projects and access restrictions. Approximately 21,517 acres of SSR/CSU could result in negligible to minor negative impacts to permittees.

This alternative would restrict travel to designated routes throughout the Planning Area, including the Hubbard Mesa SRMA but excluding over-snow travel by snowmobile.

Dispersed OHV use could be expected to decrease due to restrictions on off-road travel. This is likely to result in minor improvements in range condition and trend and decreased livestock disturbance, although access for livestock management and maintenance of range improvements could result in minor negative impacts to grazing permittees.

4.5.5 Oil and Gas

Introduction

Table 4-38 shows the estimated number of wells that would be drilled on Federal mineral estate in the Planning Area under each of the five alternatives. In general, the number of wells drilled depends 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). Alternative V, which is entirely open to leasing and has the fewest drilling restrictions, also has the greatest number of estimated wells, recoverable reserves, and long-term surface impacts. The length of time required to recover the resource fully is unknown. The 18,670 acres of previously leased Federal mineral estate in the Planning Area is already being developed. It is possible that most of the oil and gas resource within those leases will be recovered before substantial development on newly leased lands occurs.

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.

Estimating future well numbers and recoverable reserves requires a number of assumptions about the location and quality of the oil and gas resource and the density of well bore placement needed for recovery. This analysis is based on the following assumptions from the RFD (Appendix H):

1. The oil and gas resource is assumed to be distributed uniformly throughout the Planning Area
2. Production would come from both the Mesaverde Group and the Wasatch Formation.
3. Recoverable gas reserves in the Planning Area would be similar to those in the rest of Region 4 on a per-well basis; i.e., 1.17 BCF of gas from Mesaverde wells and 0.7 BCF from Wasatch wells.
4. Recoverable oil reserves in the Planning Area would be 0.0023 MBO (thousand barrels of oil) per BCF of Mesaverde gas produced.
5. Surface spacing on well pads would be 40 acres throughout the Planning Area, except for 20-acre surface spacing for sites where directional drilling would be used to access reserves by directional drilling beneath the plateau from the edge of the steep-slope NSO.
6. Downhole spacing for Mesaverde wells would be 10 acres on 80 percent of the area below the rim and 20 acres on the remaining 20 percent of the area below the rim. Downhole spacing would be 40 acres for Mesaverde wells above the rim (i.e., one vertical well per pad).
7. Downhole spacing for Wasatch wells would be 160 acres throughout, and wells would be collocated with Mesaverde pads.
8. Directional drilling and multiple wells per pad would be used where the allowable downhole density is greater than the allowable surface density.
9. Stipulations on existing leases would remain, and new stipulations under the five alternatives would apply only to new leases unless the existing lessee operator voluntarily agrees to conform to the new standards.

Table 4-38. Number of Wells and Reserves of Oil and Gas in BLM Portions of the Planning Area

Planning Area Oil and Gas Components		Alternative				
		I	II	III	IV	V
Total Planning Area Land Area		127,000 ac				
Federal Mineral Estate		73,602 ac				
Area of Federal Minerals Currently Leased		18,670 ac				
No-Lease Area		44,267 ac	21,382 ac	0 ac	0 ac	0 ac
Deferred-Lease Area [1]		0 ac	0 ac	34,758 ac	0 ac	0 ac
NSO Stipulations		13,912 ac	31,200 ac	30,928 ac	30,928 ac	21,609 ac
CSU Stipulations		8,256 ac	7,015 ac	29,594 ac	29,594 ac	21,517 ac
Standard Lease Terms, including Areas with TL Stipulations		7,146 ac	14,690 ac	13,080 ac	13,080 ac	30,476 ac
Total Areas Available for Oil and Gas Development (excludes No-lease and NSO)		15,423 ac	21,021 ac	42,674 ac	42,674 ac	51,993 ac
Potential New Wells at Full Field Development [2]		1,439	1,607	2,288	2,288	2,783
New Wells in 20 Years [2,32]	Atop the Plateau	10	87	51	168	New Wells in 20 Years [2,32]
	Below the Rim	845	818	1,273	1,156	
	Total	855	905	1,324	1,324	
Total Recoverable Reserves on BLM Lands in Planning Area [3]		2,239 BCF				
Gas Recovered from Wells Developed on BLM Lands in 20 Years [3]		983 BCF	1,041 BCF	1,523 BCF	1,523 BCF	1,819 BCF
Percent of Gas Reserves Recovered in 20 Years		44%	46%	68%	68%	81%
Approximate Number of Colorado Households that could be Served Annually by Gas Recovered from Wells on BLM Lands [3,4,5]		523,000	555,000	810,000	810,000	968,000

[1] *Leasing and drilling on BLM lands atop the plateau would be deferred until at least 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] *Mesaverde Wells – Above the Rim: 40-acre downhole spacing; Below the Rim: 80% @ 10-acre downhole spacing and 20% at 20-acre downhole spacing. Wasatch Wells: 160-acre downhole spacing throughout.*

[3] *Natural gas produced over operational life of wells drilled on BLM lands in Planning Area during 20-year period of analysis.*

[4] *Based on development rate used in RFD (Appendix H); assumes 1.17 BCF per Mesaverde well and 0.7 BCF per Wasatch well; weighted average approximately = 1.15 BCF per well.*

[5] *Based on 2.5 persons per household and 94 MCF per customer per year; see Section 3.5.5.4.*

4.5.5.1 Alternative I

Oil and gas development under this alternative would be severely limited by the continuing closure to leasing of 44,267 acres in the former NOSRs, including all of NOSR 1. Any oil and gas development under this alternative would occur on the 8,379 acres of NOSR 3 that was leased at the direction of Congress in 1999 and the 20,952 acres of Federal mineral estate in the Planning Area that lies outside the NOSRs, a total of 29,331 acres.

Of the mineral estate that is open to leasing under this alternative, 13,912 acres would be closed to surface disturbance by an NSO stipulation. The principal NSOs are those protecting the I-70 viewshed, slopes steeper than 50 percent, and ecologically important areas. A number of CSU stipulations would also apply, totaling 8,256 acres. These include protections for various visual and ecological resources, as well as slopes steeper than 30 percent in areas of severe or very severe erosion hazard. The CSU stipulations would allow BLM to require that a proposed oil and gas well or other facility be relocated by more than 200 meters if necessary to protect a specific resource value (compared to relocation of up to 200 meters under standard lease terms) (Appendix B).

With the reduction in available acreage due to NSO stipulations, a total of 15,423 acres of Federal mineral estate would be available for location of drill pads, of which 14,241 acres would be below the rim. The RFD assumes that approximately 25 percent of the area beneath steep-slope NSOs along the cliffs could be developed by directional drilling to a lateral distance of approximately 1,400 feet. Approximately 112 wells could be developed beneath the cliffs NSO at the surface spacing of 20 acres assumed in the RFD (Appendix H).

As indicated in Table 4-38, an estimated 855 wells would be developed on Federal mineral estate under Alternative I during the 20-year period of analysis. All but ten of these (845) would be below the rim. The RFD estimates an average per-year drilling rate of 43 under this alternative.

Recoverable reserves accessed by these wells are estimated at 983 BCF, compared to recoverable reserves on private land of 2,195 BCF.

4.5.5.2 Alternative II

Under this alternative, more than half of former NOSR 1 would be made available for oil and gas leasing, but 21,382 acres would remain no-lease due to management prescriptions to protect areas identified as having wilderness character (see Appendix G). Of the 52,220 acres remaining, 31,200 acres would be within areas of NSO stipulations to protect other resource values. These include visually sensitive areas, slopes steeper than 50 percent, and sensitive ecological components, including moderate- and high-risk areas for the Colorado River cutthroat trout and streams eligible for designation as WSRs. An additional 7,015 acres of CSU stipulations would also protect sensitive scenic and ecological qualities and slopes greater than 30 percent with erosive soils.

After accounting for no-lease areas and NSO stipulations, approximately 21,021 acres of BLM lands would be available for oil and gas development. This area would support approximately 905 new wells, of which 818 would be below and 87 would be above the rim, including an estimated 112 directional wells below the steep-slope NSO. The RFD estimates that an average of 45 wells would be drilled per year under this alternative.

Recoverable reserves accessed by these wells during the 20-year period of analysis are estimated at 1,041 BCF, compared to recoverable reserves on private land of 2,195 BCF.

4.5.5.3 Alternative III – Preferred Alternative

Under this alternative, the entire 44,267 acres of the former NOSRs currently closed to oil and gas leasing would be made available. However, Alternative III would defer leasing and drilling in the 34,758 acres of BLM lands on top of the plateau until 80 percent of anticipated wells below the rim under this alternative have been effectively completed to total depth and a production test performed. While the exact time to reach this point cannot be predicted, a reasonable estimate is 16 years. This estimate is based on the following:

- A total of 1,273 projected new wells on BLM lands below the rim under this alternative.
- A total of 1,244 projected new wells on areas of private mineral estate below the

rim, again derived from numbers and assumptions in the RFD.

- A total of 411 existing wells on Federal and private mineral estates as of June 1, 2001. (Note that wells constructed since that date increase the number of existing wells but decrease the estimate of new wells, and the total number is therefore not affected.)
- A resultant 80-percent threshold of the sum of these numbers of 2,342 wells (1,273 + 1,244 + 411 = 2,928 x 0.8 = 2,342).
- A resultant 80-percent threshold of 2,342 wells (1,273 + 1,244 + 411 = 2,928 x 0.8 = 2,342).

The actual point at which the 80-percent threshold is met could range from 10 years to more than 20 years, depending on technical, geological, and economic factors, as well as the annual drilling rate. The drilling rate used for Alternative III is 173 wells for both Federal and private lands, of which 148 would be below the rim. The assumed portion of the drilling rate on BLM lands (66 wells per year) is derived from information presented in the RFD (Appendix H) and reflects the area of available lands, assumptions on surface and downhole spacings, and extent of NSO stipulations.

Additionally, it is assumed that drilling atop the plateau would not begin immediately when the threshold below the rim is met, due to the leasing and drilling permit processes that would have to be completed first. This RMPA/EIS assumes that the leasing and permitting process would take up to a year. Note also that BLM could also issue some leases on top of the plateau during leasing of lands below the rim if necessary to prevent drainage.

Annually, or more frequently as appropriate, BLM will monitor the number of wells on Federal and private mineral estates below the rim as part of the lease sale process. Numbers of private-estate wells will be obtained using COGCC data. Figure 1-3 depicts the location of areas above and below the rim; the latter would be used by BLM to monitor progress toward reaching 80-percent threshold.

Although the threshold number of 2,342 wells used in this RMPA/EIS is considered a reasonable estimate, it is subject to revision in response to changes in downhole densities and refined delineation of the oil and gas reservoir. Also, leases could be granted atop the plateau during the deferral period to protect against drainage, but subject to the stipulations otherwise applicable under Alternative III.

The numbers of wells atop the plateau and below the rim at the end of the 20-year period could also vary from the assumed numbers of 51 and 1,273, respectively (total = 1,324). The relative numbers above and below the rim used throughout the impact analysis are based on an assumed drilling rate on top of the plateau of 17 wells per year for the 3 years of drilling. The assumed drilling rate below the rim is 66 wells per year during the deferral period, decreasing to 50 per year when drilling begins above the rim. The annual rate of 66 wells is the same as the combined (above/below the rim) drilling rate assumed for Alternative IV, which has the same amount of land available for oil and gas development (Table 4-38). As described previously, this RMPA/EIS assumes a lower development rate on top than below due to more difficult access, a shortened drilling season due to winter snow accumulation, a lower downhole density, thicker overburden, and more restrictions related to environmental protection.

Of the total area of leasable lands under this alternative, 30,928 acres would be within areas of NSO stipulations to protect specific resource values. The acreage of CSU stipulations under Alternative III would also be quite large (27,486 acres), although this typically would not result in loss of a drilling opportunity. CSU protection would be applied to the same types of resources described for the previous alternatives.

After accounting for the productive acreage lost to NSO areas, a total of 42,674 acres would be available for oil and gas development, and an estimated 1,324 wells would be drilled in 20 years, including 1,273 below and 51 above the rim. The total below the rim includes 112 directional wells drilled beneath the steep-slope NSO.

Recoverable reserves accessed by these wells during the 20-year period of analysis are estimated at 1,523 BCF, compared to recoverable reserves on private land of 2,195 BCF.

4.5.5.4 Alternative IV

Under this alternative, the entire 44,267 acres of the former NOSRS currently closed to oil and gas leasing would be made available at the beginning of the 20-year period, of which 30,928 acres would be in areas with an NSO stipulation to protect one or more specific resource values. The acreage of CSU stipulations under Alternative IV would also be quite large (27,486 acres), although this typically would not result in loss of a drilling opportunity. CSU protection would be applied to the same types of resources described for the previous alternatives.

After accounting for the productive acreage lost to NSO areas, a total of 42,674 acres would be available for oil and gas development, and an estimated 1,324 wells would be drilled in 20 years, including 1,156 below and 168 above the rim. The total below the rim includes 112 directional wells drilled beneath the steep-slope NSO. The RFD estimates that an average of 66 wells would be drilled per year under this alternative.

Recoverable reserves accessed by these wells during the 20-year period of analysis are estimated at 1,523 BCF, compared to recoverable reserves on private land of 2,195 BCF.

4.5.5.5 Alternative V

Under Alternative V, the entire 44,267 acres of the former NOSRs currently closed to oil and gas leasing would become available. Far less acreage would be protected by NSOs under this alternative than under Alternatives II through IV, but the area of NSO would still be nearly 22,000 acres, primarily for slopes over 50 percent; high-risk habitat for the Colorado River cutthroat trout; and protection of Federally listed threatened or endangered or BLM sensitive wildlife and plant species. The acreage of CSU stipulations is also reduced by this alternative, due mainly to the removal of VRM II and moderate-risk plant habitat from CSU protection.

After accounting for the acreage of NSO stipulations, about 51,993 acres would remain available for oil and gas production. On that acreage, an estimated 1,582 wells would be drilled, including 1,348 below and 234 above the rim. The number below the rim includes 112 directional wells drilled beneath the steep-slope NSO along the cliffs. The RFD assumes an average per-year drilling rate of 79 wells under this alternative.

Recoverable reserves accessed by these wells during the 20-year period of analysis are estimated at 1,819 BCF, compared to recoverable reserves on private land of 2,195 BCF.

Indirect, Offsite, and Cumulative Impacts

Indirect impacts associated with oil and gas development within the Planning Area under the five 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, and decreased scenic and primitive recreational opportunities. 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 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.

In excess of 2,000 new wells could 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 for the five alternatives (Table 4-38). 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.

Impact Summary

The combined level of oil and gas development under Alternative V would result in the greatest impact on other resources and land uses, but it would also represent the most effective utilization of the recoverable reserves of natural gas and petroleum beneath the Planning Area. However, even Alternative V would produce only about 36 percent of the estimated gas reserves in BLM portions of the Planning Area during the first 20-year period of development.

Development on private lands in the Planning Area is estimated to be capable of producing approximately 2,300 BCF, or 43 percent of the reserves beneath those lands based on the RFD. The higher recovery rate for private lands reflects assumptions about greater spacing density and availability of essentially the entire area except for slopes steeper than 50 percent.

The total reserves in the Planning Area represent approximately 37 percent of the total gas reserves in Colorado. The estimated recovery volumes in Table 4-38 indicate that development of this oil and gas resource at the levels of the five alternatives analyzed would be sufficient to meet the natural gas needs of more than a half million – and potentially close to one million – households during the 20-year period of analysis. As described in Section 3.5.5, the total estimated reserve beneath the Planning Area would produce enough gas over a period of 20 years to meet the needs of approximately 3.1 million households.

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), and these have been the subject of considerable investigation. However, 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. Moreover, even if a market for shale oil arises within a reasonable timeframe, apparently more viable sources occur outside BLM lands within the Planning Area.

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 five 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.

Possible future 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. However, this is not currently considered likely to occur during the 20-year period of analysis for this RMPA/EIS.

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 (see Section 4.6).

4.5.7 Areas of Critical Environmental Concern

Introduction

By definition, the analysis of impacts on ACECs is necessarily an analysis of impacts on the relevant and important values and resources that are given special management attention through the creation 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).

4.5.7.1 Alternative I

No ACECs would be designated under this alternative. Therefore, identified relevant and important values would receive no special management consideration due to their inclusion in ACECs. Values that occur above the rim would not be subject to negative impacts from oil and gas development due to continuing no-lease conditions. However, these resources would receive no special management mitigation in terms of potential impacts from all other ongoing management actions and activities. Below the rim, impacts to relevant and important values would be managed under existing surface-use stipulations.

4.5.7.2 Alternative II

This alternative provides the most protective management for relevant and important values by designating four ACECs comprising 36,184 acres (49 percent) of the Planning Area (Map 3). The ACEC designations would provide special management to protect and prevent irreparable damage to relevant and important scenic, geological, fisheries/wildlife, and botanical/ecological values (Tables 2-2a-d).

Direct and Indirect Impacts

Under Alternative II, each of the four ACECs would be entirely covered by NGD/NSO management stipulations specific to relevant and important values. Entire watersheds and estimated areas of ecosystem processes, and large areas of potential habitat would be provided maximum protection from disturbance. Most negative direct impacts to these values would be prevented. Alternative II would also provide the greatest degree of protection from indirect impacts.

A complete evaluation of direct and indirect impacts to specific relevant and important values under this alternative is located in the individual impact analysis sections.

Offsite and Cumulative Impacts

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 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 inoculate new populations in designated restoration sites.

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.

Under Alternative II, most relevant and important values will experience positive impacts as a result of special stipulations due to their inclusion in designated ACECs. These would be cumulative to comprehensive surface protections, resulting in general positive impacts.

4.5.7.3 Alternative III – Preferred Alternative

Two ACECs would be designated under this alternative: East Fork Parachute Creek and Trapper/Northwater Creek, representing approximately 11,529 acres or 16 percent of the Federal lands Area (Map 5). The ACEC designations would provide special management to protect and prevent irreparable damage to relevant and important fisheries/wildlife and botanical/ecological values (Tables 2-2a-d).

Direct and Indirect Impacts

In addition to reducing the number of designated ACECs, the entire area of the two designated ACECs would be excluded from NGD/NSO management stipulations specific to relevant and important values. Instead, NGD/NSO in these ACECs would provide substantial protection of identified relevant and important fish and plant values from direct impacts (Map 6), while SSR/CSU stipulations and designation of permit-level special mitigation areas would provide less protection for remaining portions of the watersheds, areas of crucial ecosystem processes, and additional areas of potential habitat. While these measures are more protective than standard restrictions and limitations, they do not provide the same level of protection as NGD/NSO stipulations and would allow some indirect negative impacts.

Offsite and Cumulative Impacts

A positive impact to offsite areas could occur should some existing populations of special status plant species within the Planning Area expand, or new populations be recruited, due to positive responses as a 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 in managing them on other sites.

Similar positive offsite impacts could occur if special management of sensitive wildlife species on the Planning Area causes populations to increase to the point that they would emigrate and establish new populations or augment existing populations offsite. In the case of the Colorado cutthroat trout, any future expansion of populations due to protection and enhancement of habitat under ACEC management could be sufficient to allow individuals from streams on the Planning Area to be used to establish new populations in designated restoration sites.

Negative impacts to relevant and important resource values are likely to occur from ongoing human development throughout the general region, regardless of management actions undertaken within the Planning Area. New roads, residential and commercial development, and increased recreational use of wildlands affect these resource values directly and negatively. A number of indirect impacts to relevant and important resources would also be expected. These impacts will continue to occur on a regional scale and will have an additive relationship to impacts expected from management activities within the Planning Area. If negative impacts continue to increase, the condition of these resources on public lands would become even more important in terms of contribution to global species viability, as well as the intrinsic value and biodiversity they represent.

Under Alternative III, some relevant and important resource values may benefit from special stipulations associated with their inclusion in designated ACECs. These would be cumulative to potential positive impacts from other surface protection measures as well as the potential negative onsite and offsite impacts described above.

4.5.7.4 Alternative IV

Two ACECs would be designated under this alternative: East Fork Parachute Creek and Trapper/Northwater Creek. This represents approximately 11,529 acres or 16 percent of the Federal lands Area (Map 7). ACEC designations would provide special management to protect and prevent irreparable damage to relevant and important fisheries/wildlife and botanical/ ecological values (Tables 2-2a-d).

Direct and Indirect Impacts

In addition to reducing the number of designated ACECs, the entire area of the two designated ACECs would be excluded from NGD/NSO management stipulations specific to relevant and important values. Instead, NGD/NSO in these ACECs would provide substantial protection of identified relevant and important fish and plant values from direct impacts (Map 8), while SSR/CSU stipulations and designation of permit-level special mitigation areas would provide less protection for remaining portions of the watersheds, areas of crucial ecosystem processes, and additional areas of potential habitat. While these measures are more protective than standard restrictions and limitations, they do not provide the same level of protection as NGD/NSO stipulations and would allow some indirect negative impacts.

Offsite and Cumulative Impacts

A positive impact to offsite areas could occur should some existing populations of special status plant species within the Planning Area expand or new populations be recruited due to positive responses to management actions under this alternative. 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 in managing them on other sites.

Similar positive offsite impacts could occur if special management of sensitive wildlife species causes populations to increase to the point that they would emigrate and establish new populations or augment existing populations offsite. In the case of the Colorado cutthroat trout, future expansion of populations due to protection and enhancement of habitat under ACEC management could be sufficient to allow individuals from streams on the Planning Area to be used to establish new populations in designated restoration sites.

Negative impacts to relevant and important resource values are likely to occur from ongoing human development throughout the general region, regardless of management actions undertaken within the Planning Area. New roads, residential and commercial development, and increased recreational use of wildlands directly and negatively affect these resource values. A number of indirect impacts to relevant and important resources would also be expected. These impacts will continue to occur on a regional scale and have an additive relationship to impacts expected from management activities within the Planning Area. If negative impacts to continue to increase, the condition of these resources on public lands would become even more important in terms of contribution to global species viability, as well as the intrinsic value and biodiversity they represent.

Under Alternative IV, some relevant and important resource values may benefit from special stipulations associated with their inclusion in designated ACECs. These would be cumulative to potential positive impacts from other surface protection measures as well as the potential negative onsite and offsite impacts described above.

4.5.7.5 Alternative V

As with Alternative IV, no ACECs would be designated under this alternative, and the relevant and important values identified for the ACECs would receive no special management considerations unless dictated by another resource value.

Special management of relevant and important values would be the least focused under this alternative. Approximately 21,609 acres (29 percent) would be covered by NGD/NSO stipulations, and SSR/CSU stipulations would apply to an additional 21,517 acres (29 percent). These would likely protect most identified relevant and important values, and their occupied habitat, from most direct impacts. However, larger portions of watersheds, areas of crucial ecosystem processes, and areas of potential habitat would not benefit from any special considerations other than provided by standard management. Therefore, more substantial impacts to these resources could occur than under the previous four alternatives.

4.5.8 Areas Managed to Protect Wilderness Character or Specific Wilderness Values

Introduction

Inventories for wilderness characteristics within the Planning Area were conducted following the transfer of NOSRS 1 and 3 (Section 3.5.8.1). As described in Table 2-1, no WSAs will be designated under any of the alternatives analyzed by this RMPA/EIS. Alternative II would apply a management prescription to 21,382 acres to protect roadlessness, naturalness, and outstanding opportunities for solitude and primitive and unconfined types of recreation (Map 35). Appendix G summarizes the management prescriptions for preserving wilderness characteristics in these areas under Alternative II. Alternative III would manage 9,006 acres to protect roadlessness and naturalness, including allowing no modification, waiver, or exceptions to NGD/NSO restrictions in those areas (Map 36).

4.5.8.1 Alternative I

Although no areas having wilderness character would be provided special management protection under this alternative, a no-lease designation for oil and gas for East Fork Parachute Creek and portions of the Northeast and Southeast Cliffs would result in a lack of short-term activity that would directly impact wilderness characteristics.

Over time, other resource development and associated uses would impact the wilderness characteristics of naturalness, outstanding opportunities for solitude or primitive and unconfined types of recreation, and identified supplemental values. Without specific management in place to maintain and preserve areas with wilderness character, degradation of those characteristics would occur from (1) the areas being open to cross-county motorized or mechanized use, (2) grazing activities which may include new roads and developments, and (3) no recreation direction or emphasis to promote primitive recreation. Supplemental values would decline and wilderness characteristics would be lost over 10-20 years. This includes naturalness, opportunities for solitude and for primitive and unconfined types of recreation, and roadless areas over 5,000 acres.

Roadlessness, naturalness, and outstanding opportunities for solitude or primitive and unconfined types of recreation would be lost over time due to lack of special management protection on 21,382 acres within the three wilderness inventory units described in Alternative II.

Cumulative Impacts

The loss of areas containing wilderness character would reduce opportunities to meet the increasing regional demand for primitive and unconfined recreation experiences, solitude, naturalness and roadlessness, and preservation of ecological diversity found within the current system. No new opportunities would be provided to preserve these areas.

4.5.8.2 Alternative II

To meet management goals and objectives described in Alternative II (Table 2-1) a total area of 21,382 acres in the three inventory units found to have wilderness character — East Fork Parachute Creek (10,389 acres), Northeast Cliffs (5,801 acres), and Southeast Cliffs (5,192 acres) — would be managed specifically to protect wilderness characteristics and wilderness character in the units as a whole (Map 3). The area would be managed as described in Appendix G.

Naturalness, roadlessness, outstanding opportunities for solitude and unconfined types of recreation, and identified supplemental values would be preserved on 21,382 acres due to the specific management actions described in Appendix G and the associated no-lease designation for oil and gas in effect for all units. Additional on-site resources such as recreation, ecological systems, wildlife, fisheries, air quality, special status species, water quality, vegetation, and riparian areas would also benefit from protection and maintenance of wilderness characteristics (see individual resource sections). Conversely, as a result of the management prescriptions (Appendix G) some negative effects on uses and resources such as grazing, minerals, lands and realty, and motorized and mechanized recreation could occur (see individual resource sections).

Scientific and educational benefits would be realized; natural environments offer a living laboratory for research and for many high schools, colleges, heritage programs, and outdoor leadership schools. Areas perceived and used as natural areas also provide natural control sites for studying the effect of human development on natural systems and for understanding unfettered ecological systems (Loomis and Richardson 2001).

Protection of wildlands and other natural areas can generate off-site benefits such as passive use values. These include (1) existence values – the benefits of knowing that wildlands exist and are preserved; (2) option values – the benefits of having the option to visit the area in the future; and (3) bequest values – the benefits of knowing that future generations would have opportunities to use wildlands or enjoy their existence (Richardson 2002). Numerous benefits accrue to communities from the presence of intact natural environments nearby. Public demand for wilderness designations and experiences generally corresponds with increasing urban populations. Benefits include, but are not limited to, preservation of scenic backdrops for adjacent communities and scenic viewsheds along important travel corridors, as well as the economic benefits associated with recreation, education, scientific research, and tourism.

Tourism and recreation are important to the Colorado economy and are based on visitors attracted to opportunities for recreating and sightseeing in the Rocky Mountains (USFS 2002). Scenic landscapes contribute to the success of recreation and tourism. These benefits can enhance property values and increase tax revenues, in addition to enhancing recreation and tourism, which represent $7 billion of the Garfield County and Colorado economies (Section 3.4.3.4).

Roadlessness, naturalness, outstanding opportunities for solitude or primitive and unconfined recreation, and identified supplemental values would be maintained and protected due to special management on 21,382 acres within the three wilderness inventory units described above.

Cumulative Impacts

The protection and maintenance of roadlessness, naturalness, outstanding opportunities for solitude or primitive and unconfined types of recreation, and identified supplemental values would protect and maintain ecological diversity on a regional scale, and enhance opportunities to meet the increasing regional demand for areas containing these characteristics.

4.5.8.3 Alternative III

Roadlessness and naturalness would be maintained on 9,006 acres of the three wilderness inventory units described for Alternative II, as follows: Southeast Cliffs Unit – 3,014 acres, Northeast Cliffs Unit – 2,291 acres, and East Fork Parachute Creek Unit – 4,241 acres (Map 36). This protection would result from NGD/NSO restrictions established for other resources, and portions of the NGD/NSO areas within the 9,006 acres would not be subject to modification, waiver, or exceptions. Although these restrictions would maintain naturalness and roadlessness in the main drainage of East Fork Parachute Creek, including the falls, and on visible portions of the cliffs, opportunities for solitude or primitive and unconfined recreation would be limited by the narrow configuration of the areas (Map 36). The units as a whole would not retain wilderness character.

Other resources and identified supplemental values (Section 3.5.8) within the units such as recreation, ecological systems, wildlife, fisheries, air quality, special status species, water quality, vegetation, and riparian areas would benefit from protection of key areas through the use of NGD/NSO stipulations (see individual resource sections for the above resources). Conversely, some negative effects could occur as a result of the NGD/NSO stipulation with no modification, waiver, or exceptions within the areas shown on Map 36. Affected resources could include grazing, minerals, lands and realty, and motorized and mechanized recreation.

Some scientific and educational benefits would be realized in that natural environments offer a living laboratory for research and for many high schools, colleges, heritage programs, and outdoor leadership schools; however, opportunities would be reduced due to the unit's size and narrow configuration.

As compared with Alternative I, roadlessness and naturalness would be maintained on portions (9,006 acres) within the Southeast Cliffs, Northeast Cliffs, and East Fork Parachute Creek Units due to NGD/NSO restrictions for other resources (Map 36). Outstanding opportunities for solitude or primitive and unconfined types of recreation would be lost over time due to lack of special management protection on 21,382 acres, roadlessness and naturalness would be lost on 11,836 acres, within the three wilderness units described in Alternative II.

Cumulative Impacts

Roadlessness and naturalness will be protected and maintained on 9,006 acres. The units (Map 36) will provide some opportunities to meet increasing demand for areas containing roadlessness and naturalness and will contribute to preservation of ecologic diversity within the Planning Area. No contribution would be made toward meeting increasing demand for outstanding opportunities for solitude or primitive and unconfined types of recreation.

4.5.8.4 Alternatives IV and V

No areas having wilderness character would be provided special management protection under this alternative. Oil and gas leasing and other resource development, would result in permanent impairment of roadlessness, naturalness, outstanding opportunities for solitude or primitive and unconfined types of recreation, and identified supplemental values within each unit (Section 3.5.8). These impacts would be long-term and irreversible. This would be especially true under Alternative V, which would have the fewest and smallest areas of NGD/NSO stipulations. NGD/NSO stipulations may have exceptions applied and therefore cannot be relied upon to protect wilderness characteristics.

Other resources and identified supplemental values (Section 3.5.8) such as recreation, ecological systems, wildlife, fisheries, air quality, special status species, water quality, vegetation, and riparian areas could benefit from protection through the use of NGD/NSO restrictions (see individual resource sections).

As compared with Alternative I, roadlessness, naturalness, and outstanding opportunities for solitude or primitive and unconfined types of recreation would be lost on 21,382 acres within the three wilderness inventory units described in Sedtion 4.5.8.2.

Cumulative Impacts

Opportunities to meet increasing demand for areas containing roadlessness, naturalness, and outstanding opportunities for solitude or primitive and unconfined types of recreation would not be realized.

4.5.9 Wild and Scenic Rivers

Introduction

The process of designating a Wild and Scenic River (WSR) under the authority of the Wild and Scenic Rivers Act (WSRA) involves a threshold determination of eligibility, a further assessment of suitability of eligible rivers, and Congressional action. BLM has already assessed the eligibility of rivers 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) (see Section 3.5.9 and Map 14).

For analytical purposes, Alternatives II, III, and IV assume that 8 streams have been found suitable for inclusion in the NWSRS. These alternatives therefore contain measures to protect the 7,883 acres and 24 miles of stream corridors found to be eligible. The principal method of protection for identified "outstandingly remarkable values" (ORVs) is an NGD/NSO that would apply to all ground-disturbing activities within the corridors.

BLM's policy is to protect the values contained within the eligible stream segments until the suitability analysis has been conducted and Congress has acted. However, for purposes of analysis, this RMPA/EIS assumes that no special protection is provided by Alternatives I or V. Alternative I would continue current management, while Alternative V assumes that the streams are either (a) found to be unsuitable for designation or (b) found to be suitable but not designated as WSRs by Congress.

4.5.9.1 Alternative I

This alternative assumes that no eligibility determinations have been made in the RPPA and continues current management. No specific measures would be put in place to protect ORVs in the eligible streams. However, since no oil and gas leasing would occur atop the plateau, the only impacts to eligible streams would be associated with current management actions and existing land uses. Because the NOSR withdrawals would remain in place, entry under the 1872 Mining Law would also continue to be prohibited. Precluding oil and gas leasing or mineral activities eliminates a potentially major source of adverse impacts on water quality and related stream values. However, the extensive road system already in existence, the unregulated nature of OHV use, and the continuation of current grazing practices are likely to contribute to a gradual decline in ORVs for streams atop the plateau.

Scenic Value

East Fork Parachute Creek, including the falls and box canyon, is the only stream segment evaluated that was found to have an ORV for scenic quality. This stream would be very likely to retain its outstanding scenic quality under Alternative I because large-scale development of oil and gas would not occur in this watershed. Activities that could continue, such as motorized and mechanized travel, livestock grazing, and dispersed recreation, would not affect scenic quality. However, motorized travel and/or development on adjacent private lands within the lower box canyon could affect scenic values.

Fisheries Values

The populations of genetically pure Colorado River cutthroat trout in five of the eligible streams would continue to be at some risk because of habitat degradation brought about by livestock grazing. Overuse of the riparian zone by livestock reduces protective vegetation cover and increases soil disturbance, water temperature, and turbidity.

Botanical/Ecological Values

Seven of the 31 stream segments evaluated as WSRs support rare or imperiled plant communities (Table 3-31). These would not be protected under Alternative I; some would be at risk from livestock grazing and unregulated OHV activity.

Indirect, Offsite, and Cumulative Impacts

The cumulative effect of this alternative on the preliminary eligibility classification of Roan Plateau streams would be low in the short term because the classification would probably be maintained. The scenic ORV would remain intact; fisheries and botanical/ecological ORVs would be subject to continuing, low-level, dispersed impacts but would also remain. Over the long term, the cumulative effect could be moderate to major due to loss of the preliminary classification in one or more of the stream segments. While the scenic ORV would probably remain intact, the fisheries and botanical/ecological ORVs could eventually decline to the point that they are no longer found in all of the stream segments.

4.5.9.2 Alternative II

This alternative would protect the 8 streams, representing a combined 7,883 acres and 24 miles of stream length found to be eligible for designation as WSRs. The principal method of protection for identified ORVs is an NGD/NSO designation that applies to all ground-disturbing activities in the WSR corridors (Maps 3 and 4).

Most areas adjacent to the WSR corridors in the Trapper Creek and East Fork Parachute Creek ACECs are also protected by an additional NGD/NSO designation aimed at protecting visual quality. Some portions of the uppermost tributary reaches are protected by SSR/CSU designation; upland areas in portions of the watersheds outside the ACECs would be subject to special mitigation measures (as LNs or COAs) to protect water quality and aquatic habitat (see Section 4.2.4). Because the ACEC boundaries generally extend well beyond the stream corridors, the streams and their corridors are protected not only from direct impacts but also from indirect effects of ground-disturbing activities outside the corridors. Supporting management of livestock grazing and motorized and mechanized travel under this alternative would further reduce impacts on soils and vegetation that could affect ORVs.

The East Fork Parachute Creek WSR area has another layer of protection because it is almost entirely within the boundaries of an area identified as having wilderness character and thus subject to the protective management prescription in Appendix G.

It is expected that scenic, fisheries, and ecological/botanical values would be preserved by the protective stipulations applied to WSR-eligible stream segments in addition to the protective management provided for the other special designations noted above.

Scenic Value

East Fork Parachute Creek, including the falls and box canyon, would retain its outstanding scenic quality under Alternative II because of the limited amount of oil and gas development in the associated viewshed. Existing activities that could continue, such as livestock grazing and dispersed recreation, would have some impacts but would not affect scenic quality. The restriction of activities that could continue, such as motorized and mechanized travel on designated routes, would also reduce impacts on scenic quality. However, new impacts on private lands within the same scenic viewshed could degrade overall ORV scenic values.

Fisheries Values

The populations of genetically pure Colorado River cutthroat trout in 5 of the streams that were found to be eligible would be enhanced and subject to reduced risk under this alternative. The NGD/NSO designation for the WSR corridors and complementary protection outside the corridors would prevent major ground-disturbing activities, while the Trapper/Northwater WMA would provide additional management flexibility for protecting the watershed. Supporting management of livestock grazing and restrictions on motorized and mechanized travel would reduce impacts on soils and vegetation, resulting in improved fish habitat.

Botanical/Ecological Values

The seven WSR-eligible stream segments with rare or imperiled plant communities (Table 3-31) would be protected under this alternative by the stream corridor NGD/NSO and complementary protection outside the corridors. These measures and supporting management of livestock grazing and motorized and mechanized travel would combine to enhance the significant plant communities and ensure their long-term viability.

Indirect, Offsite, and Cumulative Impacts

The cumulative effect of Alternative II on the preliminary eligibility classification of Roan Plateau streams would be to ensure that the classification is maintained until Congress makes a determination.

4.5.9.3 Alternative III – Preferred Alternative

Like Alternative III, this alternative would protect the 8 rivers and corridors (a total of 7,883 acres and 24 stream miles) found to be eligible for designation as WSRs. The principal method of protection for identified ORVs is an NGD/NSO designation that would apply to all ground-disturbing activities within the eligible stream corridors. Compared to Alternative II, Alternative III would have narrower NGD/NSO zones along the streams and rely on SSR/CSU designations and special mitigation measures to protect the watershed (Maps 5 and 6). However, the entire Parachute Creek drainage atop the plateau would be included in a WMA, providing flexibility for protective management across the watershed.

While not as restrictive as NGD/NSO, an SSR/CSU designation nonetheless provides considerable management authority to prevent or mitigate impacts to the streams, riparian corridors, and other portions of the watershed. The greater use of SSR/CSU instead of NGD/NSO would probably result in some increase in indirect impacts on the WSR corridors from adjacent areas and tributaries. Impacts from motorized and mechanized travel are not likely, due to the restriction to designated routes. Supporting management of livestock grazing would further reduce impacts on soils and vegetation.

Additionally, 9,006 acres with roadless and naturalness would be protected under Alternative III by NGD/NSO stipulations not subject to modification, waiver, or exceptions, for other values in these areas (Map 36).

One of the key features of Alternative III is that leasing and drilling for oil and gas atop the plateau would not occur until 80 percent of anticipated wells below the rim have been drilled. While the estimated 16-year deferral period would not affect the WSR-related protections described above, the overall character of the upper plateau would be essentially unchanged for most of the 29-year period of analysis.

Scenic Value

East Fork Parachute Creek, including the falls and box canyon, would retain its outstanding scenic quality under Alternative III due to the limited amount of oil and gas development atop the plateau. However, new impacts on private lands within the scenic viewshed could degrade overall ORV scenic values.

Fisheries Values

The populations of genetically pure Colorado River cutthroat trout in five of the streams that were found to be eligible as WSRs (Trapper, Northwater, East Fork Parachute, East Middle Fork Parachute, and JQS) would be at reduced risk under this alternative. The NGD/NSO stipulation in the WSR corridors would prevent any major ground-disturbing activities in those corridors. Supporting management of livestock grazing and motorized and mechanized travel, as well as the management related to the Parachute Creek WMA, would have direct and indirect benefits to fish habitats by reducing impacts to soils and vegetation in the corridors and watersheds.

Botanical/Ecological Values

The 7 WSR eligible stream segments with rare or imperiled plant communities would be largely protected under this alternative by the stream corridor NSO. Those measures and supporting management of livestock grazing and motorized and mechanized travel would combine to ensure the long-term viability of those plant communities.

Indirect, Offsite, and Cumulative Impacts

The cumulative effect of this alternative on the preliminary eligibility classification of Roan Plateau streams would be to ensure the maintenance of that classification pending Congressional determination.

4.5.9.4 Alternative IV

This alternative would also protect the 8 rivers and corridors (a total of 7,883 acres and 64 stream miles) that have been found to be eligible for designation as WSRs, as well as the East Fork Parachute Creek and Trapper/Northwater Creek ACECs. The principal method of protection is application of NGD/NSO stipulations to activities proposed or anticipated in these areas. Compared to Alternative II, however, Alternative IV would have narrower NGD/NSO zones along the streams and rely on SSR/CSU and special mitigation designations to protect the watersheds (Maps 7 and 8).

While not as restrictive as NGD/NSO, the SSR/CSU designation provides considerable management authority to prevent or mitigate impacts on streams, riparian corridors, and other portions of the watersheds. The greater reliance on SSR/CSU protection than Alternative II would probably result in some increase in indirect impacts on the WSR corridors from adjacent areas and tributaries. Impacts from motorized and mechanized travel are not likely, due to the restriction to designated routes. Supporting management of livestock grazing would further reduce impacts on soils and vegetation.

Scenic Value

East Fork Parachute Creek, including the falls and box canyon, would retain its outstanding scenic quality under Alternative IV because of the limited amount of oil and gas development atop the plateau. However, new impacts on private lands within the scenic viewshed may degrade the overall ORV scenic values.

Fisheries Values

The populations of genetically pure Colorado River cutthroat trout in five of the streams that were found to be eligible as WSRs (Trapper, Northwater, East Fork Parachute, East Middle Fork Parachute, and JQS) would be at reduced risk under this alternative. The NGD/NSO stipulation in the WSR corridors would prevent any major 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. However, protection in the adjacent and watersheds would be less than Alternatives II and III due to the lack of a WMA designation.

Botanical/Ecological Values

The seven WSR eligible stream segments with rare or imperiled plant communities would be largely protected under Alternative IV by the stream corridor NGD/NSO. Those measures and supporting management of livestock grazing, restrictions on motorized and mechanized travel would combine to ensure the long-term viability of the rare or imperiled plant communities.

Indirect, Offsite, and Cumulative Impacts

The cumulative effect of this alternative on the preliminary eligibility classification of Roan Plateau streams would be the maintenance of that classification until a determination by Congress has been made.

4.5.9.5 Alternative V

For the purpose of analysis, this alternative assumes that none of the eligible stream corridors is suitable for designation as WSR or, if suitable, that Congress declines to enact the designation. In reality, BLM is required by the WSRA to provide protection for the 8 eligible streams until that time.

Some of the protections afforded the streams and corridors in Alternatives II through IV are also components of Alternative V. Although this alternative does not include specific NGD/NSO protection for the full width of the WSR corridors, other NGD/NSO designations for riparian/wetland zones and high risk fish habitat which would protect some portions of the corridors. Additionally, several SSR/CSU designations are aimed at minimizing impacts to BLM sensitive plants and significant plant communities, other plant habitat at high risk, and fish habitat at moderate risk. Motorized and mechanized travel would be limited to designated roads and trails, excepting over-snow travel by snowmobile. This restriction would have minimal impact on ORVs. However, grazing management specifically in support of the WSR corridors would not occur, posing some elevated risk of degradation of water quality and watershed vegetation.

Scenic Value

East Fork Parachute Creek, including the falls and box canyon, would be somewhat less likely to retain its outstanding scenic quality than under Alternatives II through IV because more substantial oil and gas development could occur within view of segments of the canyon on both public and private lands, although not in the canyon itself. Activities that could continue, including livestock grazing, motorized and mechanized travel on designated routes, and dispersed recreation would have impacts but on a scale that would not affect scenic quality.

Fisheries Values

The populations of genetically pure Colorado River cutthroat trout in five of the streams that were found to be eligible as WSRs (Trapper, Northwater, East Fork Parachute, East Middle Fork Parachute, and JQS) would continue to be at risk (as they are under current conditions and Alternative I) due to habitat degradation resulting from livestock grazing and permitted ground-disturbing activities adjacent to the riparian zones and in the tributaries of the WSR-eligible segments. Surface disturbance in the watersheds from management activities and overuse of the riparian zone by livestock reduce protective vegetation cover and increase soil erosion, causing higher water temperature and increased turbidity.

Botanical/Ecological Values

The seven WSR-eligible streams with rare or imperiled plant communities would not receive the same protection under Alternative V as under Alternatives II through IV but would still receive indirect protection from the riparian and fish habitat NGD/NSO and a variety of SSR/CSU designations..

Indirect, Offsite, and Cumulative Impacts

The cumulative effect of this alternative on the preliminary eligibility classification of Roan Plateau streams would be low in the short term, because the classification would probably be maintained. The scenic ORV would be likely to remain intact, and the fisheries and botanical/ecological ORVs would undergo continuing, low-level dispersed impacts but also remain in place. However, over the long term, the cumulative effect could be minor to moderate adverse impacts because the preliminary classification could be lost in one or more of the currently eligible stream segments. Although limitations on ground-disturbing activities adjacent to the eligible streams and the restrictions on OHV travel would reduce impacts on the fisheries and ecological/botanical values of the eight WSR-eligible streams, the level of protection would be less than under Alternatives II through IV. Furthermore, the proximity of oil and gas development or other surface disturbances in portions of the watersheds could compromise the preliminary classifications.

4.5.10 Forest Products

This RMPA/EIS assumes no management actions for forest products. All 5 alternatives propose 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 were sought, 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

Wildland fire management and prescriptive vegetation treatments are tools to alter vegetation communities to achieve beneficial resource outcomes. Due to different management prescriptions proposed under the five alternatives in this RMPA/EIS, reclassification of the fire management zones (FMZs) will be necessary, as described below. The following discussion focuses on how wildland fire management and prescriptive vegetation management would change to achieve resource objectives by alternative. For a definition of FMZs A through D, please see Table 3-32 in Section 3.5.11.3.

4.5.11.1 Alternative I

Under Alternative I, current wildland fire management direction, suppression guidelines, and general guidance for prescribed vegetation treatments as identified in the GSFO and WRFO Fire Management Plans (FMPs) would stay in place. Thus, approximately 25 percent of BLM lands in the Planning Area would remain in FMZ B, 30 percent in FMZ C, and 45 percent in FMZ D (Map 38).

Top of the Plateau

The top of the plateau would continue to be managed as FMZ D. If predetermined criteria are met, fires could be managed under a Wildland Fire Use (WFU) strategy to achieve desired objectives such as improving vegetation, wildlife habitat, or watershed conditions. Under a suppression strategy, wildland fires are managed using the appropriate management response commensurate with predetermined constraints (negative effects to values and zone goals); they are contained within natural or man-made barriers/firebreaks. FMZ D areas have the lowest priority for suppression in a multiple fire situation. Within the GSRA, no more than 50 percent of the area in this zone 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. Restrictions for commercial wood product (CWP) areas would also apply.

Northeast Cliffs and Southeast Cliffs

The GSFO FMP 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, and the old-growth Douglas-fir community. Wildland fires would continue to be managed using the appropriate management response commensurate with predetermined constraints. Management strategies try 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 zone burning over a 10-year period. Wildland fire suppression guidelines apply for northern leopard frogs; wildland fire suppression restrictions for CWP areas also apply.

Lower Elevations along the I-70 Corridor

The lower elevation terrain below the rim would continue to be managed as FMZ B. The GSFO FMP recognizes that fire plays a natural role in the function of the ecosystem. However, in this area an unplanned ignition could have negative effects unless or until some form of mitigation takes place. All wildland fires, regardless of ignition source, would be high priority and promptly suppressed to protect human health. Fire suppression is usually 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. Restrictions for CWP areas and ACECs would also apply. Managers emphasize prevention/mitigation programs that reduce unplanned ignitions and threats to life, property, and natural and cultural resources.

4.5.11.2 Alternative II

Approximately 25 percent of BLM lands in the Planning Area would be managed as FMZ B and 75 percent as FMZ C.

Top of the Plateau

Fire is still a desirable component of the ecosystem under this alternative. However, reclassification and management as FMZ C is more appropriate. This alternative includes 4 ACECs, 8 stream systems that are WSR eligible, and 3 areas having wilderness character that would be managed to protect wilderness values. Although FMZ D is the preferred classification for these resources, changes in management direction combined with potential islands of oil and gas development, private in-holdings, the highly dissected topography atop the plateau, special status species constraints, the historic low occurrence of wildland fire, and seasonally intensive uses such as hunting, make it unrealistic to manage the area as FMZ D.

Ecological and resource constraints, along with human health and safety and other considerations, would be used by the incident commander and subunit line officer to determine the appropriate wildfire suppression response on a case-by-case basis. Wildland fire suppression restrictions from the GSFO FMP for the areas having wilderness character, CWP areas, and ACECs would apply. Areas in this category would generally receive lower suppression priority in multiple wildland fire situations than would areas designated FMZ A or B.

Prescribed vegetation treatments instead of wildland fire use would be used to achieve objectives for vegetation, special status species, habitats that support these species, and watersheds. Fire and non-fire fuels treatments could be used to ensure that constraints are met or to reduce any hazardous effects of unplanned wildland fire. Significant prescriptive fire activity would be expected to help attain desirable resource or ecological conditions. Vegetation treatments for hazard/fuel reduction are of a lower priority than in FMZ B.

Northeast Cliffs and Southeast Cliffs

The Northeast and Southeast Cliffs areas would be managed the same as under Alternative I, i.e., FMZ C.

Lower Elevations along the I-70 Corridor

Lower elevations along the I-70 corridor would be managed the same as under Alternative I, i.e., FMZ B.

4.5.11.3 Alternative III – Preferred Alternative

Approximately 25 percent of BLM lands in the Planning Area would be managed as FMZ B and 75 percent as FMZ C.

Top of the Plateau

The top of the plateau would be managed the same as under Alternative II. Although fire is still a desirable component of the ecosystem, reclassification and management as FMZ C is more appropriate. A major feature of this alternative is that leasing and drilling for oil and gas would not occur atop the plateau until an estimated 16 years into the 20-year period of analysis. The result of the deferral at the higher elevations is twofold: (1) total wells, pads, pipelines, and new or widened access roads would be less than under the generally more protective Alternative II, but (2) the annual drilling rate, once development begins, would be approximately twice that of Alternative II.

During the deferral period, prescriptive fire activity could be used to help attain desirable resource or ecological conditions. Once development on top of the plateau begins, however, the construction of well pads, pipelines, and new or widened access roads would tend to act as firebreaks to prescriptive fires. Therefore, prescriptive vegetation treatments would be a more realistic means of achieving resource objectives.

Northeast Cliffs and Southeast Cliffs

The Northeast and Southeast Cliffs areas would be managed the same as under Alternative II, i.e., FMZ C. Due to the lack of homes and people, the cliff areas would continue to be a lower suppression priority in multiple wildland fire situations, making an FMZ B classification inappropriate.

Lower Elevations along the I-70 Corridor

Lower elevations along the I-70 corridor would be managed the same as under Alternative I, i.e., FMZ B.

4.5.11.4 Alternative IV

Approximately 25 percent of BLM lands in the Planning Area would be managed as FMZ B and 75 percent as FMZ C.

Top of the Plateau

The top of the plateau would be managed the same as in Alternative II. Although fire is still a desirable component of the ecosystem under this alternative, reclassification and management as FMZ C is more appropriate. The increased oil and gas development is the major difference between this alternative and Alternative II.

Road, pad, and pipeline construction has the effect of creating firebreaks that act as barriers to the spread of natural wildfires as well as prescriptive fires. Therefore, prescribed vegetation treatments would be a more realistic means of achieving resource objectives.

Northeast Cliffs and Southeast Cliffs

The Northeast and Southeast Cliffs areas would be managed the same as undedr Alternative II, i.e., as FMZ C. Due to the lack of homes and people, the cliff areas would continue to be a lower suppression priority in multiple wildland fire situations, making an FMZ B classification inappropriate.

Lower Elevations along the I-70 Corridor

Lower elevations along the I-70 corridor would be managed the same as under Alternative I, i.e., FMZ B.

4.5.11.5 Alternative V

Approximately 25 percent of BLM lands in the Planning Area would be managed as FMZ B and 75 percent as FMZ C.

Top of Plateau

The top of the plateau would be managed the same as in Alternative II. Although fire would continue to be a desirable component of the ecosystem, reclassification and management as FMZ C is more appropriate. The change in management direction, with substantial oil gas development and associated construction of roads, pads, and pipelines, means that prescriptive vegetation treatments would be a more realistic means to achieve resource objectives. Due to the lack of homes and people, the top of the plateau would continue to have a lower suppression priority in multiple wildland fire situations, making an FMZ B classification inappropriate.

Northeast Cliffs and Southeast Cliffs

The Northeast and Southeast Cliffs areas would be managed the same as under Alternative II, i.e., FMZ C.

Lower Elevations along the I-70 Corridor

Lower elevations along the I-70 corridor would be managed the same as under Alternative I: FMZ B.

4.5.11.6 Indirect, Offsite, and Cumulative Impacts

The change from FMZ D to FMZ C means that naturally occurring wildland fires would not be managed to achieve targeted resource objectives. Instead, other prescriptive vegetation treatments would be used to accomplish targeted resource management objectives. From an ecological perspective, prescriptive vegetation treatments can be designed to mimic wildland fires and accomplish targeted resource objectives. Large wildland fires can be extremely complex, often with potentially disastrous effects, whereas prescriptive vegetation treatments are planned and designed to minimize the emission of smoke, control the area burned, and maximize benefits to the site.

Site-specific data on the economics of wildland fire use versus vegetation management strategies for the region are lacking. Attempting to derive economic measures for evaluating management strategies is made difficult by inadequate data and the question of what values to include in the analysis. Due to these uncertainties, no quantitative economic analysis is made in this document.

4.5.12 Hazardous Materials

Impacts from hazardous materials would most likely be in the form of discharges of wastestreams from oil and gas development to local water resources. Primary wastestreams from oil and gas extraction are typically those associated with drilling wastes and produced water. This section summarizes potential impacts; see Section 4.2.4 for an evaluation of impacts to water resources from these materials.

Drilling Muds

Drilling muds may contain various contaminants such as mercury, cadmium, arsenic, and hydrocarbons, among others. Drilling mud is typically not removed from the site. Up to 2,000 cubic yards of drilling mud per well may be air-dried and buried at each drill pad. The mud pits are typically unlined, which would allow some seepage. However, to protect sensitive riparian and aquatic habitats within the Planning Area, all operations would be required to either line the burial pits and limit the disturbed area to the area of the pad, or haul the material offsite for disposal in an approved facility.

Produced Water

Produced water is highly saline and may contain other dissolved solids or contaminants. Tanks, wellheads, piping, other structures, evaporation ponds, and transport trucks have the potential to release produced water. This could occur as a result of an accident, tank or pipe failure, or pond breach or failure. To reduce these potential risks — including the presence of dissolved constituents at concentrations harmful to vegetation or above standards for aquatic life and stock watering — drilling operations in watersheds atop the plateau would be required to use a self-contained operation in which the produced water is reused onsite and either disposed onsite by reinjection or offsite by containerized transport to a regulated facility such as Black Mountain.

Other potential releases could result from leaking tanker trucks, onsite tanks, and evaporation ponds. The average wellhead condensate tanks typically hold 300 barrels per wellhead, and produced water tanks generally hold between 200 to 300 barrels per wellhead. Transport trucks range in capacity from 60 to 120 barrels. Produced water typically contains about 10 percent condensate. 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.

Refer to Section 4.2.4 (Water Resources) for a discussion of impacts of these types of spills.

Indirect, offsite, and cumulative impacts may result from hazardous materials spills occurring at facilities not regulated by BLM, including RCRA/Hazardous Waste Notifiers (see Table 3-34). Additionally, the EPA National Response Center (NRC) has been notified of 9 known releases in the study area. Impacts of spills are highly dependent on the type and amount of material, and the location of discharge (see Section 4.2.4 for an impacts analysis of spills).

4.5.13 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 5 alternatives analyzed as part of this RMPA/EIS 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 5 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 (see Table 2-1). It is not known to what extent the construction of numerous (855 to 1,582) wells under Alternatives I through V 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.

- **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, because of the long time period (many decades to centuries) required for full recovery of the natural assemblage of species, habitat components, 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 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 5 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 (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 five alternatives. 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).

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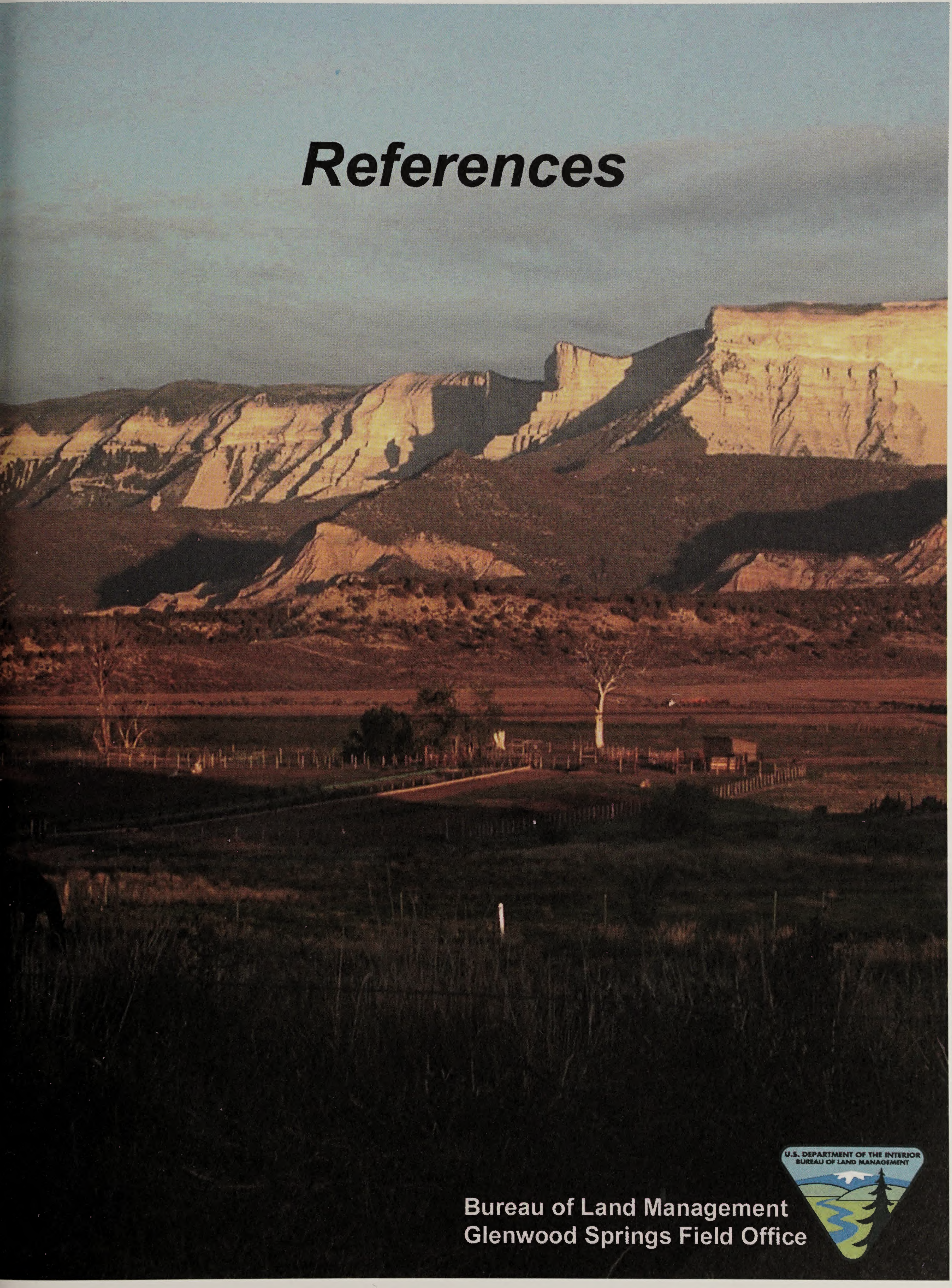

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Glenwood Springs Field Office

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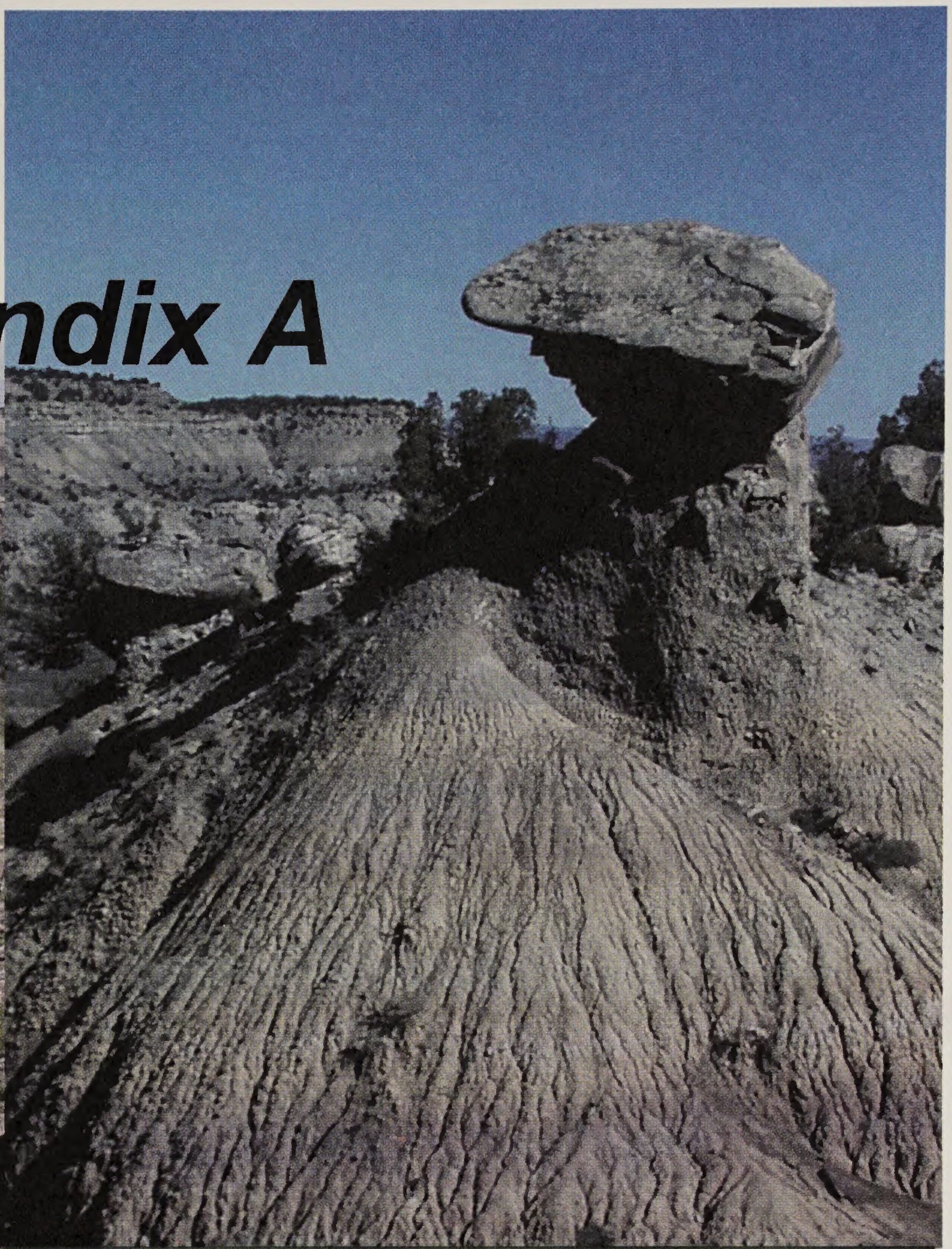
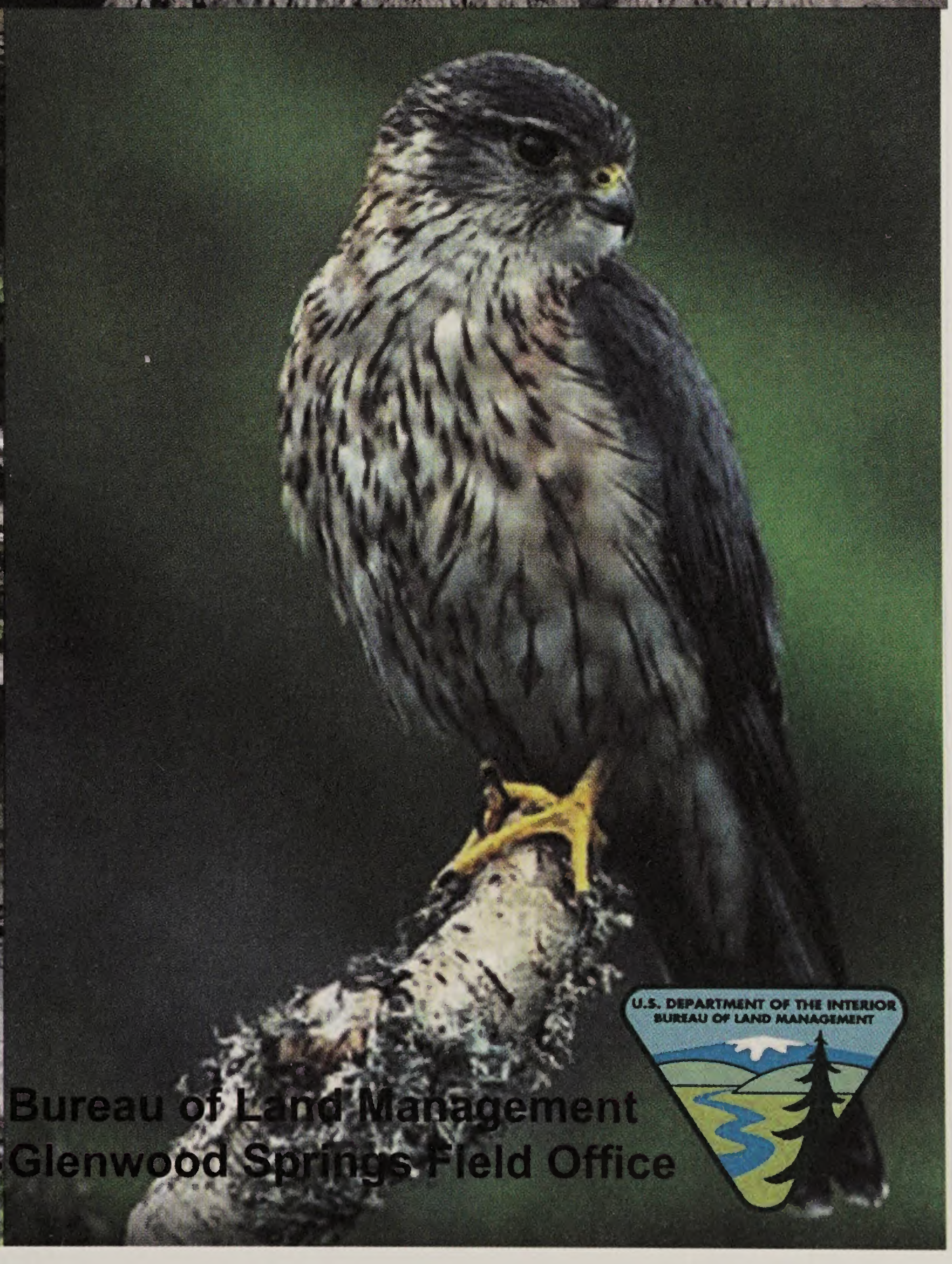
Appendix A





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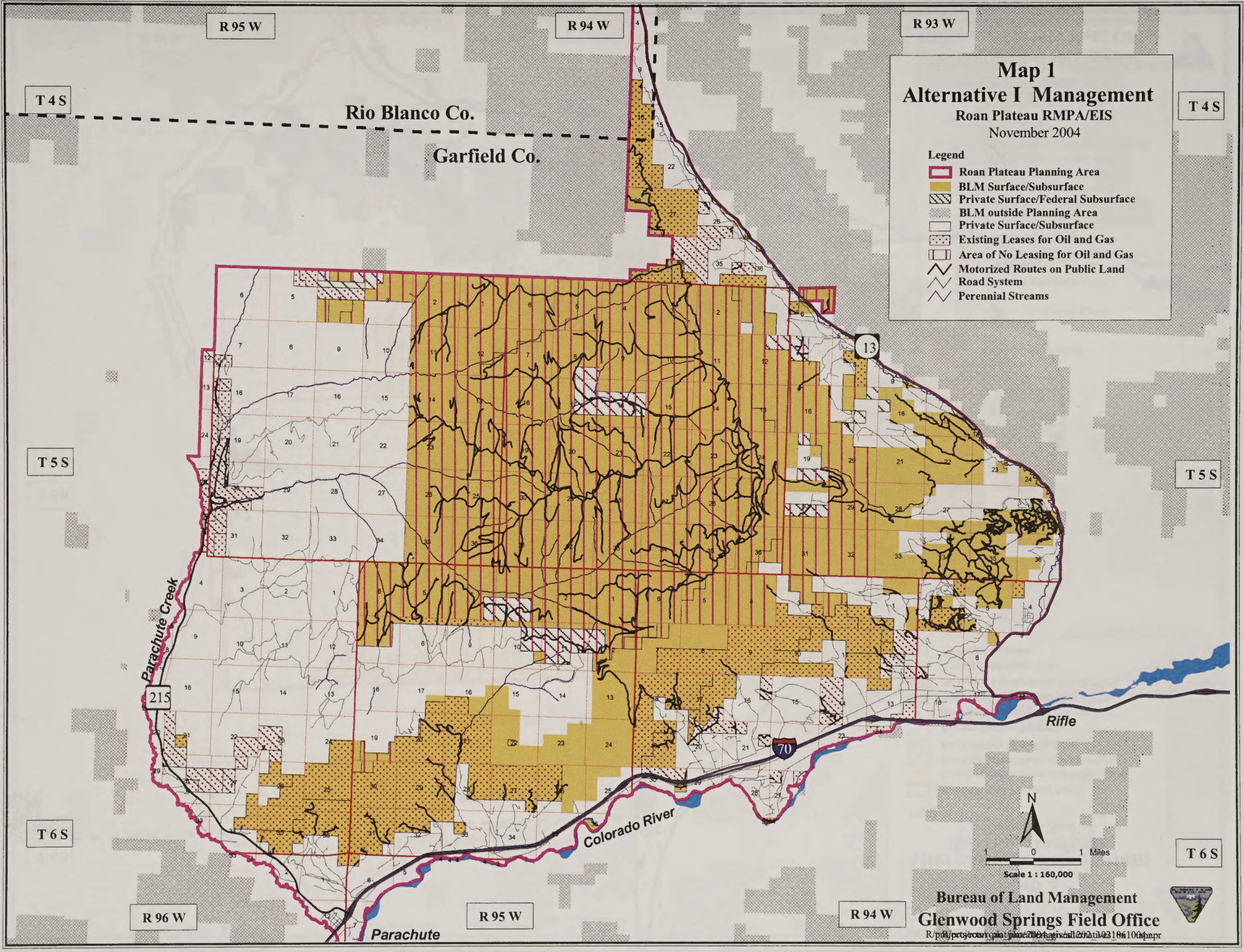
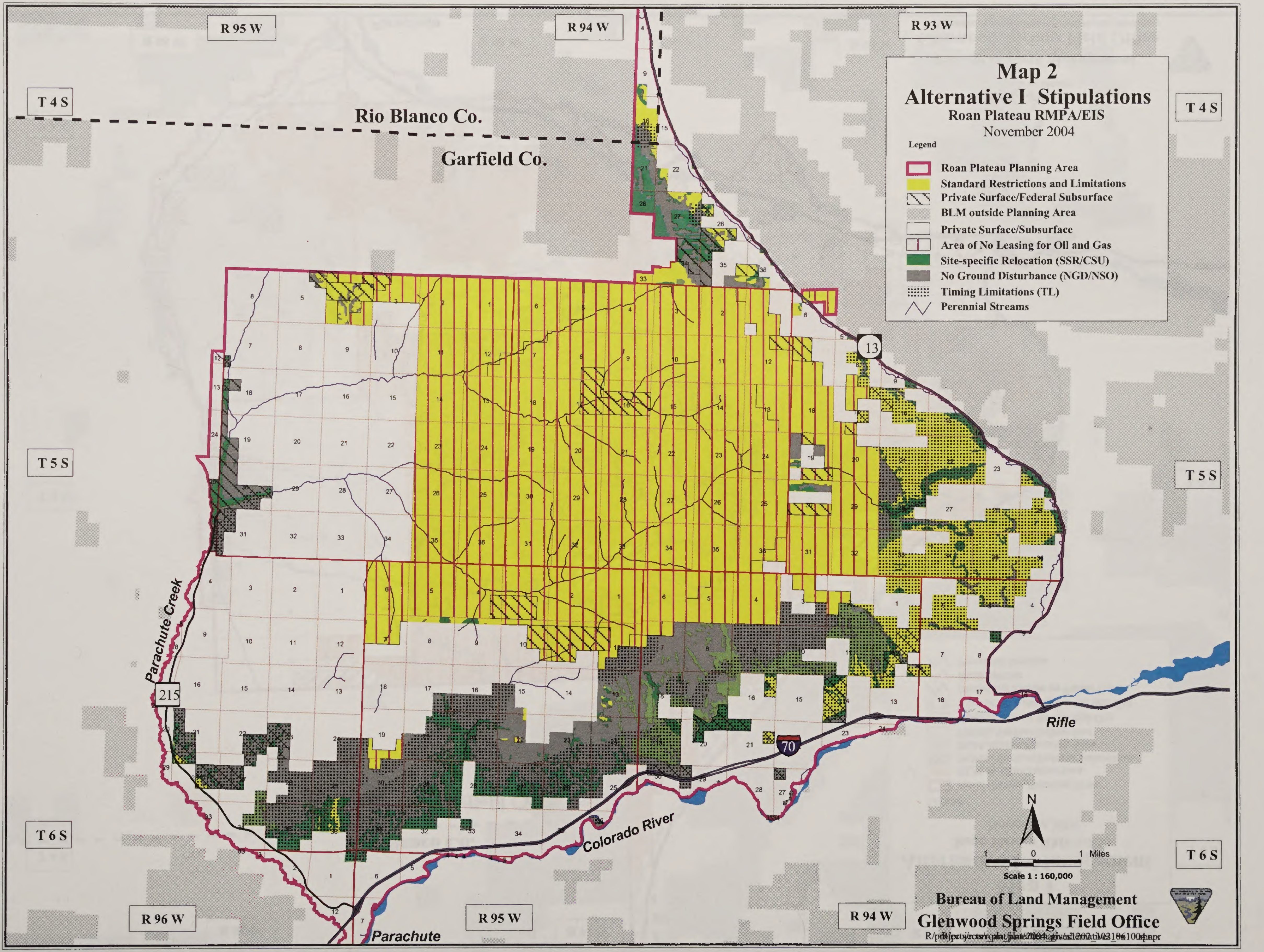


Map 1
Alternative I Management
Roan Plateau RMPA/EIS
November 2004



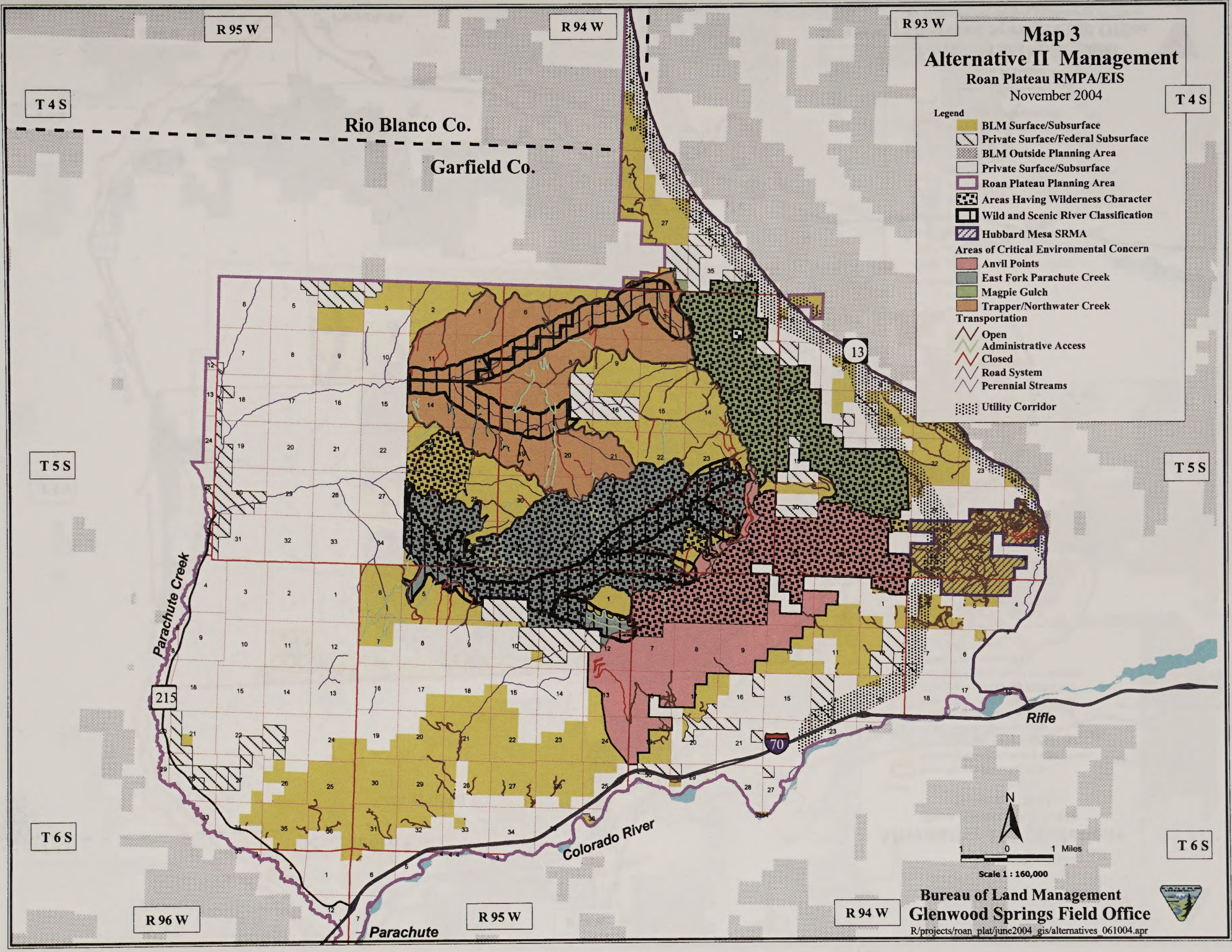
Map 2
Alternative I Stipulations

Roan Plateau RMPA/EIS

November 2004

Bureau of Land Management
Glenwood Springs Field Office

Map 3
Alternative II Management
Roan Plateau RMPA/EIS
November 2004



Bureau of Land Management
Glenwood Springs Field Office
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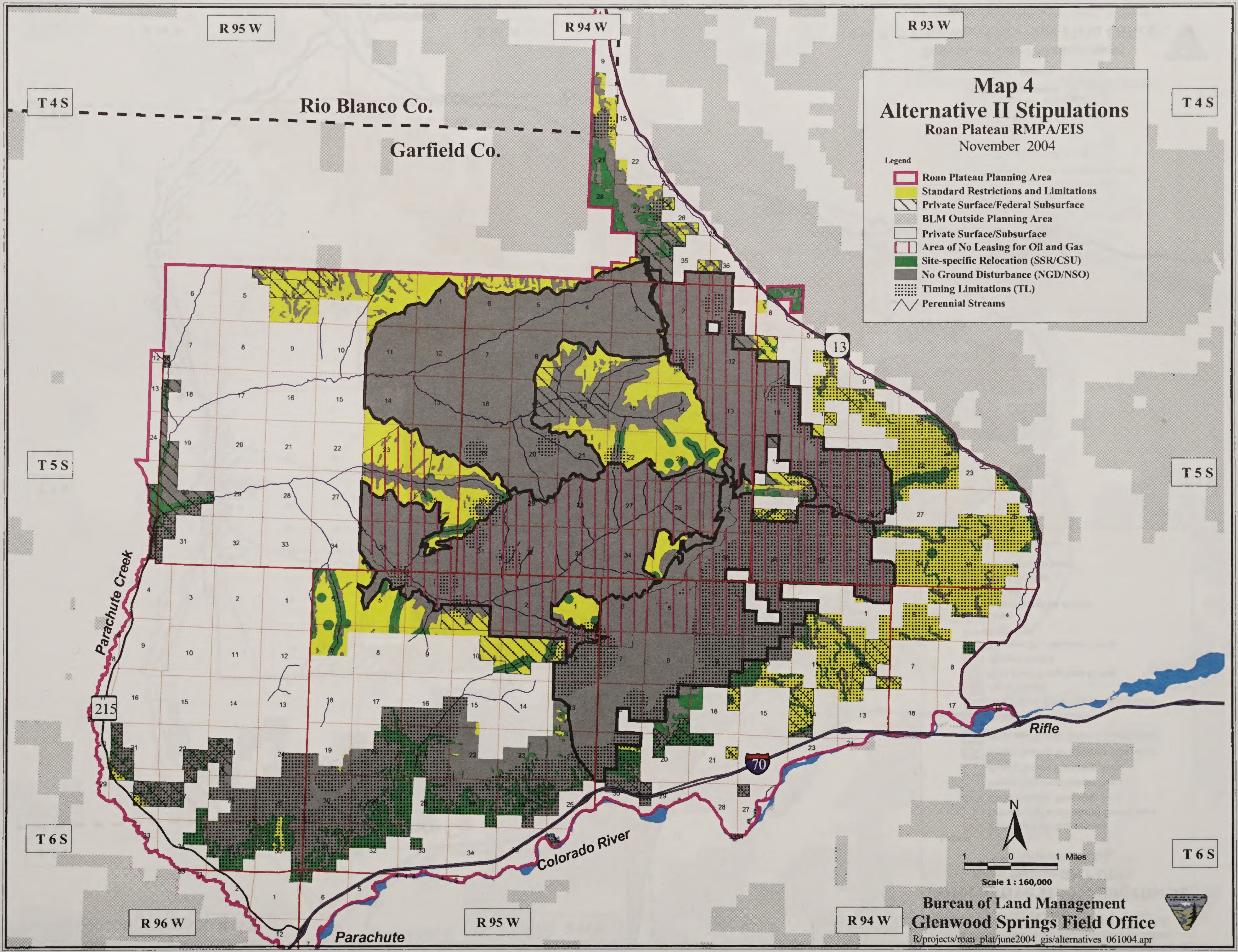


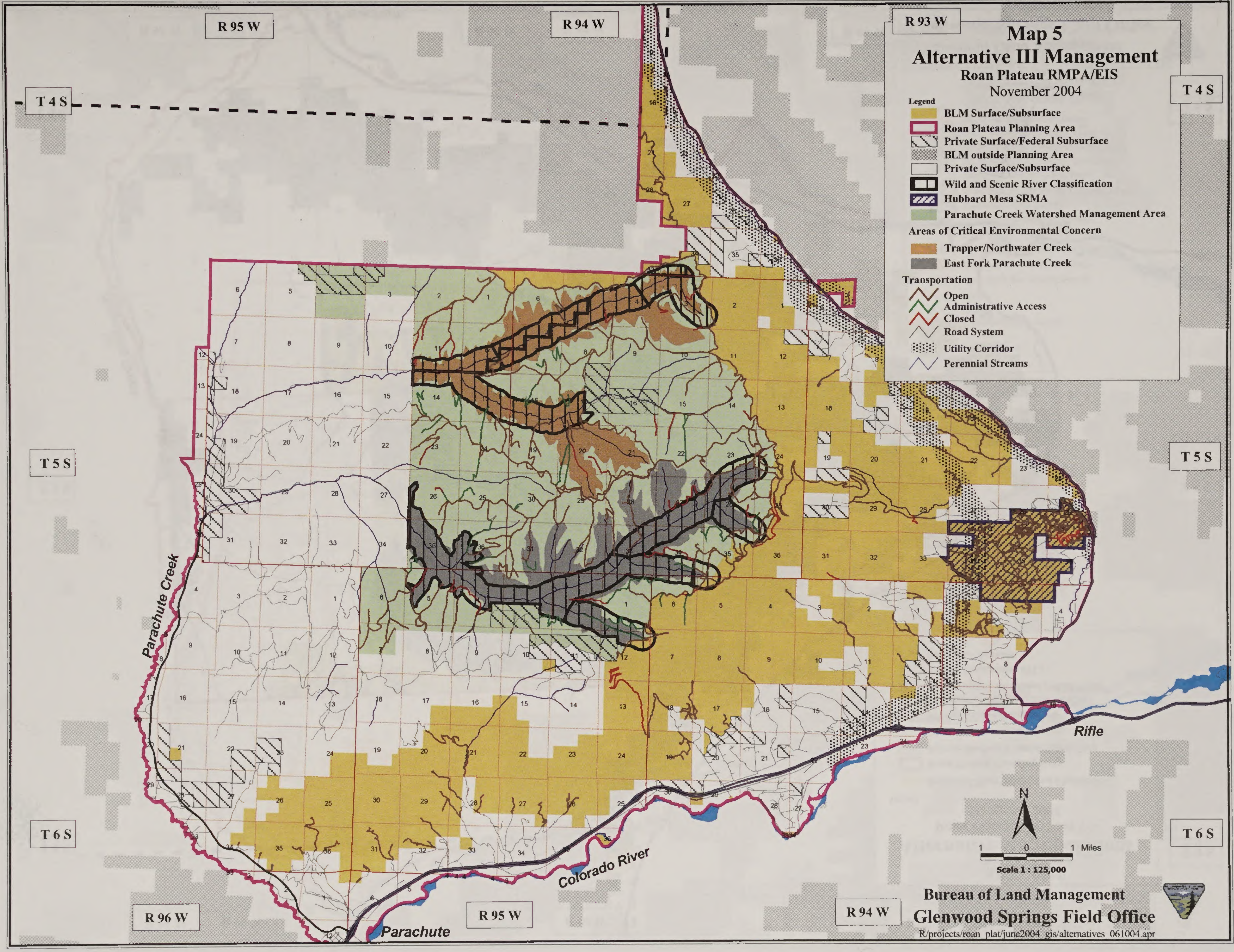
Map 4
Alternative II Stipulations
Roan Plateau RMPA/EIS
November 2004

Legend

- 🟥 Roan Plateau Planning Area
- 🟨 Standard Restrictions and Limitations
- ▨ Private Surface/Federal Subsurface
- ▒ BLM Outside Planning Area
- ☐ Private Surface/Subsurface
- ▥ Area of No Leasing for Oil and Gas
- 🟩 Site-specific Relocation (SSR/CSU)
- ■ No Ground Disturbance (NGD/NSO)
- ⁙ Timing Limitations (TL)
- ╱╲ Perennial Streams

Scale 1 : 160,000

Bureau of Land Management
Glenwood Springs Field Office
R/projects/roan_plat/june2004_gis/alternatives_061004.apr



Map 5
Alternative III Management
Roan Plateau RMPA/EIS
November 2004

Bureau of Land Management
Glenwood Springs Field Office
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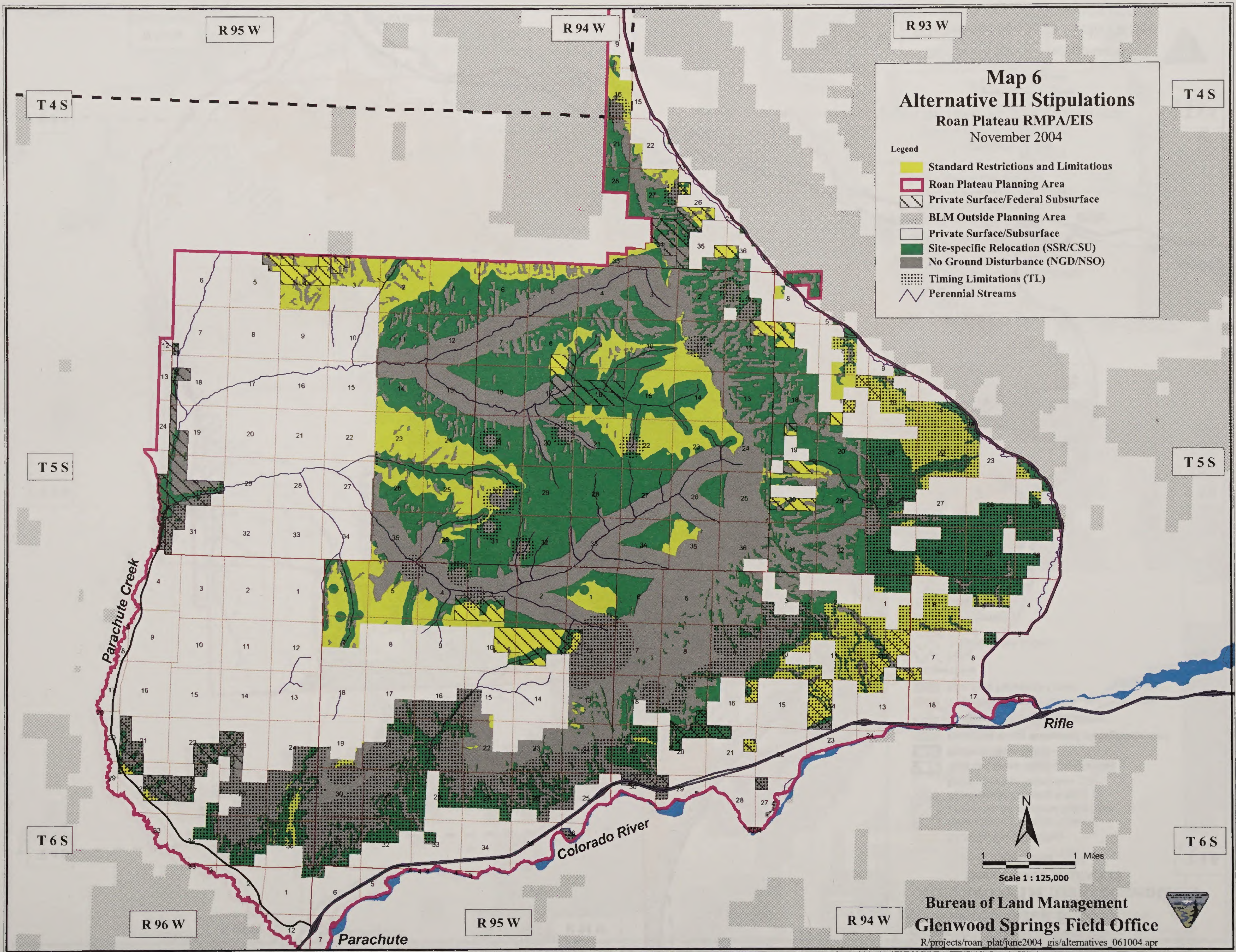

Map 6
Alternative III Stipulations

Roan Plateau RMPA/EIS

November 2004

Bureau of Land Management

Glenwood Springs Field Office

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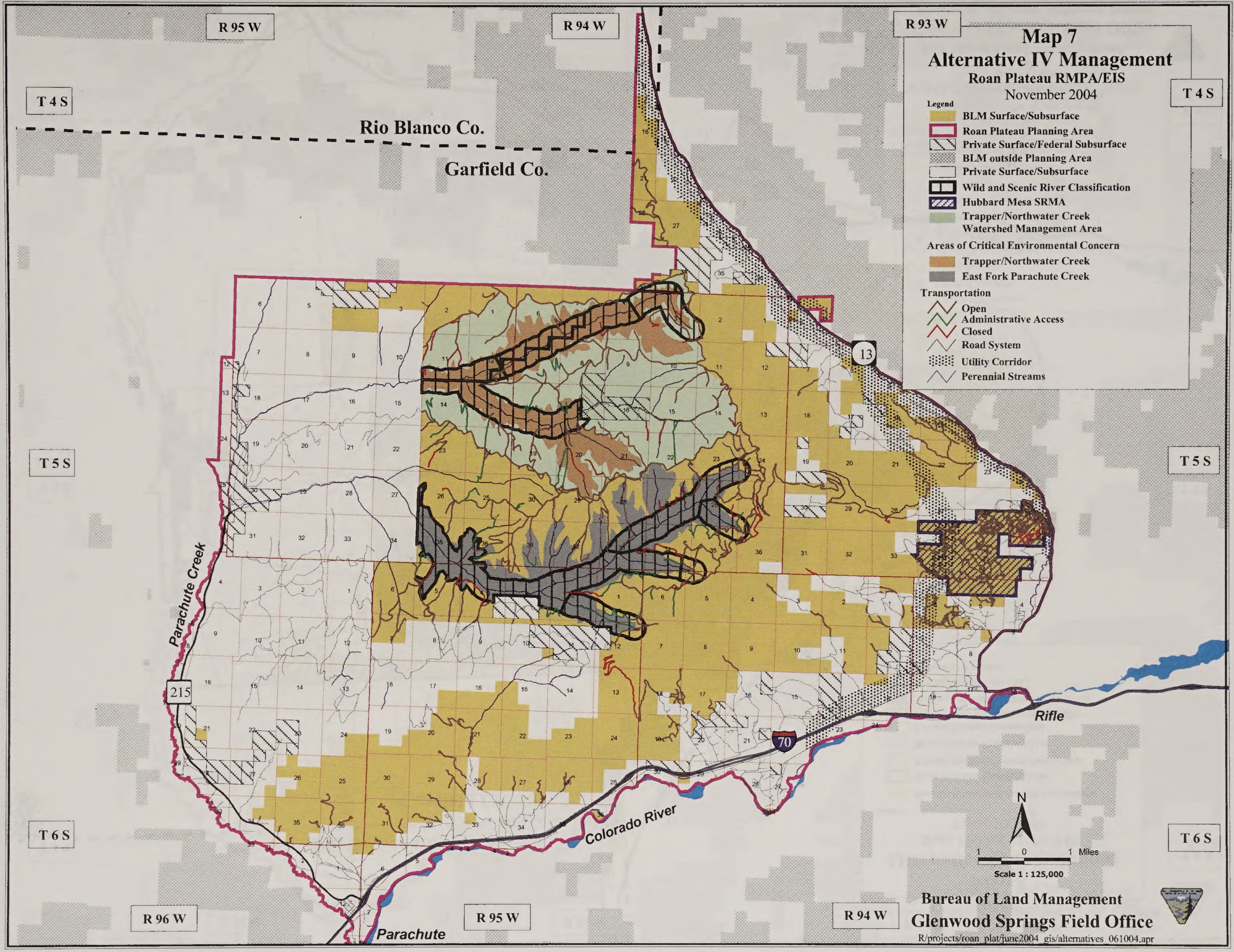

Map 7
Alternative IV Management
Roan Plateau RMPA/EIS
November 2004

Bureau of Land Management
Glenwood Springs Field Office
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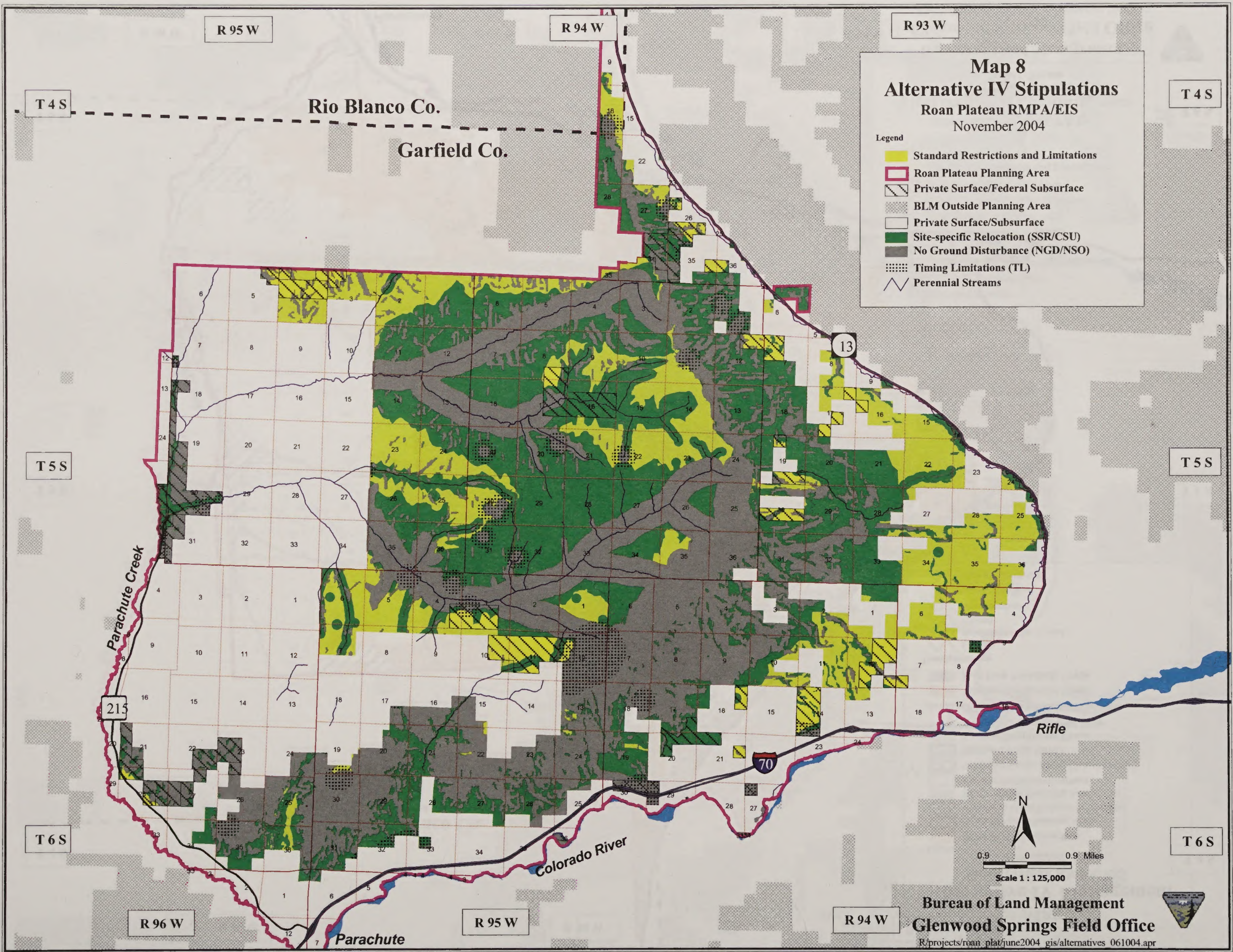

Map 8
Alternative IV Stipulations
Roan Plateau RMPA/EIS
November 2004

Bureau of Land Management
Glenwood Springs Field Office
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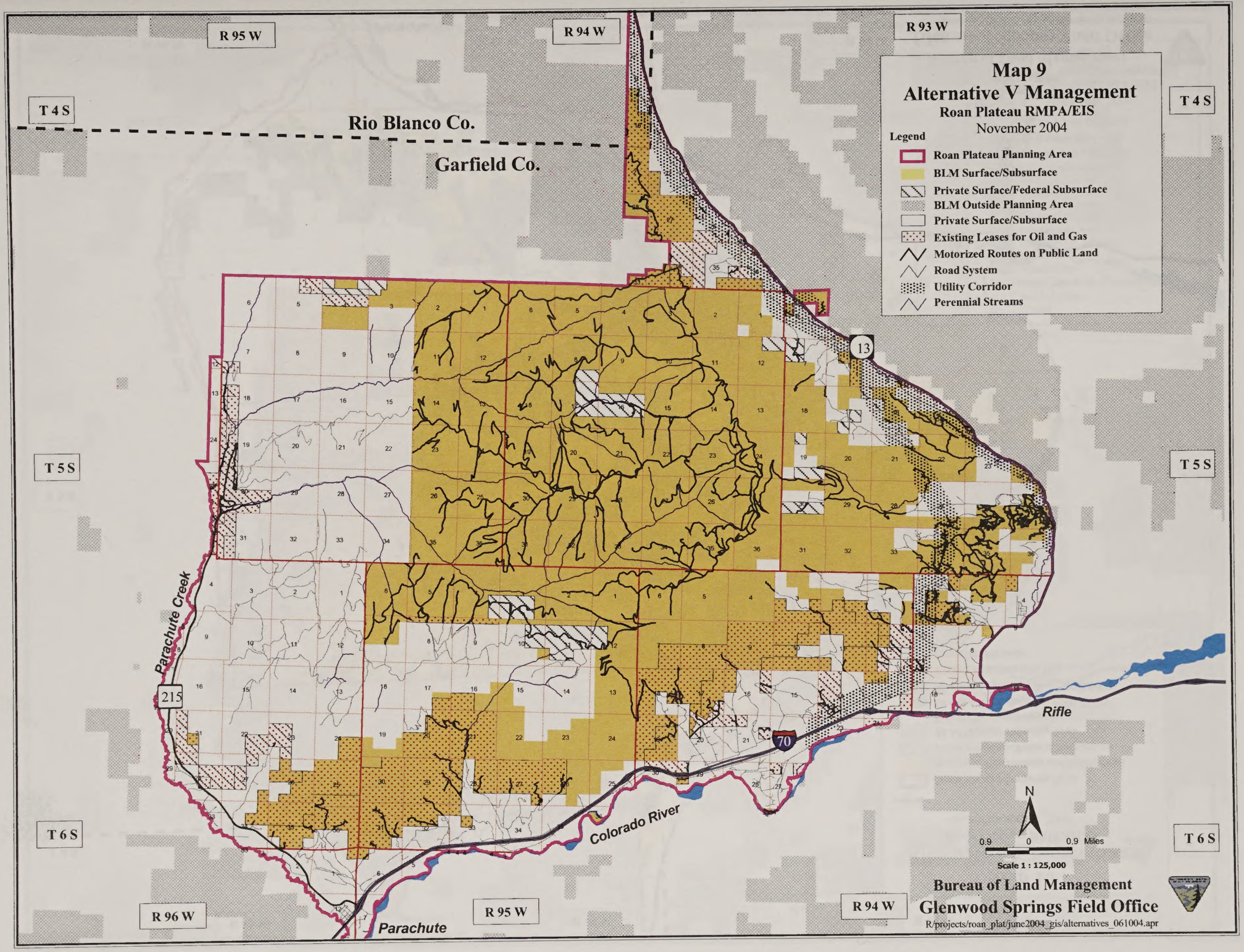

Map 9
Alternative V Management
Roan Plateau RMPA/EIS

November 2004

Bureau of Land Management
Glenwood Springs Field Office

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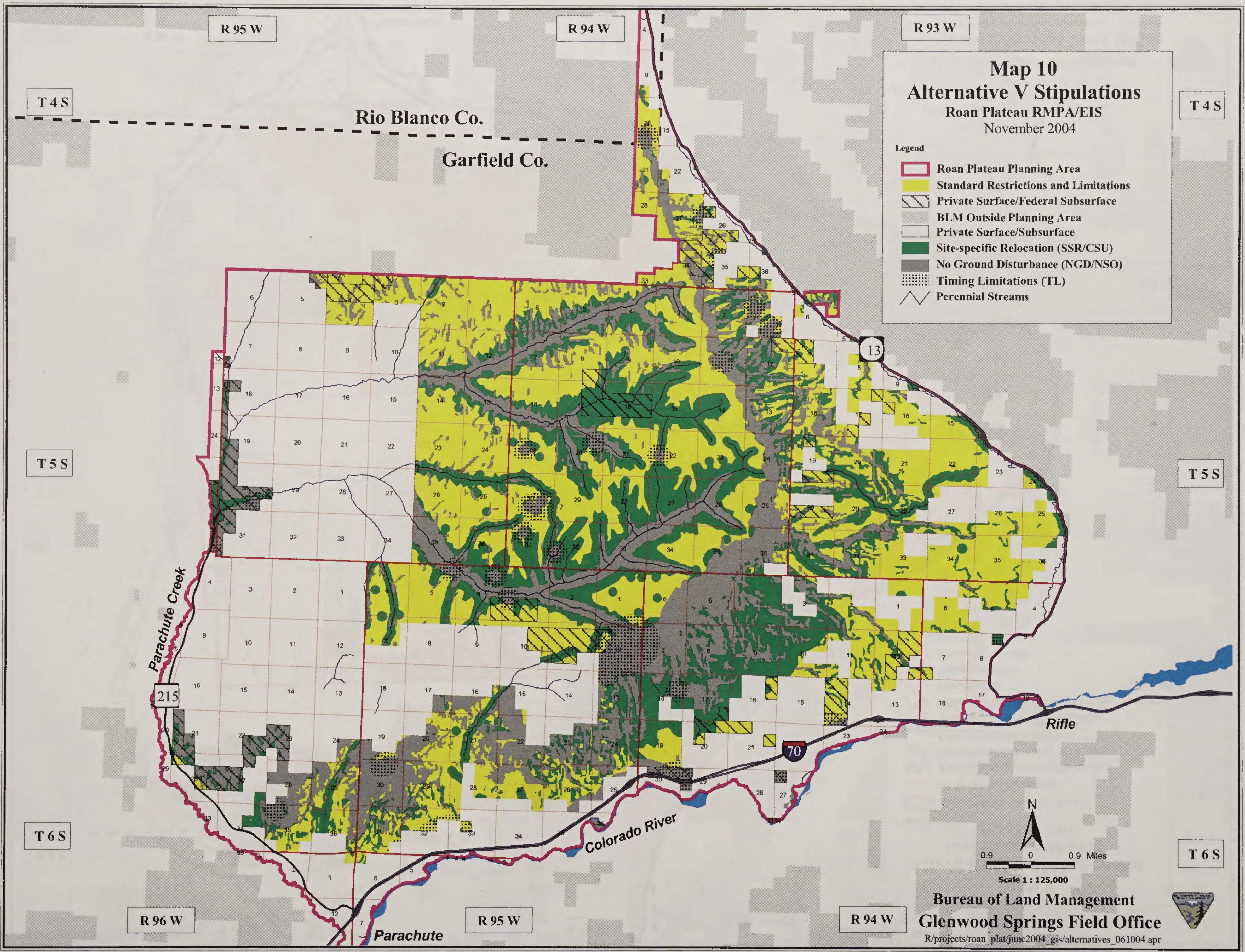
Map 10
Alternative V Stipulations

Roan Plateau RMPA/EIS
November 2004



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Glenwood Springs Field Office
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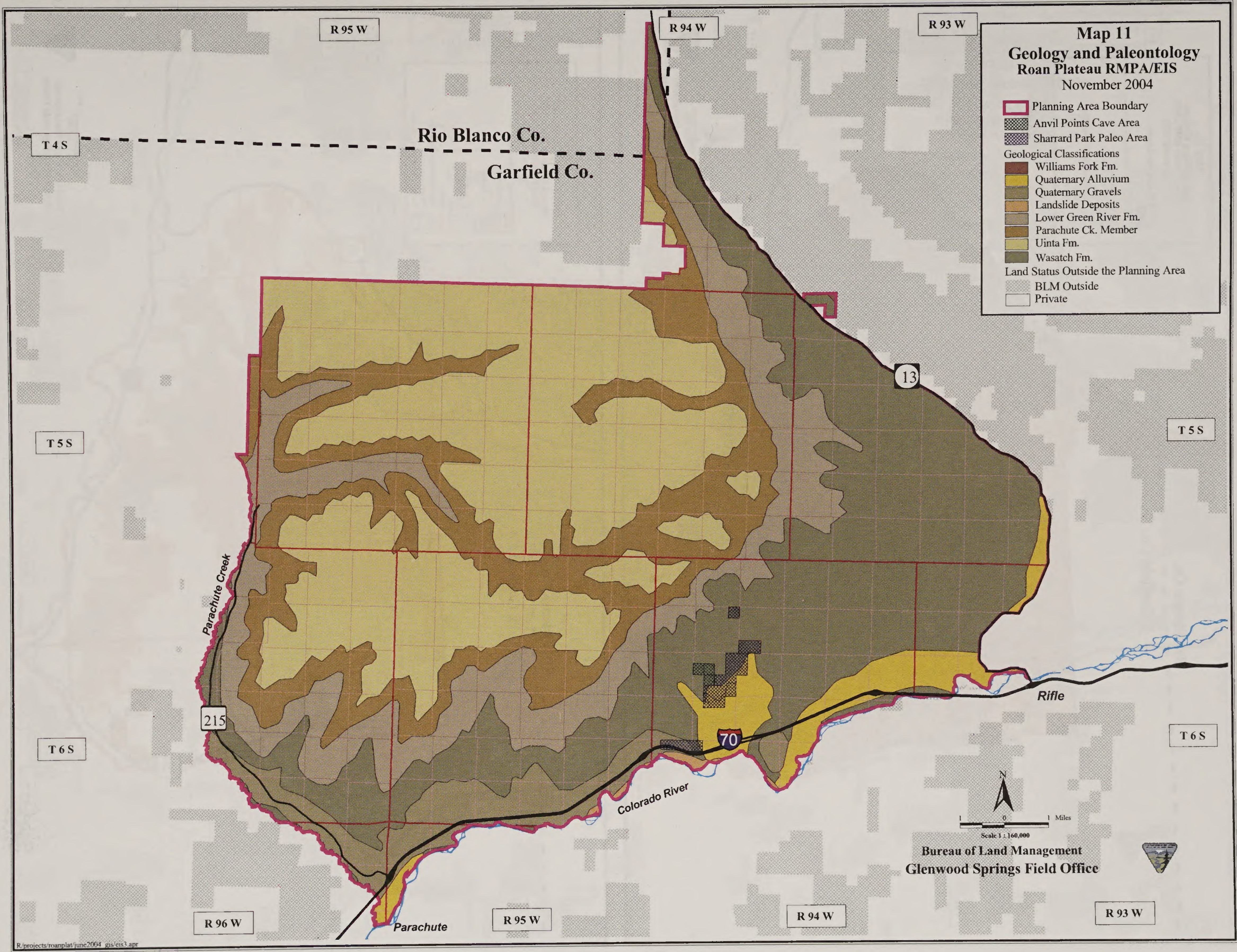
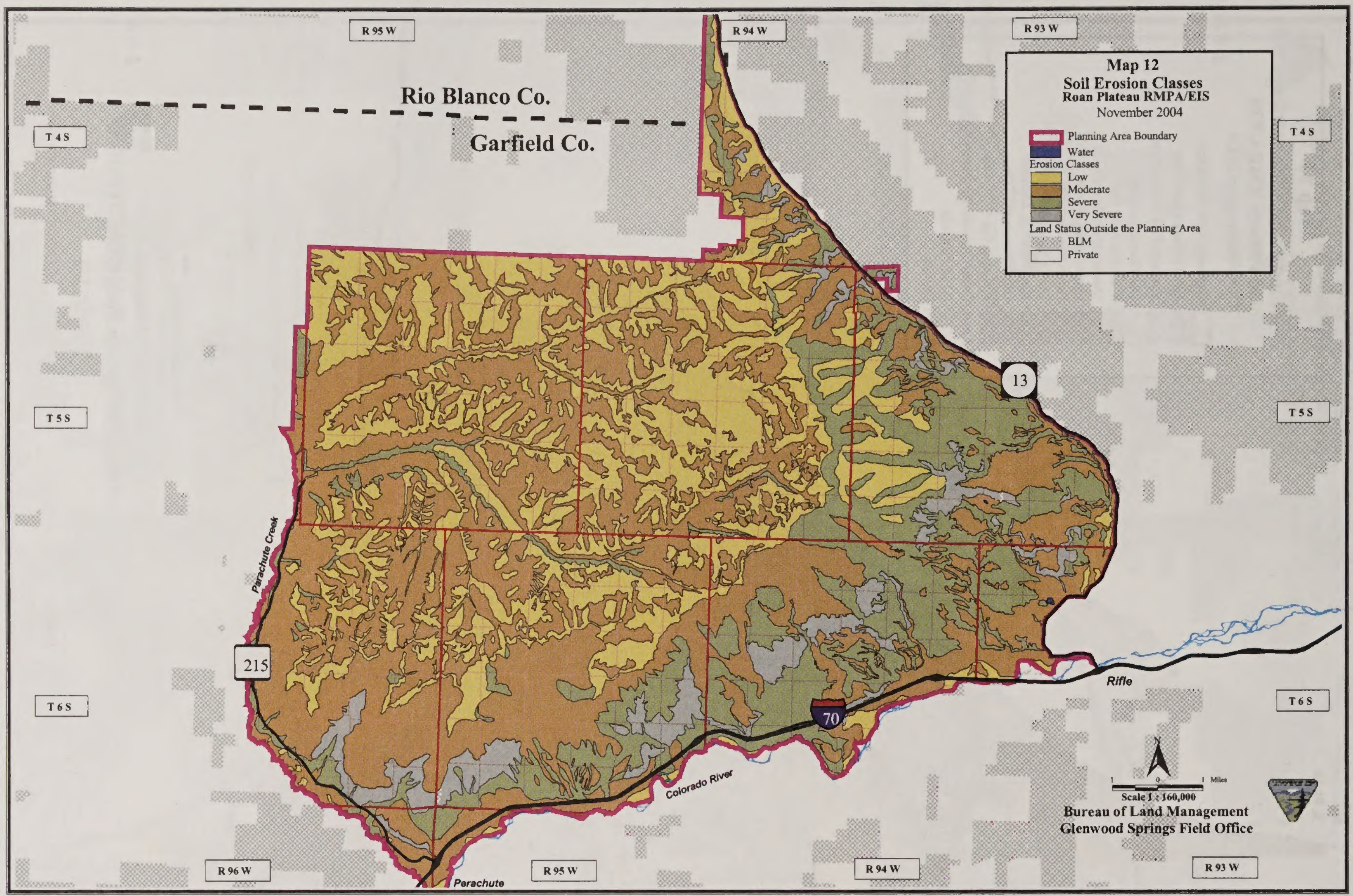
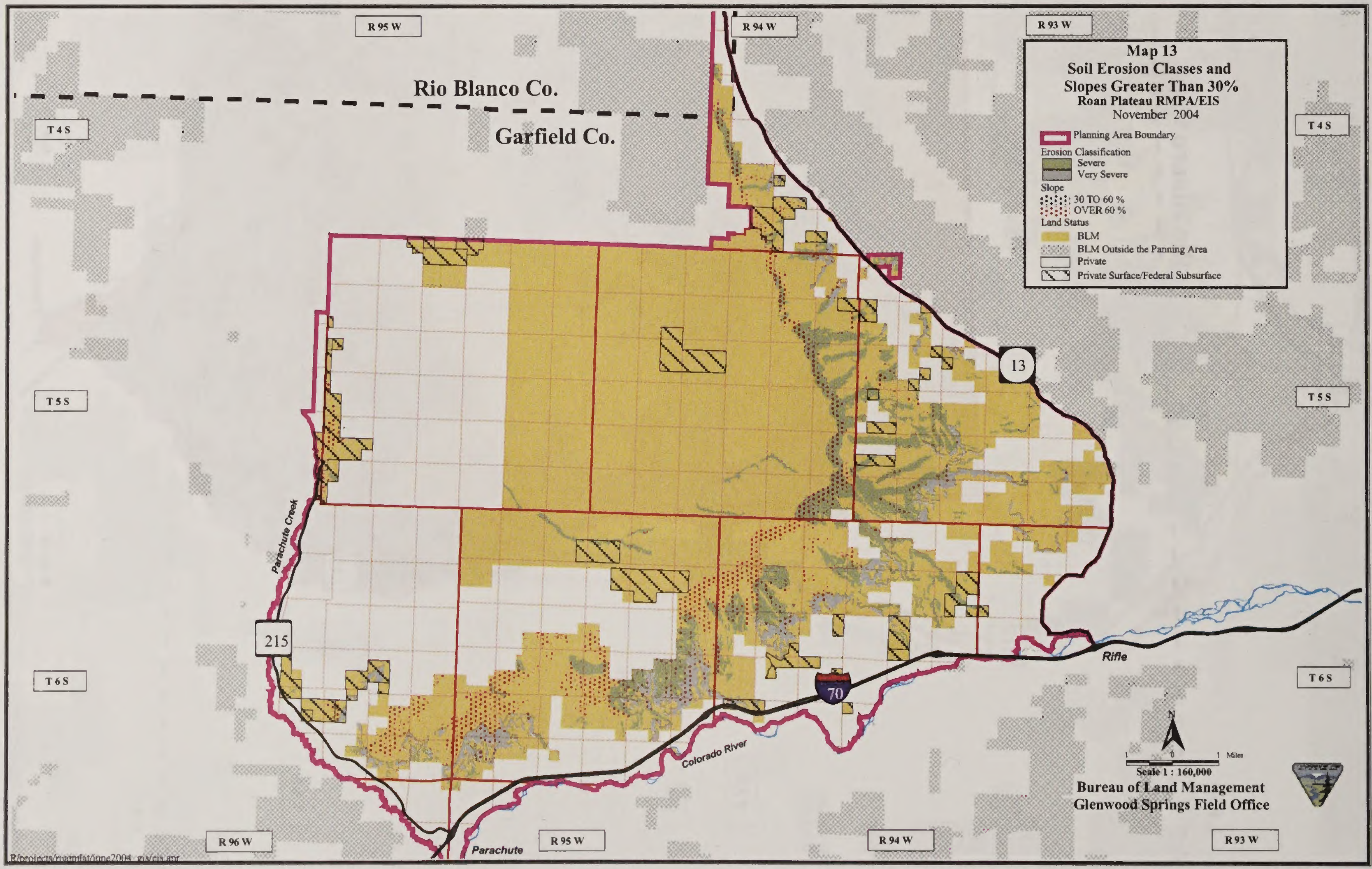
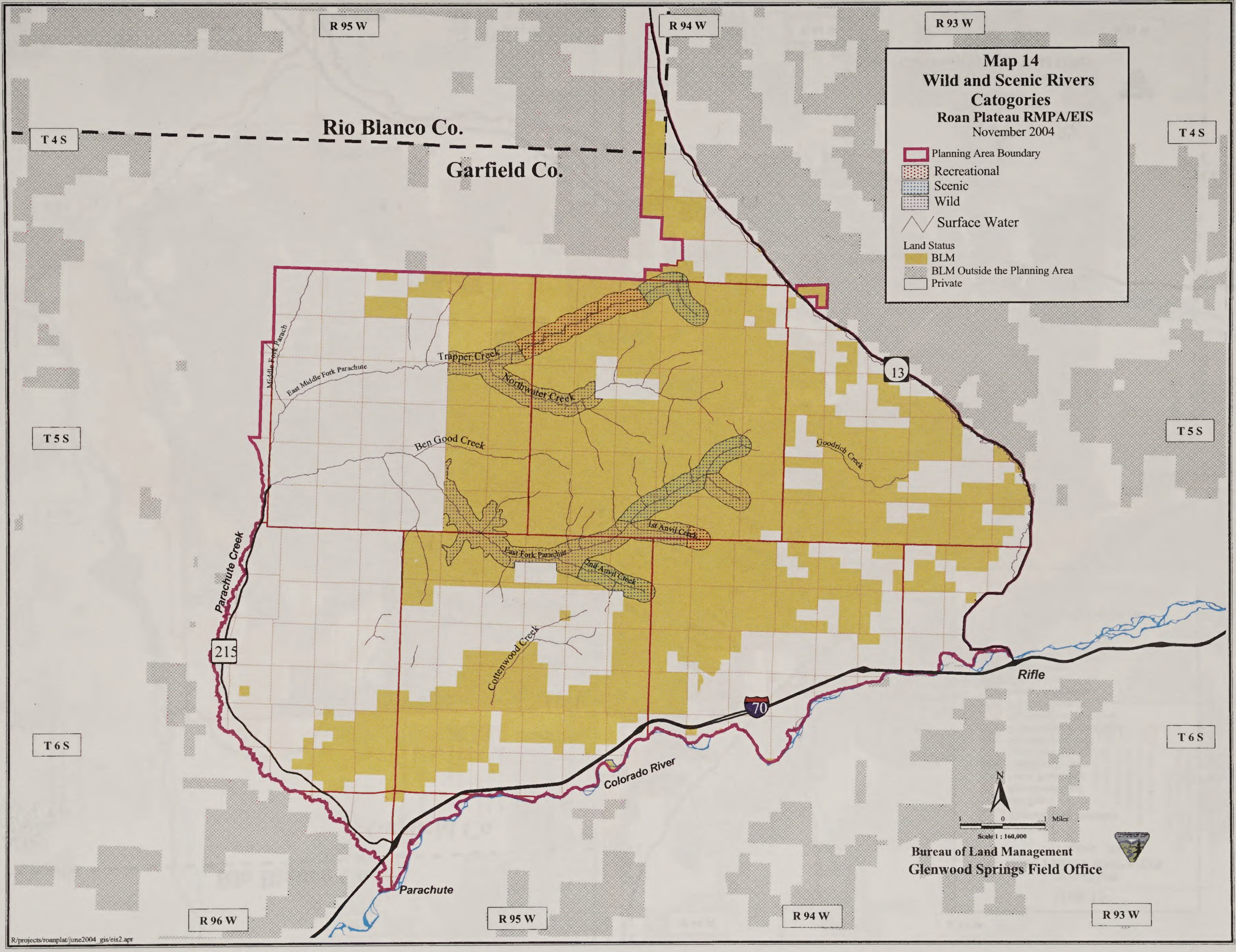


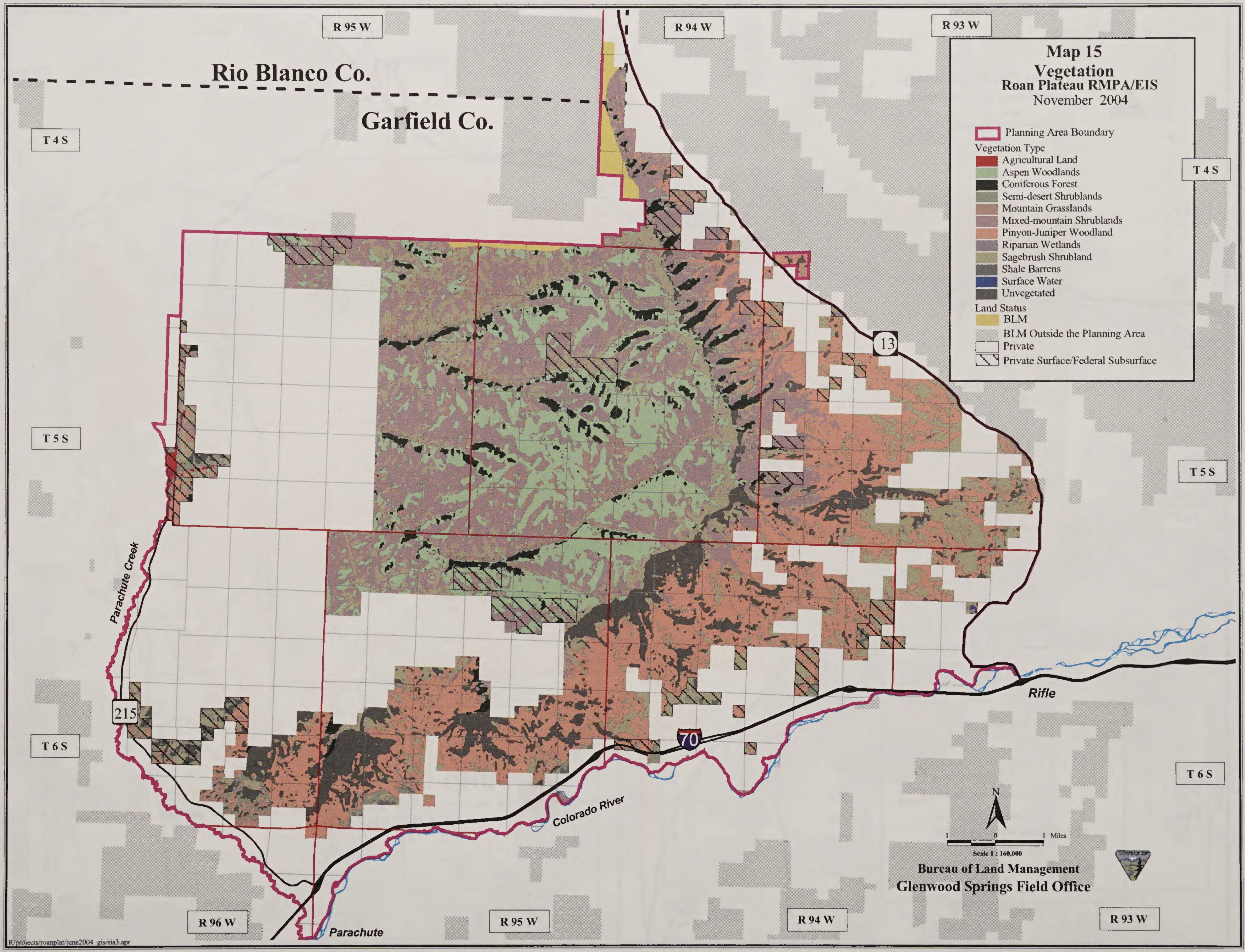
Map 11
Geology and Paleontology
Roan Plateau RMPA/EIS
November 2004


Map 12
Soil Erosion Classes
Roan Plateau RMPA/EIS
November 2004


Map 13
Soil Erosion Classes and
Slopes Greater Than 30%
Roan Plateau RMPA/EIS
November 2004



Map 14
Wild and Scenic Rivers
Catogories
Roan Plateau RMPA/EIS
November 2004



Map 15
Vegetation
Roan Plateau RMPA/EIS
November 2004

Bureau of Land Management
Glenwood Springs Field Office

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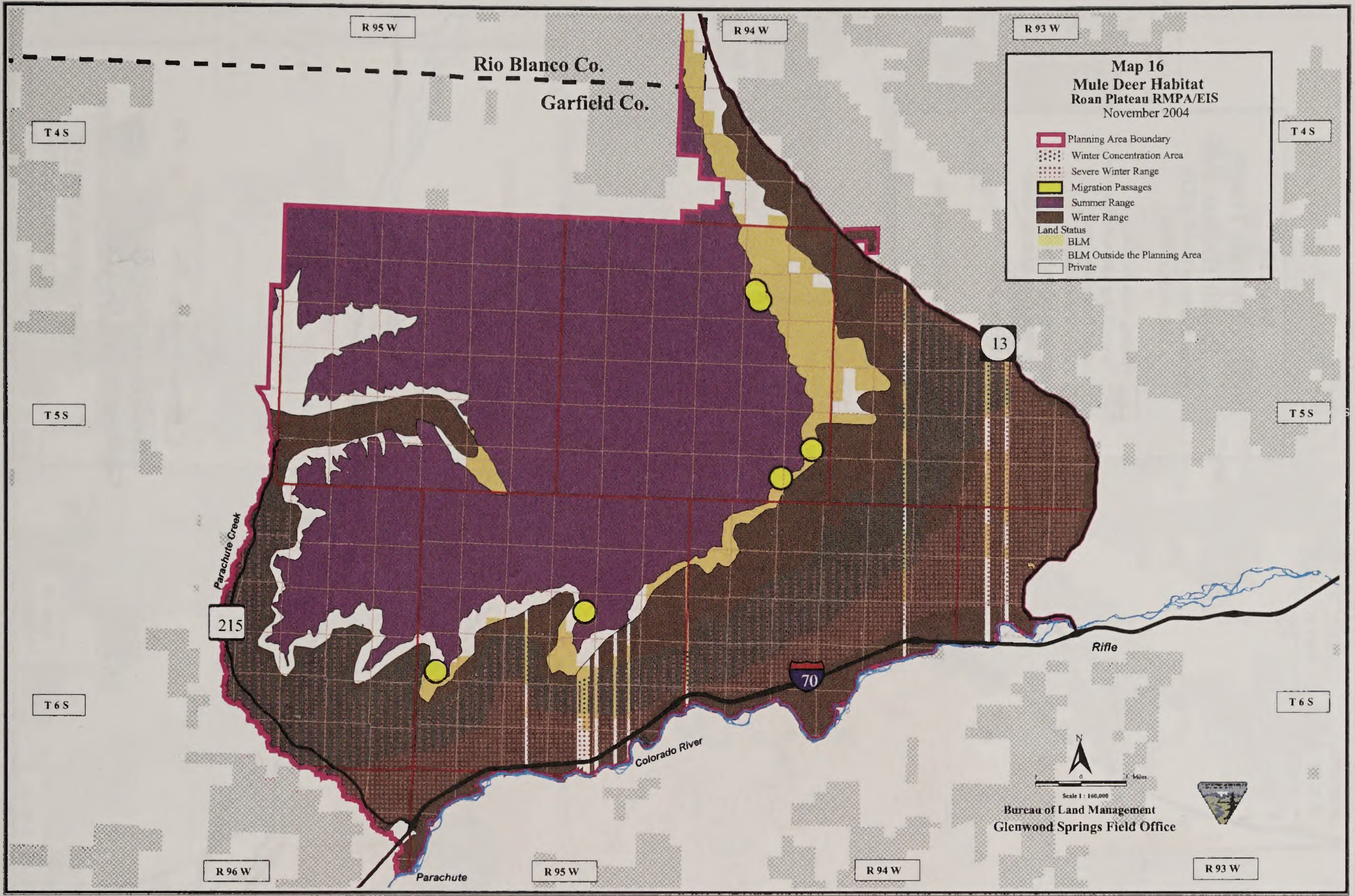
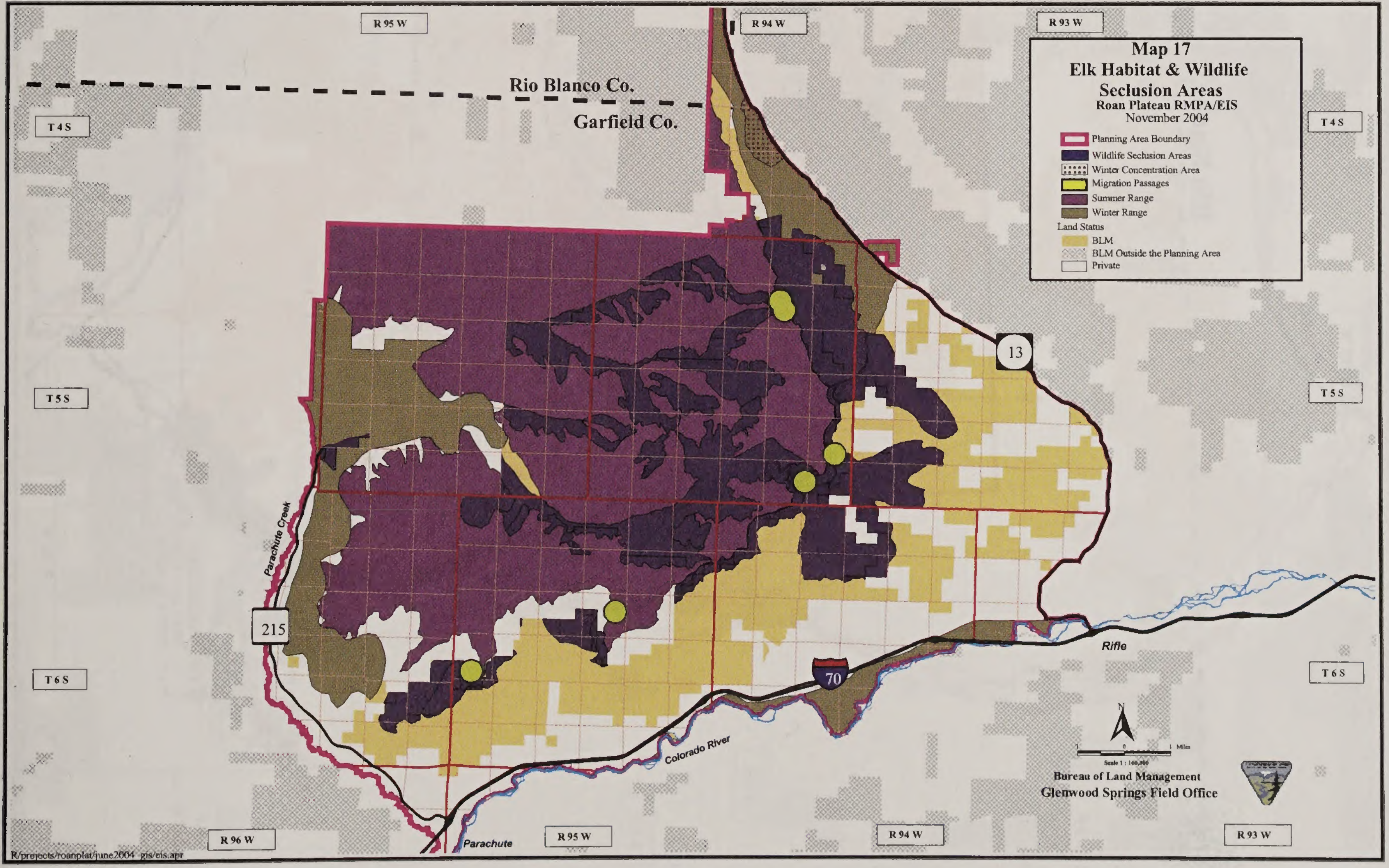

Map 16
Mule Deer Habitat
Roan Plateau RMPA/EIS
November 2004
Planning Area Boundary
Winter Concentration Area
Severe Winter Range
Migration Passages
Summer Range
Winter Range
Land Status
BLM
BLM Outside the Planning Area
Private
Rio Blanco Co.
Garfield Co.
R 95 W
R 94 W
R 93 W
R 96 W
T 4 S
T 5 S
T 6 S
13
215
70
Parachute Creek
Colorado River
Rifle
Parachute
N
1
0
1
Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office


Map 17
Elk Habitat & Wildlife Seclusion Areas
Roan Plateau RMPA/EIS
November 2004
Planning Area Boundary
Wildlife Seclusion Areas
Winter Concentration Area
Migration Passages
Summer Range
Winter Range
Land Status
BLM
BLM Outside the Planning Area
Private
Rio Blanco Co.
Garfield Co.
R 95 W
R 94 W
R 93 W
R 96 W
T 4 S
T 5 S
T 6 S
13
215
70
Parachute Creek
Colorado River
Rifle
Parachute
N
1
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Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
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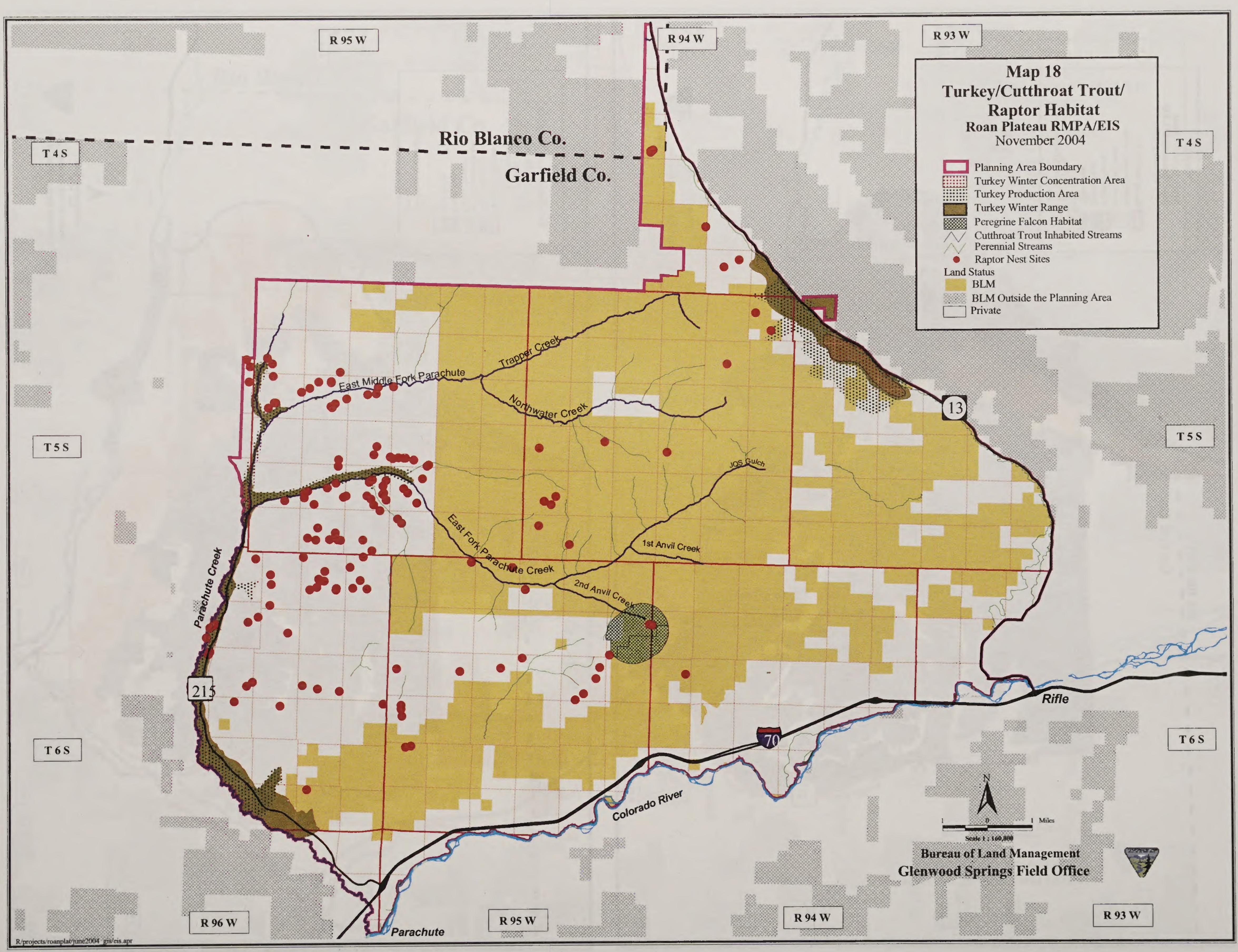
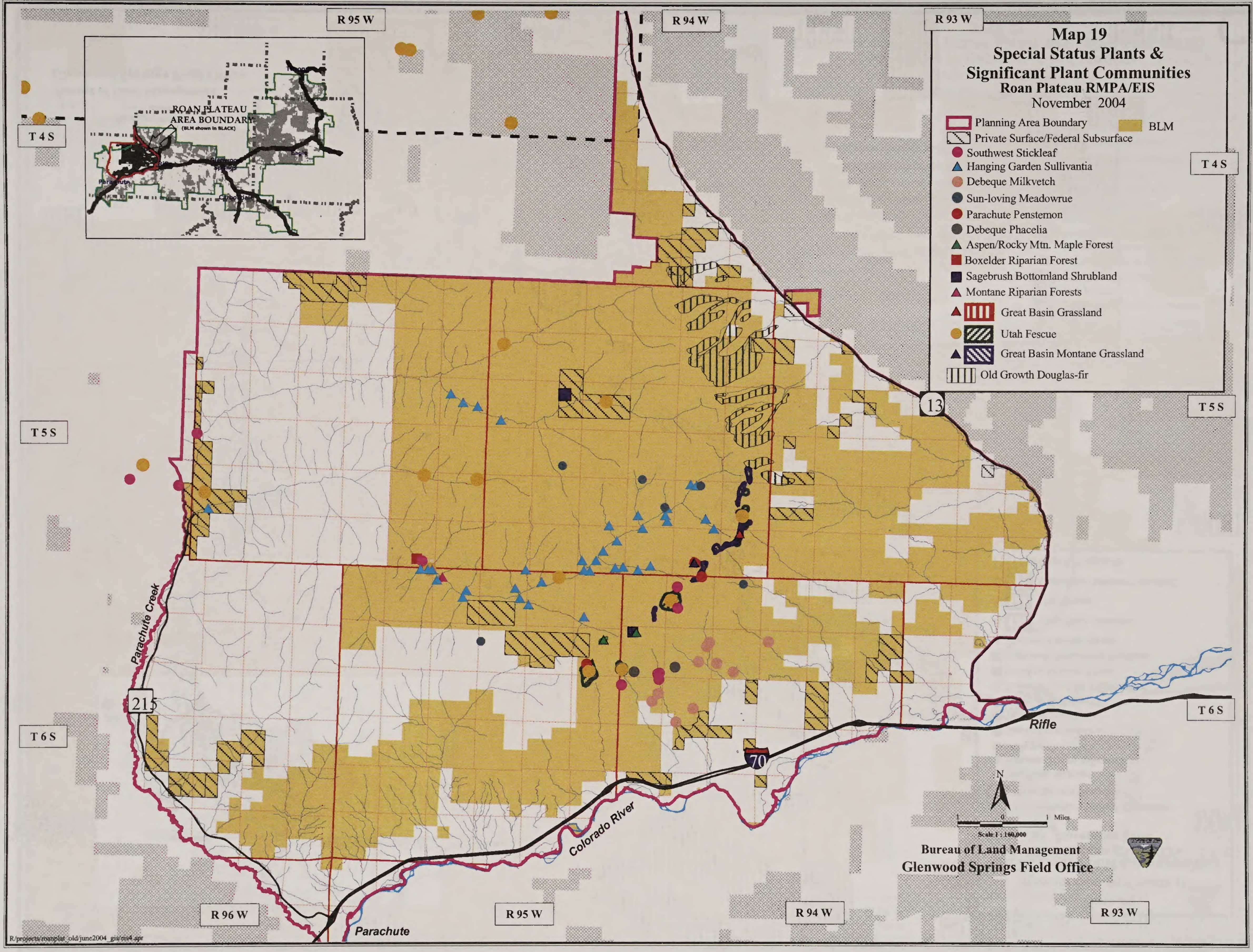
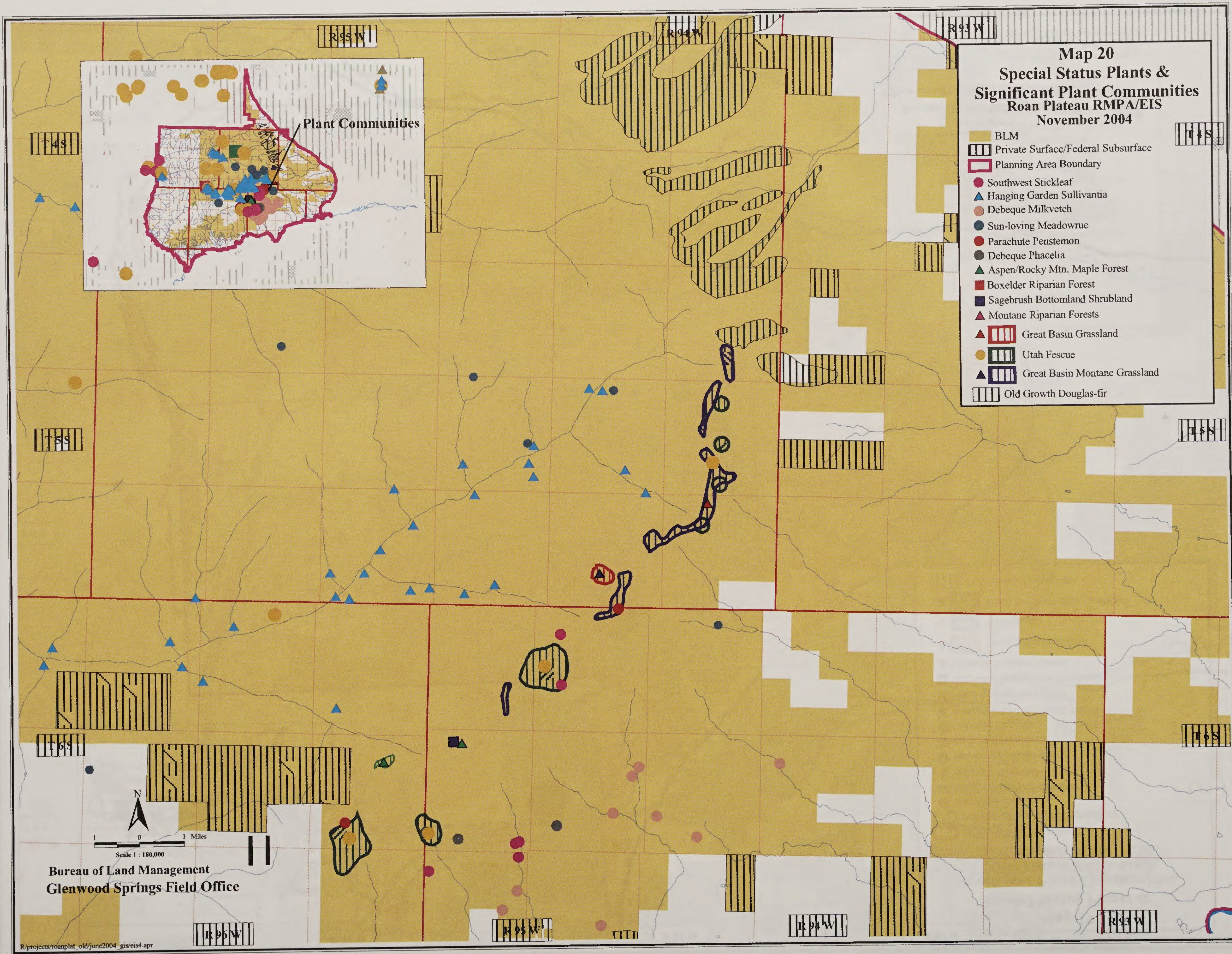

Map 18
Turkey/Cutthroat Trout/
Raptor Habitat
Roan Plateau RMPA/EIS
November 2004
Planning Area Boundary
Turkey Winter Concentration Area
Turkey Production Area
Turkey Winter Range
Peregrine Falcon Habitat
Cutthroat Trout Inhabited Streams
Perennial Streams
Raptor Nest Sites
Land Status
BLM
BLM Outside the Planning Area
Private
R 95 W
R 94 W
R 93 W
R 96 W
T 4 S
T 5 S
T 6 S
Rio Blanco Co.
Garfield Co.
13
215
70
East Middle Fork Parachute
Trapper Creek
Northwater Creek
JQS Gulch
East Fork Parachute Creek
1st Anvil Creek
2nd Anvil Creek
Parachute Creek
Colorado River
Rifle
Parachute
N
Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
R/projects/roanplat/june2004_gis/eis.apr

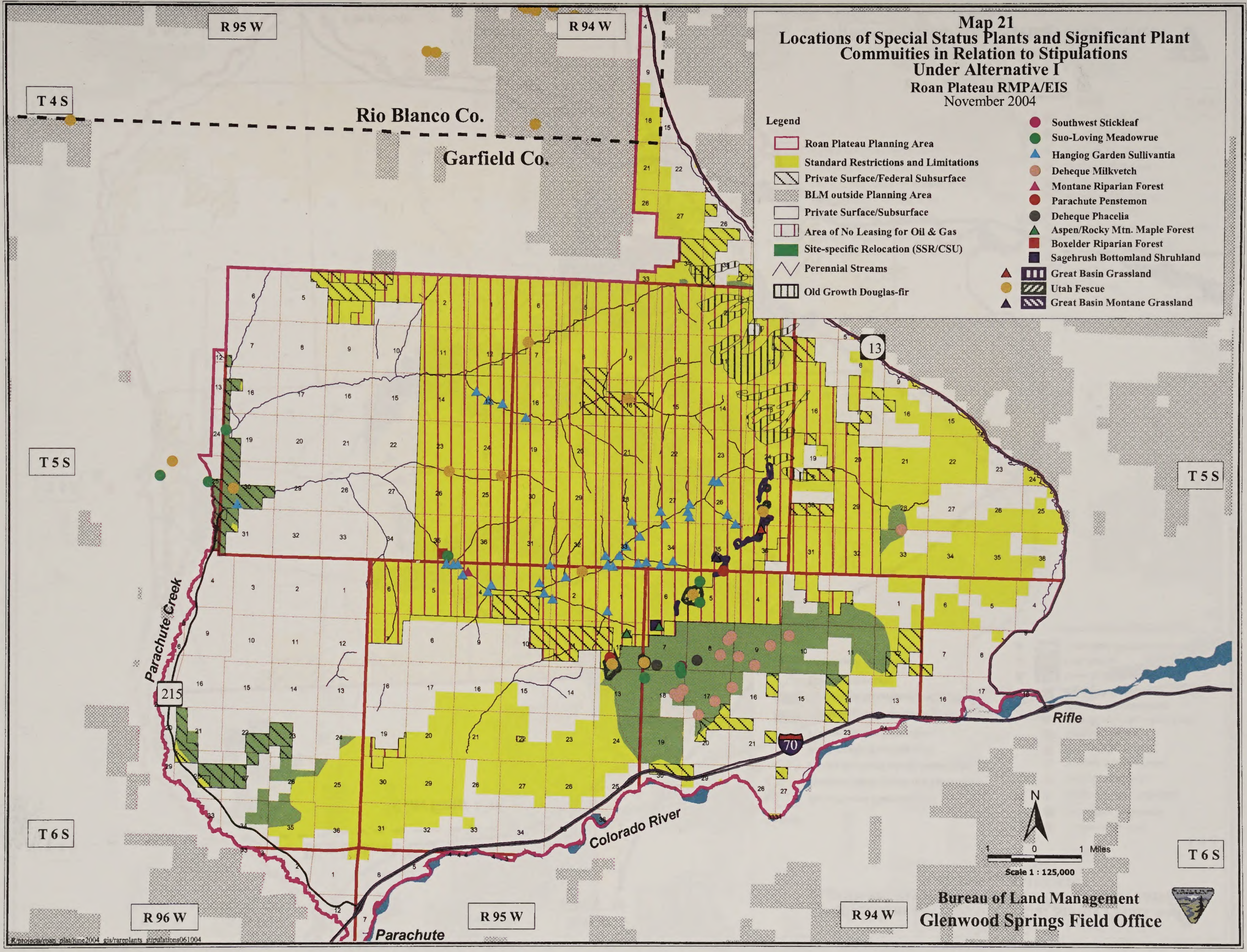


Map 19
Special Status Plants & Significant Plant Communities
Roan Plateau RMPA/EIS
November 2004

Bureau of Land Management
Glenwood Springs Field Office

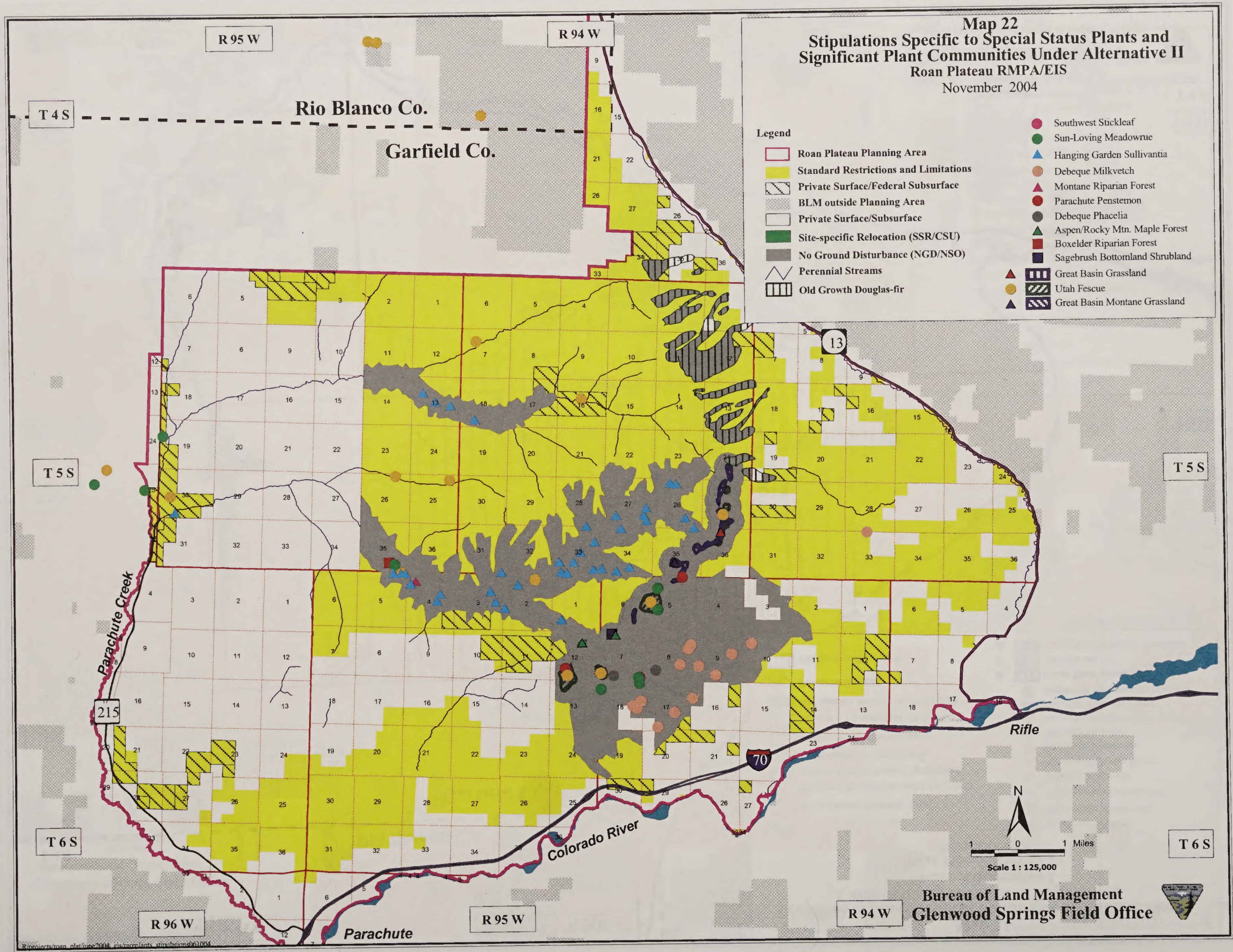

Map 20
Special Status Plants &
Significant Plant Communities
Roan Plateau RMPA/EIS
November 2004
BLM
Private Surface/Federal Subsurface
Planning Area Boundary
Southwest Stickleaf
Hanging Garden Sullivantia
Debeque Milkvetch
Sun-loving Meadowrue
Parachute Penstemon
Debeque Phacelia
Aspen/Rocky Mtn. Maple Forest
Boxelder Riparian Forest
Sagebrush Bottomland Shrubland
Montane Riparian Forests
Great Basin Grassland
Utah Fescue
Great Basin Montane Grassland
Old Growth Douglas-fir
Plant Communities
R 95 W
R 94 W
R 93 W
T 4 S
T 5 S
T 6 S
N
1 0 1 Miles
Scale 1 : 180,000
Bureau of Land Management
Glenwood Springs Field Office
R/projects/roanplat_old/june2004_gis/eis4.apr

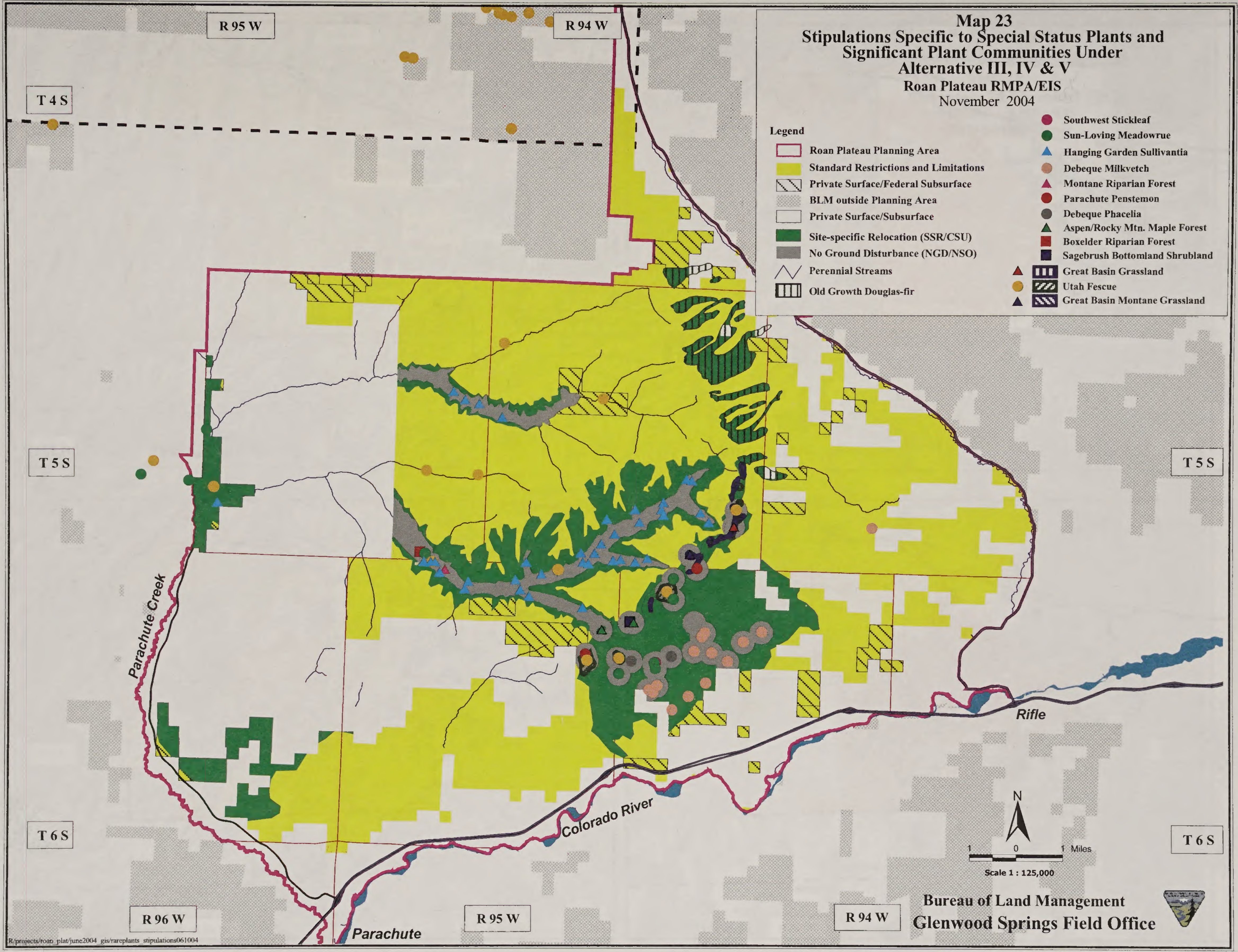
Map 21
Locations of Special Status Plants and Significant Plant Commuities in Relation to Stipulations Under Alternative I
Roan Plateau RMPA/EIS
November 2004



Bureau of Land Management
Glenwood Springs Field Office

Map 22
Stipulations Specific to Special Status Plants and Significant Plant Communities Under Alternative II
Roan Plateau RMPA/EIS
November 2004

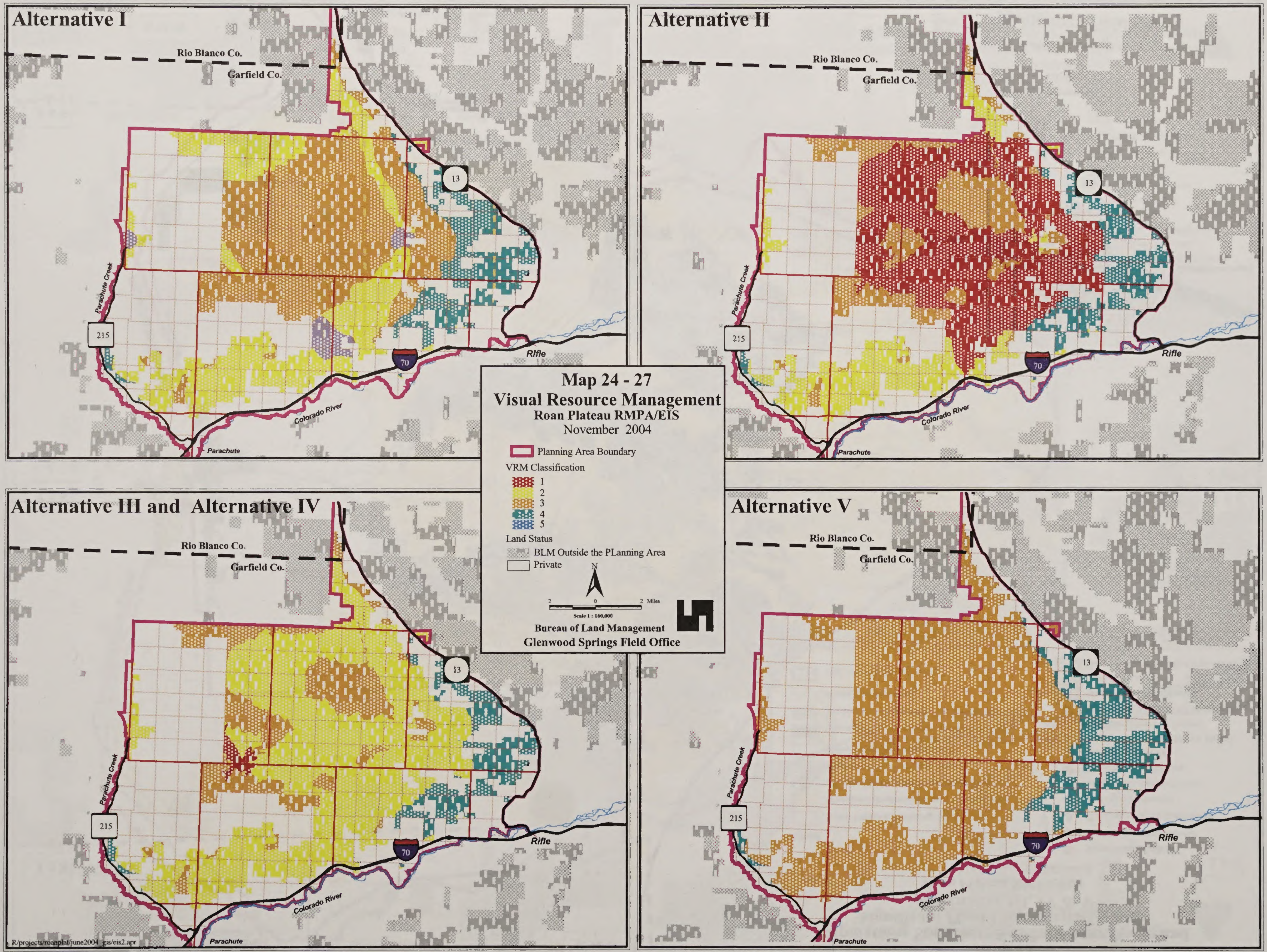




Map 23
Stipulations Specific to Special Status Plants and Significant Plant Communities Under Alternative III, IV & V

Roan Plateau RMPA/EIS
November 2004

Bureau of Land Management
Glenwood Springs Field Office



Map 24 - 27
Visual Resource Management
Roan Plateau RMPA/EIS
November 2004

- ▭ Planning Area Boundary

VRM Classification
- ▨ 1
- ▨ 2
- ▨ 3
- ▨ 4
- ▨ 5

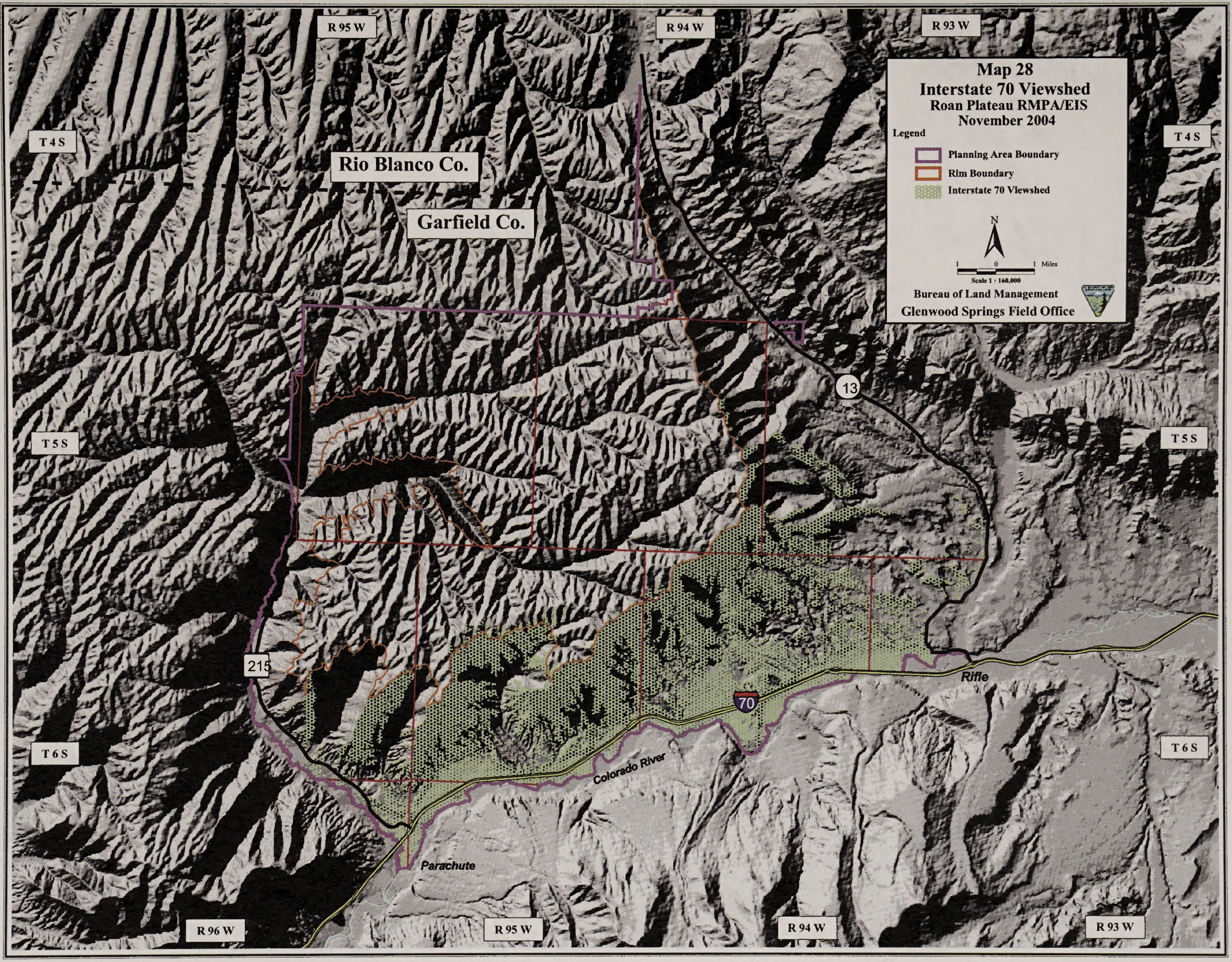
Land Status
- ▨ BLM Outside the PLanning Area
- ▭ Private

N

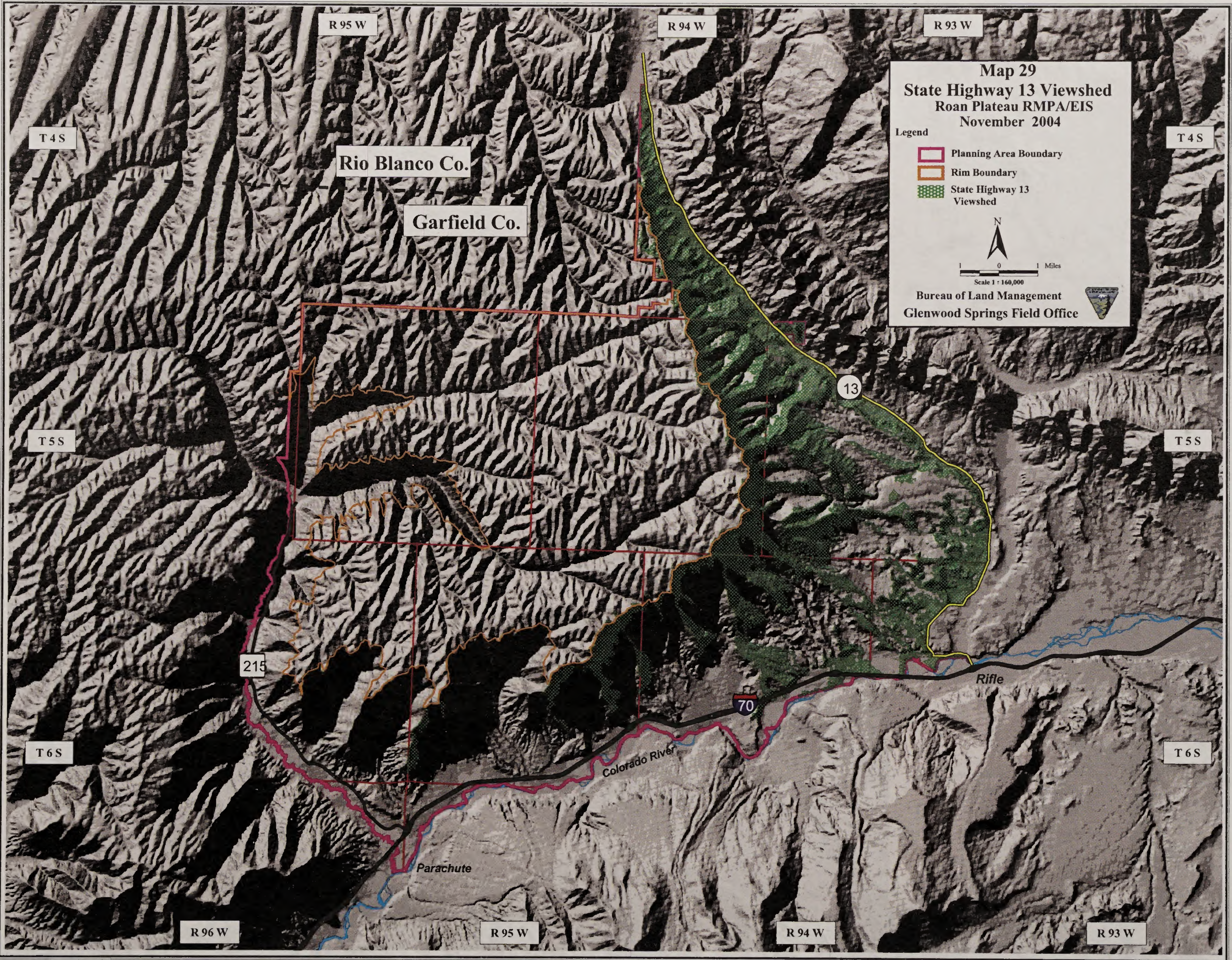
2 0 2 Miles

Scale 1 : 160,000

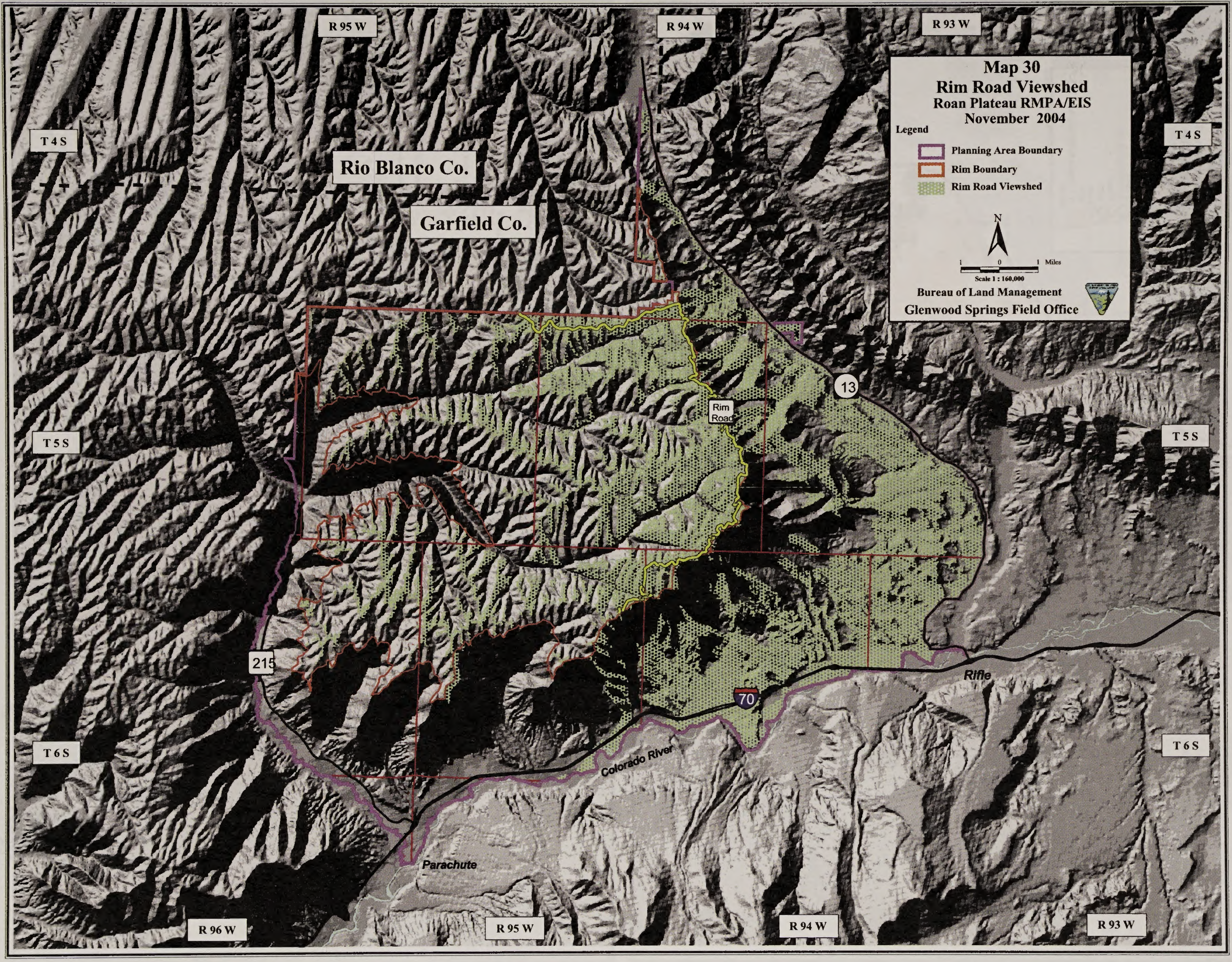
Bureau of Land Management
Glenwood Springs Field Office



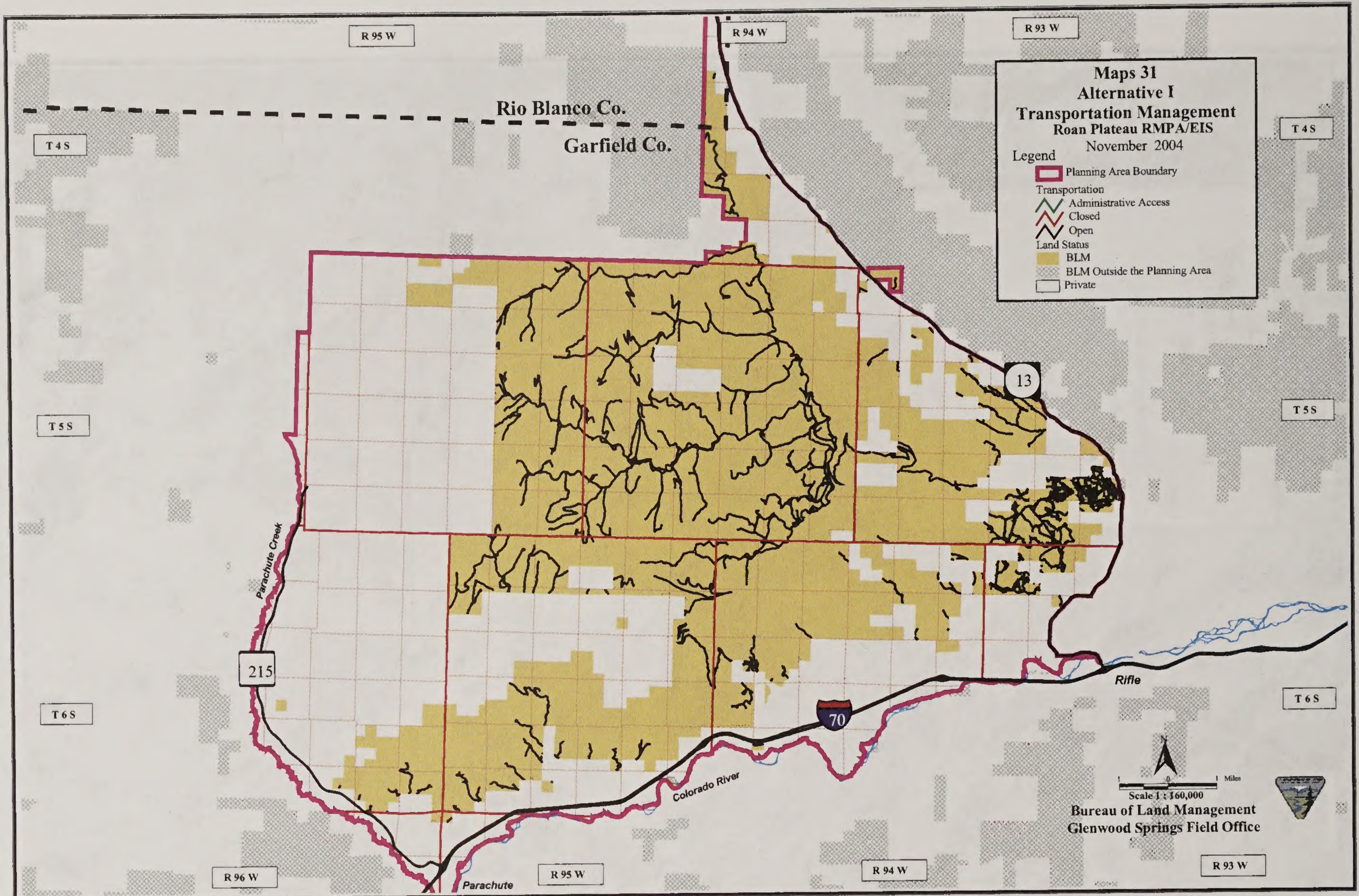
Map 28
Interstate 70 Viewshed
Roan Plateau RMPA/EIS
November 2004



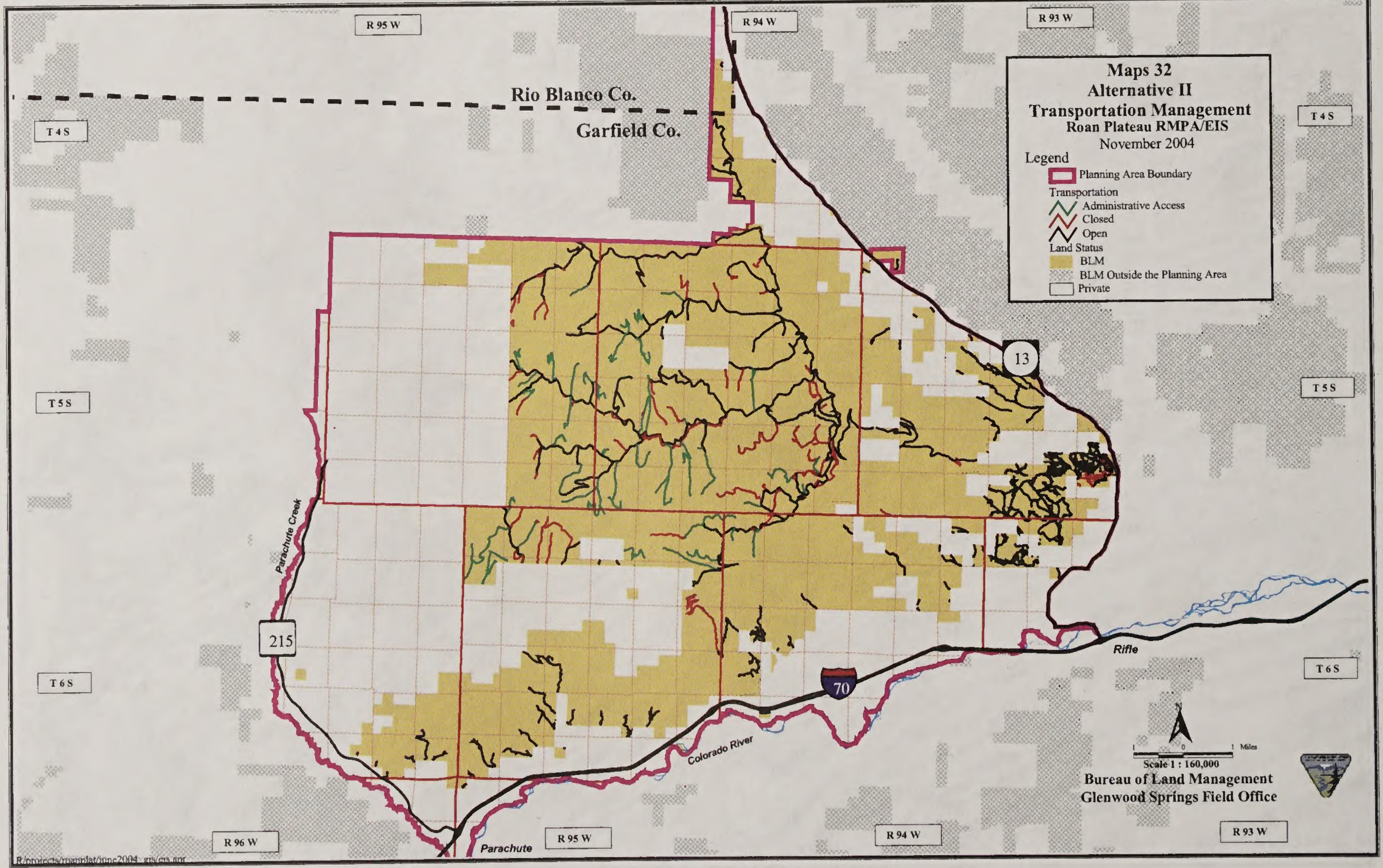
Map 29
State Highway 13 Viewshed
Roan Plateau RMPA/EIS
November 2004



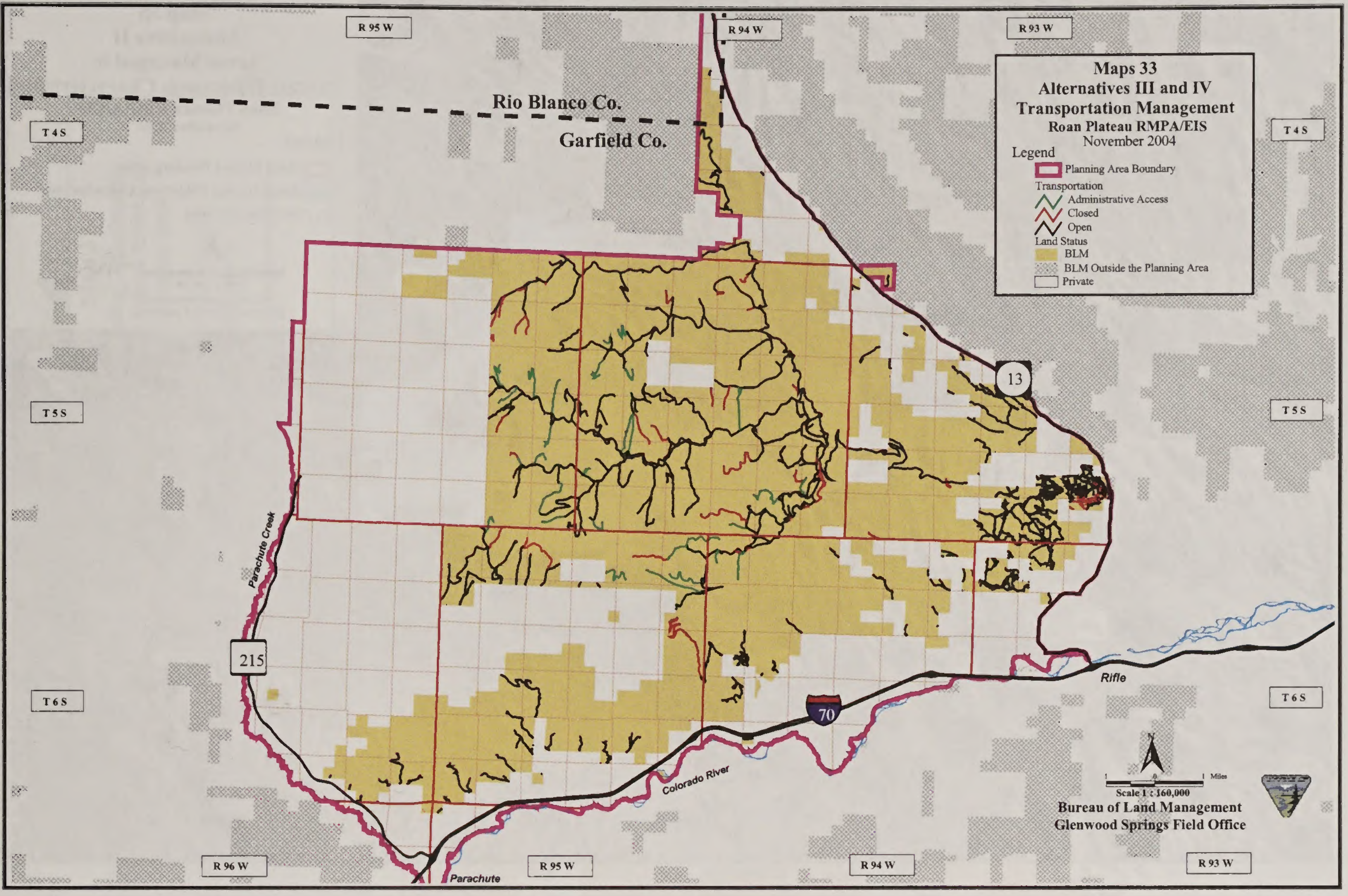
Map 30
Rim Road Viewshed
Roan Plateau RMPA/EIS
November 2004



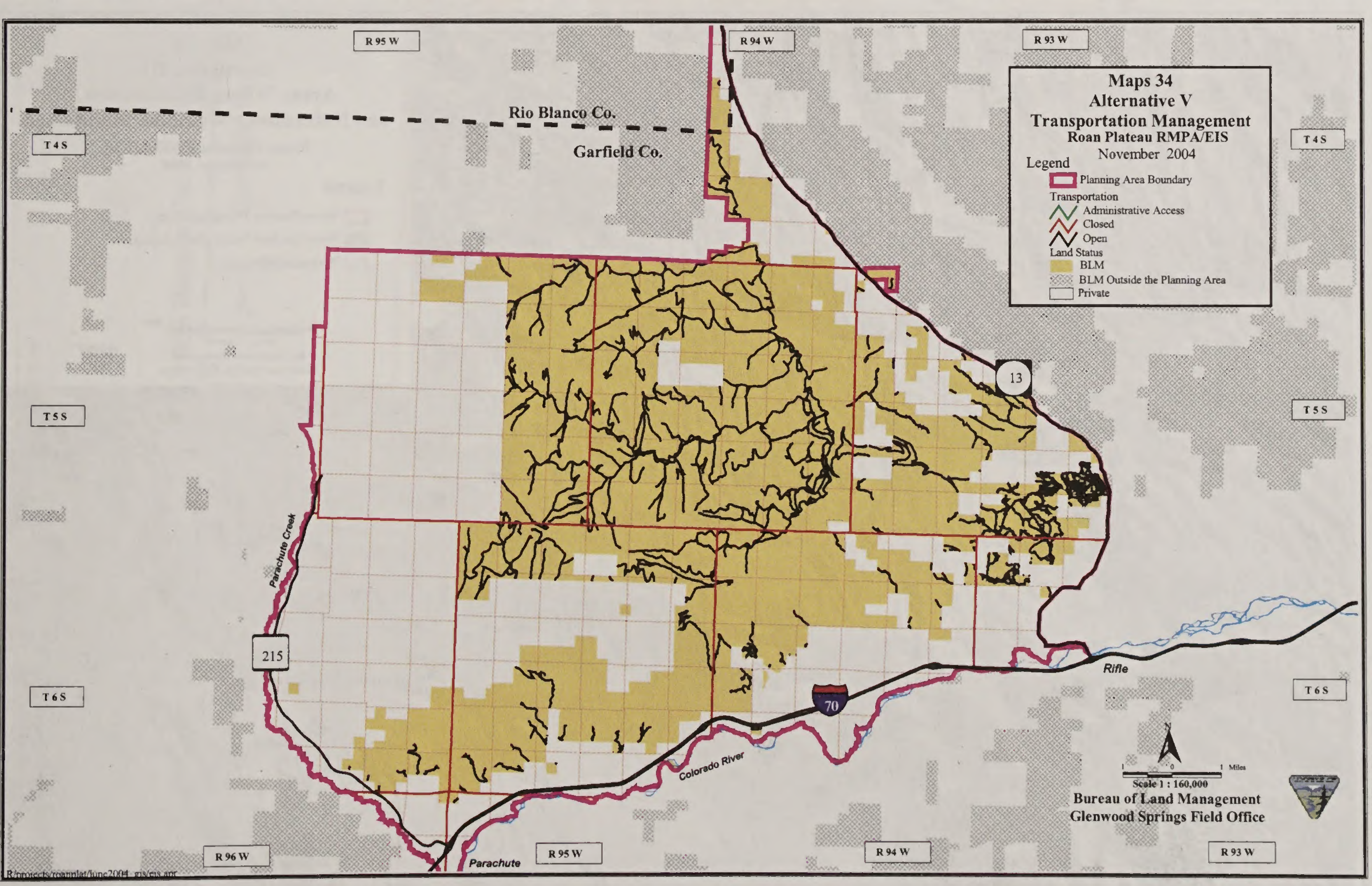
Maps 31
Alternative I
Transportation Management
Roan Plateau RMPA/EIS
November 2004



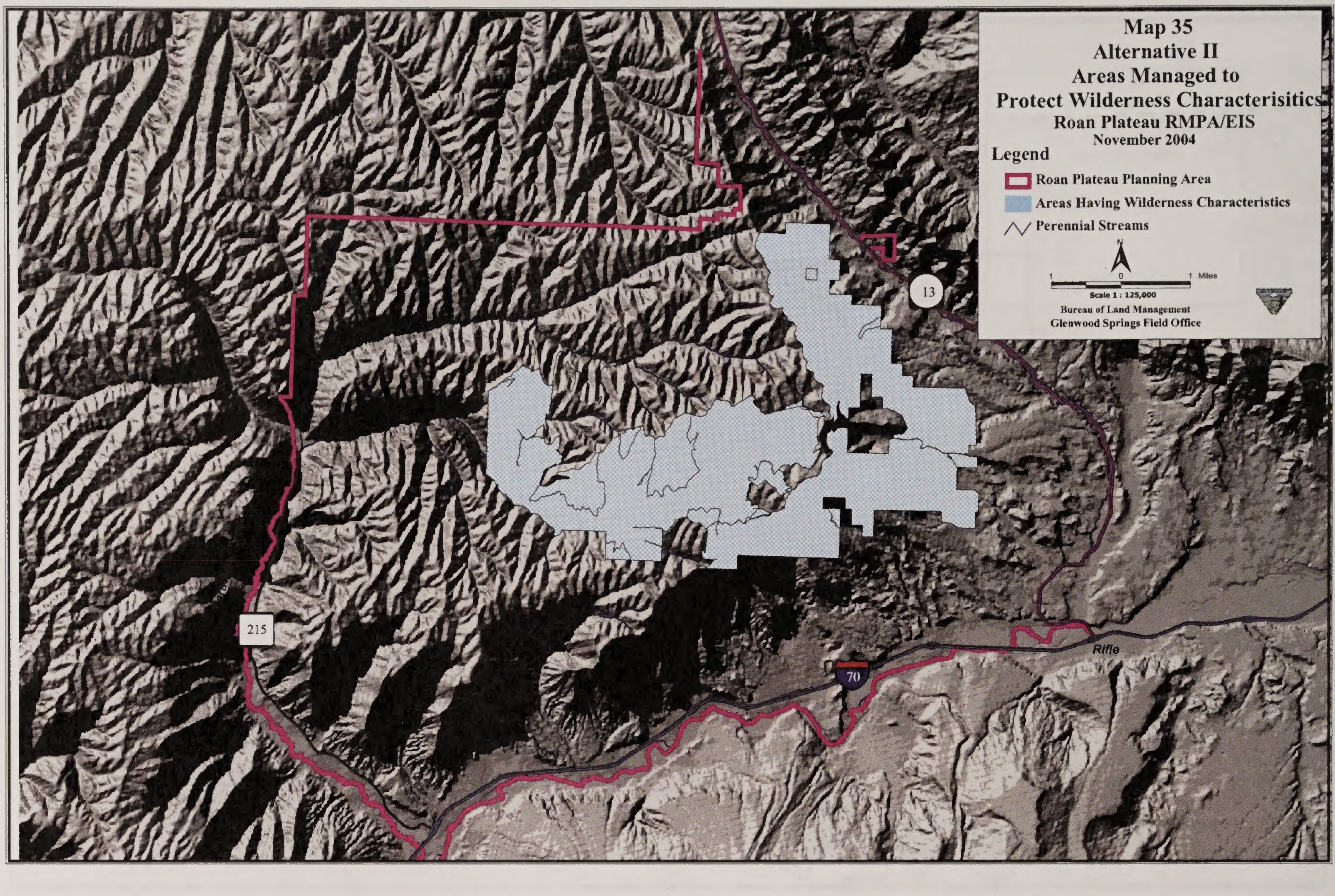
Maps 32
Alternative II
Transportation Management
Roan Plateau RMPA/EIS
November 2004



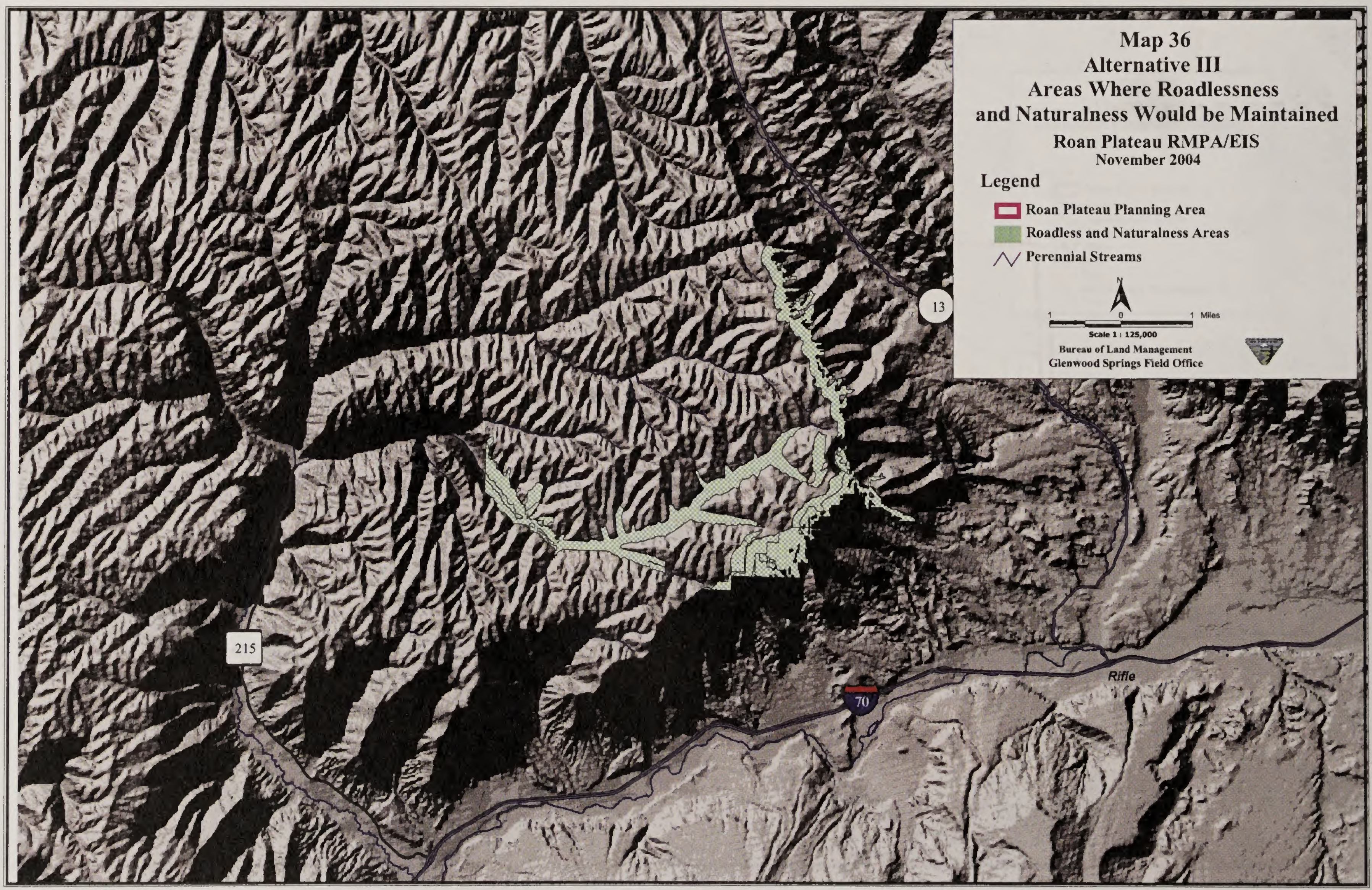
Maps 33
Alternatives III and IV
Transportation Management
Roan Plateau RMPA/EIS
November 2004



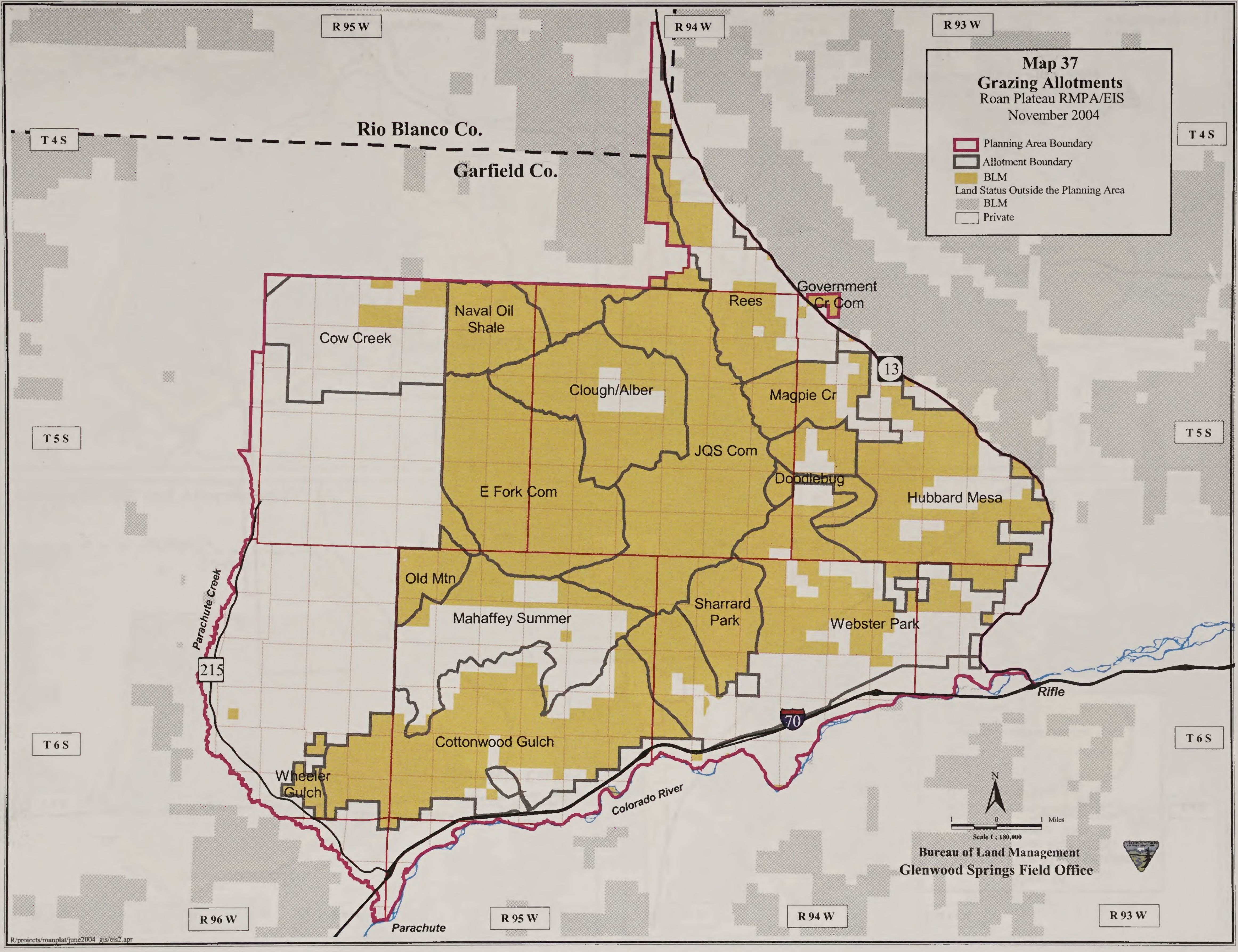
Maps 34
Alternative V
Transportation Management
Roan Plateau RMPA/EIS
November 2004



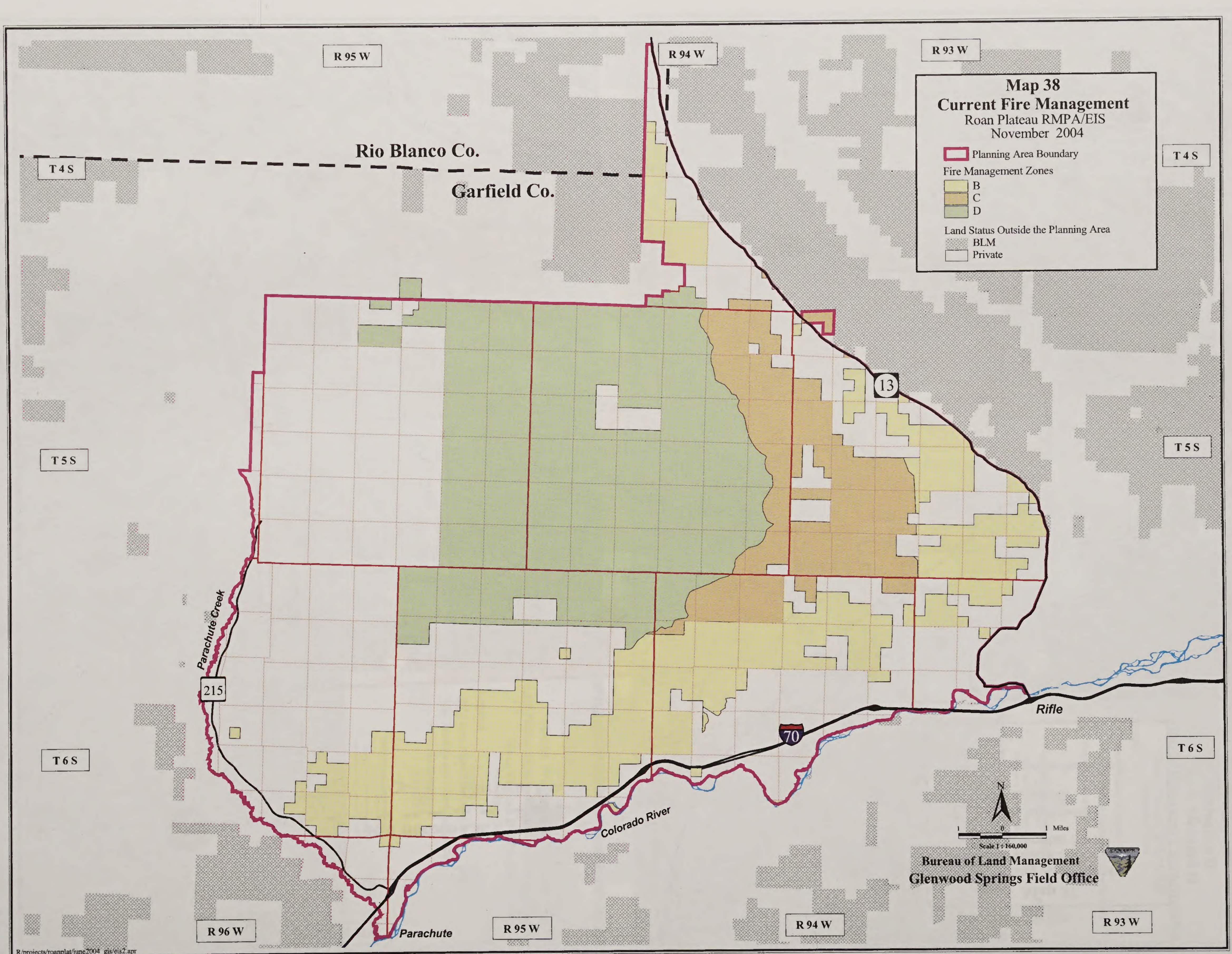
Map 35
Alternative II
Areas Managed to
Protect Wilderness Characterisitics
Roan Plateau RMPA/EIS
November 2004



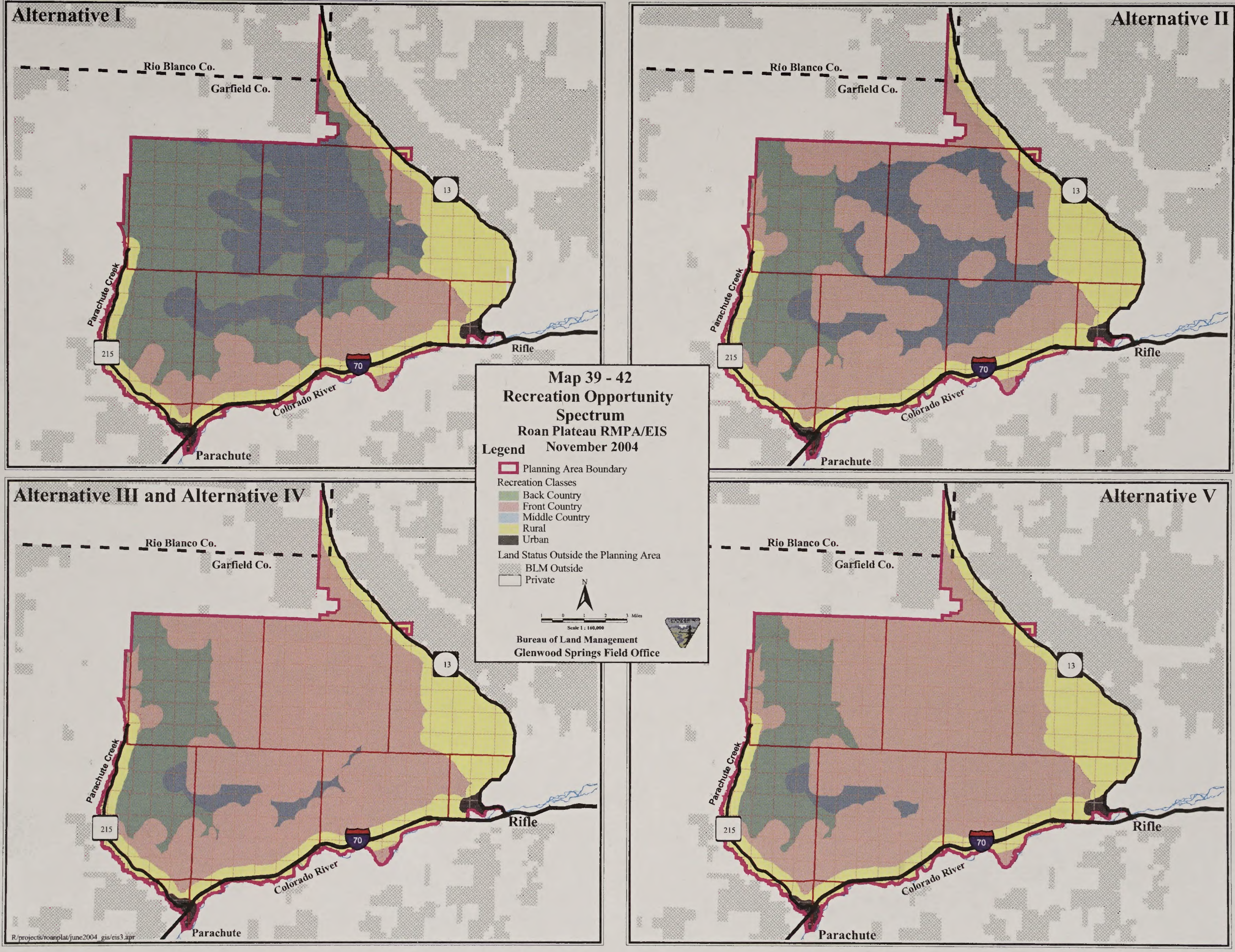
Map 36
Alternative III
Areas Where Roadlessness
and Naturalness Would be Maintained
Roan Plateau RMPA/EIS
November 2004



Map 37
Grazing Allotments
Roan Plateau RMPA/EIS
November 2004



Map 38
Current Fire Management
Roan Plateau RMPA/EIS
November 2004



Map 39 - 42
Recreation Opportunity Spectrum
Roan Plateau RMPA/EIS
November 2004

Alternative I

Alternative II

Alternative III and Alternative IV

Alternative V

Appendices B through H

Bureau of Land Management
Glenwood Springs Field Office

Appendix B

Information Related to Oil and Gas Leasing, Permitting, and Development

Description of Typical Oil and Gas Operations

Sample Oil and Gas Lease

B-1. Information Related to Oil and Gas Leasing, Permitting, and Development

BLM Authority and Responsibilities for Oil and Gas Operations

The BLM has responsibility for environmental protection, public health, and safety related to oil and gas operations on public lands. Two laws give the BLM its primary direction for oil and gas operations: the Mineral Leasing Act of 1920 (MLA) as amended, and the Federal Land Policy Management Act of 1976 (FLPMA). However, there are other laws which affect the various stages of oil and gas operations, such as the Endangered Species Act of 1973 (ESA) and the National Historic Preservation Act of 1966 (NHPA).

Under MLA, BLM is responsible for mineral leasing, including onshore oil and gas leasing, for all Federal lands, including lands with a Federal mineral estate but private surface ownership (43 CFR 3100). The MLA and other laws specify types of Federal lands that are not available for oil and gas leasing.

Under NEPA, the BLM's responsibilities are triggered by a Federal action or undertaking. This legislation directs the BLM to analyze and disclose to the public the impacts of Federal actions. Oil and gas leasing, permitting, and development are all Federal actions which require varying degrees of NEPA analysis.

Under FLPMA, BLM's responsibilities are tied to the use of Federal lands. This legislation directs the BLM to prepare and disclose to the public its plans for the public lands under its jurisdiction.

Leasing for oil and gas under MLA, impact analysis under NEPA, and management under FLPMA apply to the same lands during the leasing process; therefore, the three laws are tied together in a workable process to accomplish Congressional intent. The vehicle by which the process occurs on BLM lands begins with a Resource Management Plan (RMP) and accompanying Environmental Impact Statement (EIS). The RMP/EIS determines if the public land is available and suitable for leasing and establishes the appropriate lease stipulations.

Leasing Process

The decision to lease is a discretionary action that is made through the land use planning process. The RMP identifies lands open to leasing. All leases are subject to a standard set of terms and conditions that are found in section 6 of the lease form. A sample of this form is included at the end of this Appendix. The lease grants that a lessee has the right to use as much of the leased lands as is necessary to explore for, extract, and dispose of all the leased resources subject to:

- stipulations attached to the lease and restrictions deriving from specific non-discretionary statutes (such as the ESA), and
- such reasonable measures as may be required to minimize adverse impacts to other resource values, uses, and users not addressed in the lease stipulations at the time operations are proposed. These measures are called Conditions of Approval (COA) and are discussed in the section on the Application for a Permit to Drill (APD) process, below.

Stipulations which become attached to the lease are developed through the planning process. This can occur at the RMP level or through the RMP amendment process. The amendment process is basically the same as the land use planning process used in creating or revising RMPs. The main difference is that circumstances may allow for completing a plan amendment through the Environmental Assessment (EA) process, rather than through the EIS process.

If stipulations are developed through the plan amendment process, the new stipulations can only be attached to future leases, not current leases. In developing stipulations, the BLM interdisciplinary team considers the following:

- If standard lease terms (mentioned briefly above) and existing non-discretionary laws provide or require sufficient protection to assure that resource condition objectives, uses, and public land health standards can be achieved, then leasing stipulations are not needed.

- If it is determined that a stipulation is needed, the least restrictive stipulation that effectively accomplishes the resource objectives or uses is attached.

- If multiple stipulations are proposed for the same area, the potential effects of overlaps is considered in developing the appropriate stipulation.

The RMP also serves as the vehicle for explaining to the industry and the public the conditions under which exceptions, modifications, or waivers of lease stipulations may be granted. It should also identify the documentation requirements for supporting an exception, modification, or waiver and any associated public notification. An exception is a one-time exemption to a lease stipulation which is determined on a case-by-case basis. A modification is a change to the provisions of a lease stipulation, either temporarily or for the term of the lease. A waiver is a permanent exemption to a lease. If a proposed modification or waiver is found to be substantial, BLM is required to initiate a 30-day public comment period prior to deciding whether to approve the request.

Once decisions have been reached through the planning process as to what lands are available for leasing and under what conditions, they are offered for sale at auction. Those people interested in purchasing oil and gas leases may nominate a parcel, or the BLM may offer parcels of its choosing. In both cases, the proposal must conform to the RMP decisions and be offered for sale at a public auction. Those parcels which do not sell at auction are available for non-competitive sale for a 2-year period thereafter. Management decisions are incorporated into the lease document as stipulations and notices before it is issued. Public notice of the sale (which includes the list of parcels offered, their location, and stipulations to be attached) is given 45 days prior to the sale.

The purchaser of a lease at auction must bid at least two dollars per acre. The bonus bid must be paid at the sale and the rental is due at the beginning of each new year as long as the lease is held and is not producing. Leases purchased at auction may be held for five years without production. Leases purchased non-competitively after the auction may be held in non-producing status for ten years. If the lessee establishes production, a royalty of 12.5 percent must be paid to the government. Half of that money is returned to the State of origin for their use. The other half goes into the Federal treasury.

Geophysical Exploration Process

Separate from leasing actions, geophysical exploration may be used to search for oil and gas on public land.

Application for a Permit to Drill (APD) Process

The operating regulations used to permit an oil and gas well are found in 43 CFR Part 3160. These regulations are implemented and supplemented with a set of Onshore Oil and Gas Orders. The Orders are also regulations and carry the full force and effect of regulation. A well must be drilled in order to produce oil and/or gas from the lease. There are two ways to permit a well, either via a Notice of Staking (NOS), followed by the submittal of an Application for a Permit to Drill (APD), or directly through submittal of an APD.

The NOS option was implemented to provide a faster process once the decision is made to drill a well. This process gives the BLM an opportunity to conduct an onsite inspection before the complete APD package is submitted. The NOS informs the BLM of the well location, the access road, any ancillary facilities, and the need to conduct an onsite inspection. If the well location needs to be moved or reoriented, then the necessary re-surveying and re-staking can be performed before all subsequent documents are submitted.

Before drilling a well, the lessee, or an operator for the lease, must file an APD. The operator must file an application with the Field Office in which the action will take place. The application must include a plan for the drilling of the well and a plan for the protection of the surface and environment. The drilling plan (or 8-point plan) contains information as to the depth of the well, how it will be constructed, how groundwater and other mineral resources will be protected, and how blowouts and other emergencies will be prevented or dealt with. The surface use plan (or 13-point plan) covers such concerns as the location and amount of surface disturbance and how that disturbance will be reduced or eliminated. It covers mitigation of impacts to wildlife, cultural resources, vegetation, soils, surface water and other land uses and values. Each resource/value is evaluated in light of the RMP decisions. The operator is responsible for incorporating all RMP decisions into the proposed APD. If the appropriate information and mitigation is not incorporated into the APD, the application may be modified or rejected. RMP decisions are incorporated by attaching stipulations to the lease and Conditions of Approval (COAs) to the APD.

Onshore Oil and Gas Order No. 1 requires a field (onsite) inspection as part of the review of an APD. The inspection is a meeting between the parties to explain and clarify the proposed action. If the inspection is conducted before filing the APD, then the applicant is more likely to submit a complete surface use plan without the need for amendments. The field, meeting also helps to assure that the location is built as intended in the surface use plan.

The administrative review of the APD is usually led by the Field Office (FO) surface reclamation specialist who is responsible for evaluating the surface plan, checking the proposal against the RMP and other guidance, conducting the onsite inspection (with other appropriate specialists), and leading the preparation of the NEPA document (usually an EA) and its associated impact analysis and proposed mitigation. The surface reclamation specialist is also responsible for calling upon other expertise as needed for the analysis of impacts and recommendation of mitigation. For example, other participants routinely include the archeologist for impacts to cultural resources and the biologist for impacts to threatened and endangered species.

The NEPA process provides written documentation of the environmental review for an APD and the development of mitigation (COAs; see below). The NEPA process also serves as the vehicle to check for conformance with the RMP. In most cases, two layers of NEPA are needed in the oil and gas process. The RMP/EIS determines whether the public land is available for leasing and, if so, the appropriate stipulations for leasing. At the site-specific level, EAs are prepared for a majority of APDs in Colorado. In cases where the proposed well is obviously part of a larger field development, and such development has not already been analyzed by a NEPA document other than the RMP, a Field Development EA can be prepared. A Documentation of Land Use Plan Conformance and NEPA Adequacy (DNA) can then be prepared for future APDs within the oil and gas field, as long as the Field Development EA provides the site-specific analysis and the APD meets the DNA criteria and the criteria identified in the RMP/EIS. If an APD deviates significantly from the analysis in a Field Development EA, additional analysis of NEPA may be needed.

Another component of the review process is the technical review of the drilling plan portion of the APD. The APD review by the FO geologist includes the following items: geological markers and formation tops; oil, gas, and mineral-bearing zones; potential hazards such as abnormal pressure; casing set points; and cement tops. A geologic review report documents the review and is incorporated into the APD case file. The APD review by the FO petroleum engineer includes the following items: casing and cement program; drilling fluid program; pressure control system; and testing, coring, and logging.

When all of the resource specialists have accumulated all of the information about the proposed well operation, they determine requirements for site-specific environmental protection. As part of the impact analysis, each specialist must determine whether the APD needs to be supplemented with additional impact mitigation measures. These measures are called Conditions of Approval (COAs). However, these mitigation measures are distinct from stipulations that are attached to the lease. COAs are developed through the NEPA compliance process for each APD. Stipulations which are attached to the lease are developed through the planning process. The COAs must be reasonable. This means they must be technically possible to accomplish, and they must allow the exercise of lease rights. They must also be plainly worded and justified by the NEPA process. A COA must not prevent an applicant from proceeding with development for either economic or technical reasons.

Once all of the BLM staff specialists have reviewed the APD and determined that the surface use plan and drilling plan are in compliance with BLM regulations, and all other impacts are addressed in the appropriate NEPA document, the APD is ready for approval, providing that the mandatory 30-day posting period has elapsed. At this point, COAs are attached to the APD, and the FO Manager signs and dates the APD. The approved APD is valid for one year, with a one-time extension of up to one year, if requested.

The operator must notify the BLM within 24 hours after starting the actual drilling of the well. This is called the "Spud Notice." If the well will be completed as a producer, the drilling rig is moved off after production casing is cemented and a smaller rig, called a completion or work-over rig, is moved in. This rig is utilized for running casing identification logs, perforating, and running down-hole pumps, if necessary; running production tubing in the well bore; and setting the wellhead valves and controls. The rest of the fluid treating and handling systems are also installed at this time, such as production and storage tanks, dehydrators, separators, measuring systems, sales meters, and flow lines.

During production, field operations are inspected by the BLM to assure accountability for royalties, compliance with the lease, permit safety, and environmental requirements. The final stage in the life of an oil or gas well usually occurs when it is depleted and can no longer produce in paying quantities. At this stage, the operator submits a plug and abandonment plan which is reviewed and, if necessary, modified by the BLM petroleum engineer prior to approval. When the downhole plugging is completed, the operator submits a subsequent Report of Abandonment which is reviewed by the BLM.

When surface reclamation is completed and vegetation has been reestablished, usually in two to three growing seasons, the operator will submit another subsequent report of a Final Abandonment Notice (FAN). The BLM will inspect the location to determine whether it was reclaimed properly, and if so, approve the FAN.

B-2. Description of Typical Oil and Gas Operations

Site Preparation

An oil or gas well requires the construction of a level, structurally competent location for placement of the drilling rig and associated equipment. Wasatch and Mesaverde drill pads within the area require an average of 3.4 acres for single wells and 5 acres where two wells are drilled from one surface location. Drill pads are cleared of all vegetation using a bulldozer or other earth-moving equipment. Topsoil is usually removed and stored for use in reclaiming the site.

An access road to the drilling location will also be constructed to transport the drilling rig, materials, and well servicing equipment to the site. These roads have a driving surface that is usually 16 to 18 feet wide, and an assumed total disturbed width of 35 feet. Gross vehicle weights of vehicles using these roads may exceed 80,000 lbs. Each well access road constructed in the area will result in about 1.5 acres of surface disturbance; the average length is anticipated to be about 1,900 feet.

During construction of the drilling location, one or two earthen pits will be constructed for storing drill cuttings and drilling mud reserves during drilling. Pits are usually unlined but may be lined with plastic or bentonite clay to prevent fluid loss or contamination of subsurface water resources. Pitless or self-contained drilling systems are sometimes called for in areas of high ground water or sensitive resource values. These systems substitute portable tanks of water and drilling mud reserves and may include a reverse osmosis or centrifuge system to remove solids from drilling fluids.

The site preparation process may last several weeks, depending upon the length of access road and size of drilling pad that will be constructed.

Drilling

Oil and gas wells are drilled primarily with rotary drilling rigs. In the rotary method, a hole is drilled by means of a rotating bit to which a downward force is applied. The bit is attached to, and rotated by, a drill string composed of drill pipe and drill collars, with new sections of pipe being added as drilling progresses. Drill cuttings are lifted from the hole by the drilling mud, which is continuously pumped down the drill string through nozzles in the bit and upward through the annular space between the drill pipe and the hole. At the surface, the drilling mud is diverted to tanks or pits for cleaning and treatment.

Water-based mud is used during drilling of Wasatch and Mesaverde wells. Water requirements range between 5,000 and 15,000 gallons per day, delivered to the site by truck. Operators in the GSFO typically reuse water from their drilling mud in order to reduce water transportation costs. Drilling mud typically has several additives that are used to enhance the properties of the fluid. Typical mud additives include:

- weighting materials 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 for removal by settling
- surfactants, such as fatty acids and soaps, to defoam and emulsify the mud
- biocides to kill bacteria that may be inhabiting the mud
- fluid loss reducers such as starch and polymers to limit the loss of drilling fluid to subsurface formations

The Wasatch and Mesaverde formations are susceptible to formation damage from water contained in the drilling mud. Clays within the rock pores swell in contact with the water, resulting in reduced well productivity. Wasatch and Mesaverde wells are generally drilled under-balanced, meaning that the pressure exerted on the formation by the drilling mud is maintained at equal to, or slightly less than, the formation pressure, limiting the amount of water that is allowed to come into contact with the producing formation(s).

As the hole is drilled, casing is placed in the hole to prevent caving, and to isolate water- and hydrocarbon-bearing zones. Three or four separate casing strings may be used in wells within the RPA. Casing is secured in place by pumping cement down the inside of the casing, which travels to the bottom of the borehole, then upward into the annular space between the casing and the hole.

Directional drilling may be employed to reduce the amount of surface disturbance necessary to drill wells or to reach bottom-hole locations that may not be accessible from the surface with a straight hole. More than one well can be drilled from a single surface location using this technology, with the objective of effectively accessing the producing horizon beneath areas where surface disturbance is not permitted. A directionally drilled well is more costly to drill than a vertical well to the same depth.

Typical Wasatch and Mesaverde wells within the area require about 2 weeks to drill, log, and set casing. Following setting of the casing and any surface equipment, the drilling rig is moved from the well location. Drill cuttings are usually buried in the pit where they were accumulated during well drilling.

Well Completion

After drilling the well, several steps are required to start production. Well completion operations are generally performed by a completion rig — a small, truck-mounted rig used to complete the well and install downhole equipment. The casing and cement must be perforated to enable gas to enter the well bore. Several producing zones may be perforated by means of small, shaped explosive charges that create holes in the casing and cement.

The Wasatch and Mesaverde formations are considered low-permeability gas reservoirs and require hydraulic fracturing in order to produce at economic flow rates. Hydraulic fracturing is accomplished by pumping a water-based viscous fluid and sand down the well at high pressures and flow rates. After the fracture gradient (the pressure where the formation begins to break down) for the zone is reached and exceeded, the formation fractures and begins taking the fluid and remains propped open after pumping stops and pressure is released. The propped fracture provides a high-permeability channel for gas to enter the well bore. In some wells, hydrochloric or hydrofluoric acid may be pumped into the producing formation to enhance permeability.

Gas production from the well is controlled using an assembly of pipes, valves, and fittings at the surface (called the Christmas tree). Following completion, a well is allowed to flow back to the pit, which removes any excess fracturing fluid, spent acid, and remaining sand in the well bore. Any gas and oil that comes to the surface is burned off, or “flared.” Some operators in the GSFO use specialized separation equipment, referred to as a super separator, to decrease the need for flaring. The well is then shut-in or connected to a gas flowline.

Infrastructure

Produced fluid flows from the wellhead into an onsite separator that removes water and condensate from the flow line. Natural gas is directed from the separator into a flowline, a 2- to 4-inch-diameter pipeline leading to a trunk line or natural gas compressor. Flowlines are usually buried but can be laid on the ground surface. Within the area, flowlines will primarily be built along the existing access road to minimize surface disturbance. Water and condensate are stored in onsite tanks and are periodically removed by truck. The condensate is sold and the water is transported to an approved disposal facility.

Trunk lines gather gas from a number of producing wells and are usually 6 to 8 inches in diameter and buried. Compressors are used to move gas from flowlines and trunk lines into transmission lines. Compressor stations range in size from one acre to as much as 20 acres, depending upon the number of compressors required and the need for additional support infrastructure. Natural gas is generally sold at the point at which it moves into a transmission line. Transmission lines range from 10 to 36 inches in diameter and transport natural gas to a facility to be conditioned for ultimate sale to a purchaser.

Maintenance

Natural gas wells may periodically require maintenance procedures called workovers. Workovers are performed using a completion rig and may include repairing leaks in the casing, tubing, or other downhole equipment; re-completing the well in additional producing formations; stimulating the well with supplemental fracturing or acid treatments; or removing scale and other accumulated deposits. Workovers may take one day to several days to complete, depending upon the complexity of the tasks to be undertaken.

Surface equipment may also require periodic maintenance. Valves, piping, tanks, and separators may require repair, cleaning, and adjustment. Each well is visited on a regular basis by the operator, who checks on the performance of the well, gauges condensate and water tanks, and is responsible for the proper functioning of the production equipment. The frequency of these visits may range from once per day to once per week. Some operators in the vicinity of the Roan Plateau use solar-powered remote telemetry facilities to monitor well performance, reducing the number of visits to the well site.

Reclamation and Abandonment

Disturbed areas are partially reclaimed following well completion, based on a BLM-approved reclamation plan. This includes reclamation on that portion of disturbed areas which is not considered necessary during well production. Abandoned well locations are reclaimed. Reclamation requirements are contained in the Conditions of Approval (COAs) applied by BLM during the permitting process.

Well abandonment involves placing cement plugs in the well bore to prevent fluid migration. Surface facilities are removed and the well is capped below the ground surface. Buried pipelines are usually left in place but plugged at intervals as a safety precaution.

References

Bureau of Land Management (BLM) 1998. Glenwood Springs Resource Area Oil & Gas Leasing & Development Draft Supplemental Environmental Impact Statement. Glenwood Springs, CO. June.

Bureau of Land Management (BLM) 1999. Glenwood Springs Resource Area Oil & Gas Leasing & Development Final Supplemental Environmental Impact Statement. Glenwood Springs, CO. January.

U.S. Environmental Protection Agency (EPA) 2000. Profile of the Oil and Gas Extraction Industry. Washington, D.C. October.

Form 3100-11
(October 1992)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Serial No.

OFFER TO LEASE AND LEASE FOR OIL AND GAS

The undersigned *(reverse)* offers to lease all or any of the lands in Item 2 that are available for lease pursuant to the Mineral Leasing Act of 1920, as amended and supplemented (30 U.S.C. 181 et seq.), the Mineral Leasing Act for Acquired Lands of 1947, as amended (30 U.S.C. 351-359), the Attorney General's Opinion of April 2, 1941 (40 Op. Atty. Gen. 41), or the

READ INSTRUCTIONS BEFORE COMPLETING

1. Name
Street
City, State, Zip Code

2. This application/offer/lease is for: *(Check only One)* ☐ PUBLIC DOMAIN LANDS ☐ ACQUIRED LANDS (percent U.S. interest ________)
Surface managing agency if other than BLM: ____________________ Unit/project ____________________
Legal description of land requested: *Parcel No.: ____________ * Sale Date (m/d/y): ___/___/___
***SEE ITEM 2 IN INSTRUCTIONS BELOW PRIOR TO COMPLETING PARCEL NUMBER AND SALE DATE.**

T. R. Meridian State County

Total acres applied for ____________
Amount remitted: Filing fee $ ____________ Rental fee $ ____________ Total $ ____________

DO NOT WRITE BELOW THIS LINE

3. Land included in lease:

T. R. Meridian State County

Total acres in lease ____________
Rental retained $____________

This lease is issued granting the exclusive right to drill for, mine, extract, remove and dispose of all the oil and gas (except *helium*) in the lands described in Item 3 together with the right to build and maintain necessary improvements thereupon for the term indicated below, subject to renewal or extension in accordance with the appropriate leasing authority. Rights granted are subject to applicable laws, the terms, conditions, and attached stipulations of this lease, the Secretary of the Interior's regulations and formal orders in effect as of lease issuance, and to regulations and formal orders hereafter promulgated when not inconsistent with lease rights granted or specific provisions of this lease.

NOTE: This lease is issued to the high bidder pursuant to his/her duly executed bid or nomination form submitted under 43 CFR 3120 and is subject to the provisions of that bid or nomination and those specified on this form.

Type and primary term of lease:
☐ Noncompetitive lease (ten years)
☐ Competitive lease (ten years)
☐ Other ____________________

THE UNITED STATES OF AMERICA

by ____________________
(Signing Officer)

____________________ ____________
(Title) (Date)

EFFECTIVE DATE OF LEASE ____________________

(Continued on reverse)

4. (a) Undersigned certifies that (1) offeror is a citizen of the United States; an association of such citizens; a municipality; or a corporation organized under the laws of the United States or of any State or Territory thereof; (2) all parties holding an interest in the offer are in compliance with 43 CFR 3100 and the leasing authorities; (3) offeror's chargeable interests, direct and indirect, in each public domain and acquired lands separately in the same State, do not exceed 246,080 acres in oil and gas leases (of which up to 200,000 acres may be in oil and gas options), or 300,000 acres in leases in each leasing District in Alaska of which up to 200,000 acres may be in options, (4) offeror is not considered a minor under the laws of the State in which the lands covered by this offer are located; (5) offeror is in compliance with qualifications concerning Federal coal lease holdings provided in sec. 2(a)(2)(A) of the Mineral Leasing Act, (6) offeror is in compliance with reclamation requirements for all Federal oil and gas lease holdings as required by sec. 17(g) of the Mineral Leasing Act; and (7) offeror is not in violation of sec. 41 of the Act.

(b) Undersigned agrees that signature to this offer constitutes acceptance of this lease, including all terms, conditions, and stipulations of which offeror bas been given notice, and any amendment or separate lease that may include any land described in this offer open to leasing at the time this offer was filed but omitted for any reason from this lease. The offeror further agrees that this offer cannot be withdrawn, either in whole or in part unless the withdrawal is received by the proper BLM State Office before this lease, an amendment to this lease, or a separate lease, whichever covers the land described in the withdrawal, has been signed on behalf of the United States.

This offer will be rejected and will afford offeror no priority if it is not prnperly completed and executed in accordance with the regulations, or if it is not accompanied by the required payments. 18 U.S.C. Sec. 1001 makes it a crime for any person knowingly and willfully to make to any Department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

Duly executed this ____________ day of______________________________ 20 ______ ______________________________

(Signature of Lessee or Attorney-in-fact)

LEASE TERMS

Sec. 1. Rentals - Rentals shall be paid to proper office of lessor in advance of each lease year. Annual rental rates per acre or fraction thereof are:

(a) Noncompetitive lease, $1.50 for the first 5 years; thereafter $2.00;
(b) Competitive lease, $1.50, for the first 5 years; thereafter $2.00;
(c) Other, see attachment, or
as specified in regulations at the time this lease is issued.

If this lease or a portion thereof is committed to an approved cooperative or unit plan which includes a well capable of producing leased resources, and the plan contains a provision for allocation of production, royalties shall be paid on the production allocated to this lease. However, annual rentals shall continue to be due at the rate specified in (a), (b), or (c) for those lands not within a participating area.

Failure to pay annual rental, if due, on or before the anniversary date of this lease (or next official working day if office is closed) shall automatically terminate this lease by operation of law. Rentals may be waived, reduced, or suspended by the Secretary upon a sufficient showing by lessee.

Sec. 2. Royalties - Royalties shall be paid to proper office of lessor. Royalties shall be computed in accordance with regulations on production removed or sold. Royalty rates are:

(a) Noncompetitive lease, 12 1/2 %;
(b) Competitive lease, 12 1/2 %;
(c) Other, see attachment; or
as specified in regulations at the time this lease is issued.

Lessor reserves the right to specify whether royalty is to be paid in value or in kind, and the right to establish reasonable minimum values on products after giving lessee notice and an opportunity to be heard. When paid in value, royalties shall be due and payable on the last day of the month following the month in which production occurred. When paid in kind, production shall be delivered, unless otherwise agreed to by lessor, in merchantable condition on the premises where produced without cost to lessor. Lessee shall not be required to hold such production in storage beyond the last day of the month following the month in which production occurred, nor shall lessee be held liable for loss or destruction of royalty oil or other products in storage from causes beyond the reasonable control of lessee.

Minimum royalty in lieu of rental of not less than the rental which otherwise would be required for that lease year shall be payable at the end of each lease year beginning on or after a discovery in paying quantities. This minimum royalty may be waived, suspended, or reduced, and the above royalty rates may be reduced, for all or portions of this lease if the Secretary determines that such action is necessary to encourage the greatest ultimate recovery of the leased resources, or is otherwise justified.

An interest charge shall be assessed on late royalty payments or underpayments in accordance with the Federal Oil and Gas Royalty Management Act of 1982 (FOGRMA) (30 U.S.C. 1701). Lessee shall be liable for royalty payments on oil and gas lost or wasted from a lease site when such loss or waste is due to negligence on the part of the operator, or due to the failure to comply with any rule, regulation, order, or citation issued under FOGRMA or the leasing authority.

Sec. 3. Bonds - A bond shall be filed and maintained for lease operations as required under regulations.

Sec. 4. Diligence, rate of development, unitization, and drainage - Lessee shall exercise reasonable diligence in developing and producing, and shall prevent unnecessary damage to, loss of, or waste of leased resources. Lessor reserves right to specify rates of development and production in the public interest and to require lessee to subscribe to a cooperative or unit plan, within 30 days of notice, if deemed necessary for proper development and operation of area, field, or pool embracing these leased lands. Lessee shall drill and produce wells necessary to protect leased lands from drainage or pay compensatory royalty for drainage in amount determined by lessor.

Sec. 5. Documents, evidence, and inspection - Lessee shall file with proper office of lessor, not later than 30 days after effective date thereof, any contract or evidence of other arrangement for sale or disposal of production. At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing amounts and quality of all products removed and sold, proceeds therefrom, and amount used for production purposes or unavoidably lost. Lessee may be required to provide plats and schematic diagrams showing development work and improvements and reports with respect to parties in interest, expenditures, and depreciation costs. In the form prescribed by lessor, lessee shall keep a daily drilling record, a log, information on well surveys and tests, and a record of subsurface investigations and furnish copies to lessor when required. Lessee shall keep open at all reasonable times for inspection by any authorized officer of lessor, the leased premises and all wells, improvements, machinery, and fixtures thereon, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or in the leased lands. Lessee shall maintain copies of all contracts, sales agreements, accounting records, and documentation such as billings, invoices, or similar documentation that supports costs claimed as manufacturing, preparation, and/or transportation costs. All such records shall be maintained in lessee's accounting offices for future audit by lessor. Lessee shall maintain required records for 6 years after they are generated or, if an audit or investigation is underway, until released of the obligation to maintain such records by lessor.

During existence of this lease, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 6. Conduct of operations - Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air, and water, to cultural, biological, visual, and other resources, and to other land uses or users. Lessee shall take reasonable measures deemed necessary by lessor to accomplish the intent of this section. To the extent consistent with lease rights granted, such measures may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in the leased lands, including the approval of easements or rights-of-way. Such uses shall be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee.

Prior to disturbing the surface of the leased lands, lessee shall contact lessor to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessee may be required to complete minor inventories or short term special studies under guidelines provided by lessor. If in the conduct of operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipated environmental effects are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in the destruction of such species or objects.

Sec. 7. Mining operations - To the extent that impacts from mining operations would be substantially different or greater than those associated with normal drilling operations, lessor reserves the right to deny approval of such operations.

Sec. 8. Extraction of helium - Lessor reserves the option of extracting or having extracted helium from gas production in a manner specified and by means provided by lessor at no expense or loss to lessee or owner of the gas. Lessee shall include in any contract of sale of gas the provisions of this section.

Sec. 9. Damages to property - Lessee shall pay lessor for damage to lessor's improvements, and shall save and hold lessor harmless from all claims for damage or harm to persons or property as a result of lease operations.

Sec. 10. Protection of diverse interests and equal opportunity - Lessee shall: pay when due all taxes legally assessed and levied under laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; and take measures necessary to protect the health and safety of the public.

Lessor reserves the right to ensure that production is sold at reasonable prices; and to prevent monopoly. If lessee operates a pipeline, or owns controlling interest in a pipeline or a company operating a pipeline, which may be operated accessible to oil derived from these leased lands, lessee shall comply with section 28 of the Mineral Leasing Act of 1920.

Lessee shall comply with Executive Order No. 11246 of September 24, 1965, as amended, and regulations and relevant orders of the Secretary of Labor issued pursuant thereto. Neither lessee, nor lessee's subcontractors shall maintain segregated facilities.

Sec. 11. Transfer of lease interests and relinquishment of lease - As required by regulations, lessee shall file with lessor any assignment or other transfer of an interest in this lease. Lessee may relinquish this lease or any legal subdivision by filing in the proper office a written relinquishment, which shall be effective as of the date of filing, subject to the continued obligation of the lessee and surety to pay all accrued rentals and royalties.

Sec. 12. Delivery of premises - At such time as all or portions of this lease are returned to lessor, lessee shall place affected wells in condition for suspension or abandonment, reclaim the land as specified by lessor and, within a reasonable period of time, remove equipment and improvements not deemed necessary by lessor for preservation of producible wells.

Sec. 13. Proceedings in case of default - If lessee fails to comply with any provisions of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation unless or until the leasehold contains a well capable of production of oil or gas in paying quantities, or the lease is committed to an approved cooperative or unit plan or communitization agreement which contains a well capable of production of unitized substances in paying quantities. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time. Lessee shall be subject to applicable provisions and penalties of FOGRMA (30 U.S.C. 1701).

Sec. 14. Heirs and successors-in-interest - Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to the heirs, executors, administrators, successors, beneficiaries, or assignees of the respective parties hereto.

Appendix C

Resource Management Decision Stipulations for New Oil and Gas Leases and Other Land Uses and Management Actions

Resource Management Decision Stipulations for New Oil and Gas Leases and Other Lands Uses and Management Actions under Alternative I through V

Introduction

Oil and gas leases issued pursuant to approval and implementation of any of the alternatives analyzed under this RMPA/EIS grant the lessee the right to extract the oil and gas resource on affected BLM lands within the Planning Area. Section 6 of the lease document (see sample in Appendix B) restricts the lease rights granted by requiring that the lessee conduct operations in a manner that minimizes adverse [environmental] impacts and take reasonable measures deemed necessary by the lessor (BLM) to accomplish this intent. These prudent measures are applied through attaching stipulations to the lease and Conditions of Approval (COAs) to the APD. Stipulations and COAs clarify BLM's intent to protect known resources or resource values. Stipulations that would be attached to new oil and gas leases under Alternatives I through V are listed and described in Table C-1 below. The table also describes the criteria by which BLM may grant exceptions, modifications, or waivers to the stipulations. If none are listed, none have been identified. Areas included within the various stipulations under Alternatives I through V are shown on Maps 2, 4, 6, and 8, and 10, respectively, of Appendix A. Definitions are as follows:

- **Stipulation** – A condition of lease issuance (or other land use approval) that provides protection for other resource values or land uses by establishing authority for substantial delay or site changes or the denial of operations within the terms of the lease contract.
- **Exception** – A one-time exemption from a stipulation. Exceptions are determined on a case-by-case basis, and if granted, suspend the restrictions of a stipulation for a specified period, location, or activity. The stipulation continues to apply to other sites within the stipulation area. Exceptions that conform to the RMP do not require public notice. Non-conforming exceptions are granted only upon RMP amendment and following public notice.

  Hypothetical Example: During a mild winter, mule deer have not moved into some low-elevation, low-quality winter range because adequate and higher quality winter range is available at higher elevations. The BLM may grant an exception to the seasonal restriction (Timing Limitation) for all or part of the mule deer winter range if it determines that *de facto* loss of that habitat in that year would not adversely affect the population. Even if an exception to the 5-month Timing Limitation is granted, BLM could still require a 2-month seasonal avoidance during the coldest months, and the stipulation would be reapplied the following winter unless data indicated a similar situation.
- **Modification** – A fundamental change to the provisions of a stipulation. Modifications may be temporary or permanent and apply to a specific site or to all sites within the stipulation areas. Modifications are made if it is determined that the stipulation is no longer required as written, such as based on the results of monitoring data. While the underlying purpose of the stipulation continues, it can be met with less restrictive means. Modifications require an environmental assessment to determine potential impacts and evaluate

whether an RMP amendment is needed. If deemed substantial, a modification requires a 30-day public notice period prior to implementation.

Hypothetical Example: Monitoring data and an area analysis indicate that the No Surface Occupancy stipulation excluding long-term ground-disturbing activities within 0.5 mile of the Colorado River is unnecessarily stringent. This conclusion is based (hypothetically) on a determination that intervening vegetation, topography, and other land uses are such that a narrower buffer would adequately protect the hydrologic, aquatic, riparian, visual, and other resource values. BLM may modify the stipulation, either temporarily or permanently, to reduce the buffer width to 0.25 miles and rely on other stipulations to provide the necessary protection.

- **Waiver** – A permanent exemption to a stipulation. Waivers apply to an entire stipulation area and are applied only after preparation of an environmental assessment and subsequent decision that a stipulation is no longer required to protect a specific resource. The decision to waive a substantial stipulation requires a plan amendment and a 30-day public notice period prior to waiver.

  Hypothetical Example: Monitoring data indicate that a particular Controlled Surface Use stipulation for the protection of sensitive plant species and significant plant communities associated with drainages is not needed. Because of other stipulations that provide the same or higher level protection along the actual stream corridor, standard stipulations are adequate to protect the specific vegetation resources. BLM could, after preparing an environmental assessment and plan amendment involving a 30-day public comment period, waive that stipulation throughout the area where it previously applied.

Regulations covering exceptions, modifications, and waivers are found in 43 CFR 3101.1-4. Typically, lease stipulations can only be changed by mutual agreement between the BLM and the leasing party. Leases have no expiration date providing terms and conditions of the lease are met. COAs can be changed at the discretion of the BLM.

For the purposes of this RMPA/EIS, the stipulations and associated bases for granting exceptions, modifications, and waivers apply to all land uses and management actions for which the BLM has approval responsibility, and not only to oil and gas development. Any restrictions on these other land uses or management activities are imposed at the time of issuance of a specific permit or other approval, while stipulations for oil and gas activities are attached to the lease document.

- **No Surface Occupancy (NSO)** – The NSO stipulation is intended for application only when other stipulations are deemed insufficient to achieve the level of resource protection necessary to protect the public interest. An NSO stipulation is not needed if the desired level of protection can be accomplished by relocating a proposed facility or activity or avoiding that activity for a specified period.

  The equivalent of an NSO for land uses and activities other than oil and gas development is NGD (No Ground Disturbance).

- **Controlled Surface Use (CSU)** – The CSU stipulation is intended for application where standard lease terms and permit-level decisions are deemed insufficient to achieve the level of resource protection necessary to protect the public interest, but where an NSO is deemed overly restrictive.

A CSU stipulation allows BLM to require that a proposed facility or activity be relocated by more than 200 meters from the proposed location if necessary to achieve the desired level of protection. A CSU is not needed if relocating the proposed facility or activity by up to 200 meters would be sufficient.

The equivalent of a CSU for land uses and activities other than oil and gas development is SSR (Site Specific Relocation).

- **Timing Limitation (TL)** – This stipulation limits activity during a specified period of the year. A TL stipulation is intended for application where standard lease terms are deemed insufficient to achieve the level of resource protection necessary to protect the public interest, but where an NSO is deemed overly restrictive. The scope of the TL stipulation goes beyond ground-disturbing activities to encompass any source of protracted or high-intensity disturbance that could interfere with normal wildlife behavior and adversely affect habitat use. The limitation is applied annually for a specified period lasting more than 60 days.

  Under this RMPA/EIS, Timing Limitations may also be applied to land uses and activities other than oil and gas development.

Note that existing stipulations under the 1999 ROD and RMP Amendment would apply to existing leases under all alternatives, while new stipulations under this RMPA/EIS would apply to all new oil and gas leases. Note also that equivalent levels of protection would be applied to other land uses and management actions as a condition of their approval. Other protective measures such as special mitigation requirements could also be applied to land uses and management actions other than oil and gas. (As described above, they could be required for oil and gas development as a COA during the permitting process.)

In the following tables, and throughout the text of this RMPA/EIS, reference is made to existing stipulations that would be applied, extended, retained, or dropped with regard to new leases. This is procedurally imprecise, since only new stipulations would be applied to new leases. However, many of the new leases are based on, and vary only slightly (or not at all) from, some of the existing stipulations for current leases.

In the following tables and in Chapter 4 of this RMPA/EIS, new stipulations designated by NSO, CSU, or TL followed by a number are based on existing stipulations, while those that include a "P" for plants, "V" for visual resources, "W" for wildlife, or "WSR" for Wild and Scenic Rivers are not derived from existing stipulations.

Also apparent in Table C-1 is a gap in the numbering system for stipulations. This is an artifact of the status of the planning process. When a final alternative is selected, the ROD and RMP Amendment implementing that alternative will include a sequential renumbering of the stipulations to eliminate any gaps.

Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases and to Other Land Uses and Management Actions under Alternatives I through V [1]

Stipulation	Alternatives	Objective	Measures and Areas Applied	Exception or Modification Criteria
NO SURFACE OCCUPANCY (NSO) STIPULATIONS APPLICABLE TO NEW OIL AND GAS LEASES AND TO OTHER LAND USES				
NSO 2 Riparian and Wetland Zones 231.7 acres	All	Maintain proper hydrologic function and protect adjacent riparian and wetland areas that provide habitat for special- status fish and wildlife species, waterfowl and shorebird production, and amphibian breeding/feeding or that provide important water quality, scenic, or recreation values.	Ground-disturbing activities, roads, electric transmission lines, and other sources of surface disturbance are limited to areas beyond the outer edge of riparian or wetland vegetation.	An exception or modification may be granted if (a) the activity will cause no loss of riparian vegetation or, if riparian is lost, that the loss is limited to no more than 0.1 acre, and 100 linear feet, per mile of stream; (b) any temporarily disturbed areas are revegetated with the same or similar species, including use of "nursery stock" rather than seeds to replace woody plants on a one-to-one basis (trees) or area-for-area basis (shrubs); (c) revegetation success can be achieved within 2 years; (d) the activity will not impair water quality, flow regime, aquatic habitat quality, and channel and bank stability; and (e) no suitable alternative is available.
NSO 3 Major River Corridors 439.8 acres	All	Protect high-quality habitats and wildlife areas, water quality-benefits, and scenic qualities along the Colorado River.	No ground-disturbing activities within 0.5 mile of high water mark on either side of river.	An exception or modification (e.g., reduced buffer zone width) may be granted if the BLM determines that (a) the specific activity or requested change would not impair water quality, high-quality habitats, and scenic qualities after considering the vegetation, topography, existing habitat impacts, and other site-specific or activity-specific factors and the amount, type, and duration of surface disturbance proposed; and (b) any lost vegetation would be replaced with the same or similar species within 3 to 5 years.
NSO 7 Raptor Nesting Areas 715.7 acres	All	Protect nesting of raptors not protected by the Endangered Species Act or other species-specific stipulation.	No ground-disturbing activities within 0.125 mile of an active nest (i.e., containing eggs or young or being attended by adults in preparation for nesting).	An exception or modification may be granted (a) if the BLM determines, following consultation with CDOW, that the specific activity or requested change would not impair behaviors, habitat use and quality, and reproductive success of raptor species present within the specific NSO area; (b) the activity would have a duration within the buffer zone of an active nest of less than one day; and (c) no suitable alternative is available. The BLM's determination would consider the vegetation, topography, existing habitat impacts, and other site-specific or activity-specific factors and the amount, type, and exact location of the surface

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[1] *NSO, CSU, and TL stipulations may overlap within and among categories. Acres of stipulations cannot be summed to calculate total area affected.*

Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases and to Other Land Uses and Management Actions under Alternatives I through V [1]

Stipulation	Alternatives	Objective	Measures and Areas Applied	Exception or Modification Criteria
				disturbance in relation to the nest and vegetation or topographic screening.
NSO 8 Bald Eagle 31.8 acres	All	Protect nesting or winter roosting of this Federally listed threatened species.	No ground-disturbing activities within 0.25 mile of designated bald eagle nesting or roosting habitat.	An exception or modification (e.g., reduced buffer zone width) may be granted following Section 7 consultation with USFWS and depending on the status of the nest or roost (active or inactive); the location of the activity in relation to the nest and areas of topographic or vegetation screening; conservation measures if required by USFWS; and the amount, type, and duration of surface disturbance. An exception or modification granted in one year would not necessarily be granted in subsequent years.
NSO 9 Peregrine Falcon 367.4 acres	All	Protect nesting of this State-listed threatened species.	No ground-disturbing activities within 0.25 mile of the cliff-nesting complex along the Roan Cliffs from March 15 through July 31.	An exception or modification (e.g., reduced buffer zone width) may be granted following consultation with CDOW and after considering the status of the nest (active or inactive), its relationship to areas of topographic or vegetational screening, and the type, amount, and duration of the surface disturbance. No exception would be granted for an activity with a duration longer than one when the cliff-nesting complex is occupied by breeding by peregrine falcons. An exception or modification granted in one year would not necessarily be granted in subsequent years.
NSO 11 Wildlife Seclusion Areas 3,444 acres	I, II	Protect important seclusion (security) for wildlife, especially deer and elk.	No ground-disturbing activities in areas that provide high-value habitats along and below the base of the Roan Cliffs.	An exception or modification may be granted (a) if BLM determines, following consultation with CDOW, that the specific activity or requested change would not impair habitat quality due to habitat loss or fragmentation or disturbance from human activity; or (b) the activity would have a duration within the seclusion area of less than one day. The BLM's determination would consider the vegetation, topography, existing habitat impacts, and other site-specific or activity-specific factors and the amount, type, and exact location of the surface disturbance.
NSO 12	All	Protect occupied habitat, or other	No ground-disturbing activities within	An exception or modification may be granted,

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Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases and to Other Land Uses and Management Actions under Alternatives I through V [1]

Stipulation	Alternatives	Objective	Measures and Areas Applied	Exception or Modification Criteria
Threatened or Endangered Species 1,944.6 acres		habitat crucial for the maintenance or recovery, of species listed at the Federal or State levels as threatened or endangered, and proposed or candidate species at the Federal level.	occupied habitat or habitat necessary for maintenance or recovery of the species.	following Section 7 consultation with USFWS or consultation with CDOW for State-listed species, and after considering the behavioral and ecological requirements of the species; the type, amount, and duration of the surface disturbance, relative extent of available habitat; relationship to topography and vegetation screening; and other factors that may affect maintenance or recovery of the species. If a species affected by this stipulation is removed from the Federal listed ("delisted"), this stipulation would be modified to exclude that species.
NSO 15 Steep Slopes (>50%) 16,549.9 acres	All	Maintain soil stability and productivity and minimize impacts of soil erosion on other resources.	No ground-disturbing activities on slopes steeper than 50%. [Note: This differs from the existing condition in that pipeline construction is no longer exempted.]	An exception or modification may be granted on areas with slopes less than 50% that are entirely or partially surrounded by slopes steeper than 50% if the less steep area (a) is at least 10 acres in size and (b) can be reached by road, pipeline, powerline, or other required access without crossing any slope steeper than 50%. No exceptions will be granted in areas of steep slopes that also are designated as wildlife movement corridors.
NSO 18 I-70 Viewshed 10,982.3 acres	I, II, III, IV	Protect areas with high visual sensitivity within 5 miles of I-70.	No ground-disturbing activities on slopes steeper than 30% with high visual sensitivity in the I-70 viewshed. These are lands within 5 miles of the highway, of moderate to high visual exposure, where details of vegetation and landform are readily discernible, and changes in contrast can be easily noticed by the casual observer on I-70.	An exception or modification may be granted if protective measures can be designed to accomplish VRM Class II objectives, viz., that the overall landscape character is retained on a site-specific and cumulative basis. Such measures would be designed to blend the disturbance with the natural landscape.
NSO 19 Anvil Points Cave Area	All	Protect the scientific and wildlife values of these caves.	No ground-disturbing activities in the area encompassing the cave opening, subsurface features, and watersheds overlying the caves.	An exception or modification would require that the proponent demonstrate by monitoring or other method, and with a high degree of scientific reliability, that the activity would not impair the cave values being

[1] ***NSO, CSU, and TL stipulations may overlap within and among categories. Acres of stipulations cannot be summed to calculate total area affected.***

Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases and to Other Land Uses and Management Actions under Alternatives I through V [1]

Stipulation	Alternatives	Objective	Measures and Areas Applied	Exception or Modification Criteria
118.4 acres				protected. Any exception or modification would be approved only after consultation with CDOW and considering the type, amount, duration, and timing of the activity.
NSO WSR-1 Wild and Scenic Rivers 7,883 acres	II, III, IV	Protect stream segments eligible for a suitability study under the Wild and Scenic Rivers Act (WSRA).	No ground-disturbing activities within 0.25 mile of any stream segment determined, as a result of the BLM surveys, to meet criteria for eligibility for designation as a Wild and Scenic River. Includes a total of 64 stream miles in portions of the East Fork Parachute Creek and Trapper/Northwater Creek drainages.	An exception may be granted if the BLM determines that the proposed activity would not affect the values being preserved under interim management guidelines for WSR-eligible stream segments. The BLM's determination would consider the type, amount, duration, and timing of surface disturbance in relation to the values being protected. A modification would be granted if a suitability study pursuant to the WSRA (modification) resulted in a decision not to designate the eligible streams as WSRs.
NSO V-1 VRM Class I Areas – East Fork Falls and Box Canyon 920.7 acres	II, III, IV	Preserve the existing character of the landscape to meet VRM Class I objectives in areas designated as very high or high visual sensitivity (East Fork Falls and Box Canyon)	No ground-disturbing activities that would cause landscape modifications that violate VRM Class I objectives or interfere with natural ecological changes in landscape character and scenic quality.	An exception or modification may be granted if the BLM determines that the basic landscape elements (line, form, color, and texture) would be retained and that any modifications would appear natural and would not be evident.
NSO V-2 VRM Class I Areas 36,183.9 acres	II	Preserve the existing character of landscape to meet VRM Class I objectives.	No ground-disturbing activities that would cause landscape modifications that violate VRM Class I objectives or interfere with natural ecological changes in landscape character and scenic quality.	An exception or modification may be granted if the BLM determines that the basic landscape elements (line, form, color, and texture) would be retained and that any modifications would appear natural and would not be evident.
NSO P-1 Occupied Habitat for Sensitive Plants and Significant	II, III, IV,V	Protect occupied habitat of, and ecosystem processes that support, sensitive plant species or significant plant communities.	No ground-disturbing activities within habitats known to contain individuals or populations of sensitive plant species, within a significant plant community, or in adjacent areas that provide ecosystem	An exception may be granted if the BLM determines that (a) the requested activity would not impair values associated with sensitive plants or significant plant communities; (b) any lost vegetation would be replaced with the same or similar species within 3 to 5 years;

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Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases and to Other Land Uses and Management Actions under Alternatives I through V [1]

Stipulation	Alternatives	Objective	Measures and Areas Applied	Exception or Modification Criteria
Plant Communities 2,690.5 acres			processes needed to support these vegetation resources.	and (c) no suitable alternative is available. The stipulation may be modified if the proponent demonstrates through monitoring studies or other scientifically reliable method that an NSO is not needed to achieve specified resource protection.
NSO P-2 Potential Habitat for Sensitive Plants and Significant Plant Communities	II	Protect and maintain potential habitat and ecosystem processes that support sensitive plant species or significant plant communities.	No long-term ground disturbing activities within potential habitat/ecosystem processes for rare plants and significant communities.	An exception may be granted if the BLM determines that (a) the requested activity would not impair values associated with sensitive plants or significant plant communities; (b) any lost vegetation would be replaced with the same or similar species within 3 to 5 years; and (c) no suitable alternative is available. The stipulation may be modified if the proponent demonstrates through monitoring studies or other scientifically reliable method that an NSO is not needed to achieve specified resource protection.
NSO P-3 Remnant Plant Communities (Old-growth Douglas-fir) 1,729.7	II	Protect the current extent, ecological integrity, and function of the old-growth Douglas-fir community.	No ground-disturbing activities within old-growth Douglas-fir remnant community, including removal of any size-class trees.	An exception may be granted if the BLM determines that (a) the requested activity would not impair the continued survival of a stand of Douglas-fir; (b) would result in less than 10% fragmentation of any contiguous block; (c) the physical disturbance would not last more one growing season; (d) the disturbed area could be restored with a native herb and shrub understory and planted with Douglas-fir trees; and (e) no suitable alternative exists.
NSO P-4 High Risk Habitat for Sensitive Plants or Significant Plant Communities 3,039.7 acres	II, III, IV, V	Protect sensitive plant species and significant plant communities from direct impacts in High Risk Habitat.	No ground-disturbing activities that would result in loss or degradation of areas designated as High Risk Habitat for individuals or populations of sensitive plant species or areas of significant plant communities.	An exception may be granted if the BLM determines that the requested activity would not impair habitat values associated with sensitive plants and significant plant communities. The stipulation may be modified if the proponent demonstrates through monitoring studies or other scientific method that an NSO is not needed to achieve the specified resource protection.
NSO P-5	II	Protect and maintain the	Allow no ground-disturbing activities	An exception may be granted if the BLM determines

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Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases and to Other Land Uses and Management Actions under Alternatives I through V [1]

Stipulation	Alternatives	Objective	Measures and Areas Applied	Exception or Modification Criteria
Moderate Risk Habitat for Sensitive Plant Species or Significant Plant Communities 7,946 acres		hydrological and ecological processes that support the rare plants and significant plant communities within habitat identified as Moderate Risk Plant Habitat.	within the watershed that would disturb, alter, or interrupt the hydrologic or ecological processes that support rare plant species or significant plant communities (designated as Moderate Risk Hydrologic Value).	that the requested activity would not impair habitat values associated with sensitive plants and significant plant communities. The stipulation may be modified if the proponent demonstrates through monitoring studies or other scientific method that an NSO is not needed to achieve the specified resource protection.
NSO W-2 Unroaded Wildlife Habitat below Roan Cliffs 7,986.8 acres	II	Protect unroaded wildlife habitat below the cliffs from habitat loss or fragmentation.	No long-term ground-disturbing activity in the unroaded wildlife habitat below the cliffs in the Anvil Points and Magpie Gulch ACECs.	An exception or modification may be granted if the BLM determines, following consultation with CDOW, that (a) the specific activity or requested change would not impair habitat quality due to habitat loss or fragmentation or disturbance from human activity; or (b) the activity would have a duration within the seclusion area of less than one day. The BLM's determination would consider the vegetation, topography, existing habitat impacts, and other site-specific or activity-specific factors and amount, type, and location of the disturbance.
NSO W-4 High Risk Habitat for Colorado River Cutthroat Trout 4,229 acres	II, III, IV, V	Protect Colorado River cutthroat trout from direct and indirect impacts in High Risk Habitats.	No ground-disturbing activities that would result in loss or degradation of areas designated as High Risk Habitat for Colorado River cutthroat trout.	An exception may be granted if the BLM determines, following consultation with CDOW, that the requested activity would not impair values associated with High Risk Habitat for Colorado River cutthroat trout, including habitat conditions needed for feeding, spawning, survival of eggs and larvae, and refugia during high or low flow. Impairment could include siltation of substrate, changes in flow regime (e.g., localized damming), loss of overhanging vegetation canopy, reduction in bank stability, reduction in water quality, and direct mortality of trout or trout eggs.
NSO W-5 Moderate Risk Habitat for Colorado River	II	Protect Colorado River cutthroat trout from direct and indirect impacts in Moderate Risk Habitats.	No ground-disturbing activities that would cause the loss or degradation of Moderate Risk stream habitat that supports Colorado River cutthroat trout.	An exception or modification may be granted if the BLM determines, following consultation with CDOW, that (a) the requested activity would not impair values associated with Moderate Risk Habitat for Colorado

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Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases and to Other Land Uses and Management Actions under Alternatives I through V [1]

Stipulation	Alternatives	Objective	Measures and Areas Applied	Exception or Modification Criteria
Cutthroat Trout 12,815 acres				River cutthroat trout, including habitat conditions needed for feeding, spawning, survival of eggs and larvae, and refugia during high or low flow. Impairment could include siltation of substrate, changes in flow regime (e.g., localized damming), loss of overhanging vegetation canopy, reduction in bank stability, reduction in water quality, and direct mortality of trout or trout eggs.
NSO W-6 High Value Watershed Processes for Colorado River Cutthroat Trout 36,185 acres	II	Protect Colorado River cutthroat trout from direct and indirect impacts within areas delineated as High Value Watersheds.	Allow no new long-term (greater than two growing seasons) ground-disturbing activities within the area mapped as High Value Watershed Processes.	Following consultation with CDOW, the BLM may grant an exception or modification if (a) the requested activity would not impair values associated with ecosystem process needed to sustain Colorado River cutthroat trout habitat; (b) any lost or damaged vegetation could be replaced with the same or similar native species; (c) revegetation success could be achieved in 3 to 5 years; (d) the activity would not encroach closer than 100 meters to a stream (200 meters if on a slope steeper than 30%); and (e) no suitable alternative exists.
CONTROLLED SURFACE USE (CSU) STIPULATIONS APPLICABLE TO NEW OIL AND GAS LEASES AND TO OTHER LAND USES				
CSU 2 Riparian and Wetland Zones 11,507 acres	All	Maintain proper hydrologic function and protect adjacent riparian and wetland areas that provide habitat for special- status fish and wildlife species, waterfowl and shorebird production, and amphibian breeding/feeding or that provide important water quality, scenic, or recreation values.	The BLM may require special design, construction, operation, mitigation, or reclamation measures, relocation by more than 200 meters for any ground-disturbing activities, electric transmission lines, and other sources of disturbance within 500 feet of riparian or wetland vegetation to protect the values and functions of these areas. Measures required will be based on the nature, extent, and value of the area potentially affected.	The BLM may determine that the level of protection available under a CSU stipulation is not needed to ensure that values associated with proper hydrological and ecological functioning are not impaired, and that adjacent riparian and wetland areas that support the specified fish and wildlife resources are adequately protected. The BLM's determination would be based on site-specific conditions and on the type, amount, and duration of the associated impacts.
CSU 3 BLM Sensitive Species 11,830 acres	All	Protect plant species, significant plant communities, and fish and wildlife species listed by BLM as sensitive, including protection of occupied habitat or of other areas	The BLM may require special design, construction, operation, mitigation, or reclamation measures, relocation by more than 200 meters to protect specified species, plant communities, or associated	The BLM may determine that the level of protection available under a CSU stipulation is not required to ensure the values associated with occupied habitat or ecological functioning needed to support BLM sensitive species are adequately protected. The BLM's

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Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases and to Other Land Uses and Management Actions under Alternatives I through V [1]

Stipulation	Alternatives	Objective	Measures and Areas Applied	Exception or Modification Criteria
		needed to support the species.	ecological functions. Measures required will be based on the nature, extent, and value of the area potentially affected.	determination would be based on site-specific conditions, species-specific behaviors and habitat requirements, and the type, amount, and duration of the associated impacts.
CSU 4 Erosive Soils on Slopes Steeper than 30% 10,950.6 acres	All	Maintain soil stability and productivity and minimize impacts of soil erosion on other resources.	The BLM may require special design, construction, operation, mitigation, or reclamation measures, relocation by more than 200 meters to protect the soil resource, minimize impacts to other resources, and ensure reclamation success in areas of highly erosive soils on slopes steeper than 30% Highly erosive soils are those in the "severe" and "very severe" erosion classes based on NRCS mapping. This stipulation also applies to the Trapper Creek Watershed Management Area.	The BLM may determine that the level of protection available under a CSU stipulation is not required to preserve soil stability and productivity and minimize adverse impacts from soil erosion. The BLM's determination would be based on site-specific conditions and the type, amount, and duration of the associated impacts.
CSU 5 VRM Class II Areas 18,932.6 acres	I, II, III, IV	Preserve the existing character of the landscape to meet VRM Class II objectives in all areas designated at this class.	The BLM may require special design, construction, operation, mitigation, or reclamation measures, or relocation by more than 200 meters to retain the existing landscape character and allow only limited changes.	The BLM may determine that the level of protection available under a CSU stipulation is not required to meet VRM Class II objectives based on preserve soil stability and productivity and on site-specific conditions, visibility of the site; the type, amount, and duration of the associated impacts; and the effectiveness of standard stipulations in a given situation.
CSU 6 Sharrard Park Paleontological Area 750 acres	All	Protect, preserve, or recover the scientifically fossil resources in this area.	The BLM may require special survey, design, construction, operation, and reclamation measures, or relocation by more than 200 meters in identified portions of Wasatch Formation outcrops in Sharrard Park. Prior to any ground-disturbing activity, the operator shall have the paleontological resources surveyed within 200 feet of the proposed disturbance, to be performed by a BLM-approved paleontologist. Other special measures	The BLM may determine that the level of protection available under a CSU stipulation is not required to protect, preserve, or recover the fossil resources at specific sites or for specific activities within this area. The BLM's determination would be based on site-specific conditions and the type, amount, and duration of the associated impacts.

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[1] *NSO, CSU, and TL stipulations may overlap within and among categories. Acres of stipulations cannot be summed to calculate total area affected.*

Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases and to Other Land Uses and Management Actions under Alternatives I through V [1]

Stipulation	Alternatives	Objective	Measures and Areas Applied	Exception or Modification Criteria
			will include a requirement that onsite personnel are informed about the potential for fossils and instructed to notify the BLM if any fossils are found and to leave any vertebrate fossils in place.	
CSU P-7 Moderate Risk Habitat for Sensitive Plants or Significant Plant Communities 13,520.5 acres	III, IV, V	Protect Moderate Risk Habitat for sensitive plant species or significant plant communities, including hydrological and ecological values needed to sustain these resources.	The BLM may require special design, construction, operation, mitigation, or reclamation measures in areas of Moderate Risk Habitat, including relocation by more than 200 meters.	The BLM may determine that the level of protection available under a CSU stipulation is not required to protect the ecological and hydrological processes that support sensitive plant species or significant plant communities in Moderate Risk Habitat (designated as Moderate Risk Hydrologic Value). BLM's determination would be based on site-specific conditions and the type, amount, and duration of the associated impacts.
CSU P-10 Potential Habitat for Sensitive Plants or Significant Plant Communities 10,244.1 acres	III, IV	Protect potential habitat of, and associated ecological functions potentially supporting, sensitive plant species or significant plant communities.	The BLM may require special design, construction, operation, mitigation, and reclamation measures or relocation by more than 200 meters to protect potential habitat and adjacent areas with ecosystem processes needed to sustain sensitive plant species or significant plant communities.	The BLM may determine that the level of protection available under a CSU stipulation is not required to protect habitats and associated ecological functions with the potential to support sensitive plant species or significant plant communities. The BLM's determination would be based on site-specific conditions and the type, amount, and duration of the associated impacts.
CSU P-12 Remnant Plant Communities 1,729.7 acres	III, IV	Protect remnant communities of old-growth Douglas-fir.	The BLM may require special design, construction, operation, mitigation, and reclamation measures or relocation by more than 200 meters to minimize fragmentation or loss of old-growth Douglas-fir in more than 10% of a contiguous block.	The BLM may determine that the level of protection available under a CSU stipulation is not required to protect old-growth Douglas-fir forests from habitat loss or fragmentation. The BLM's determination would be based on site-specific conditions and the type, amount, and duration of the associated impacts.
CSU W-3 Bat Habitat 118.4 acres	II	Protect and preserve bat habitat values of the Anvil Points cave and karst system.	Special design, construction, implementation, and/or mitigation measures including relocation of operations by more than 200 meters may be required for those species listed as sensitive by BLM.	The BLM may determine that the level of protection available under a CSU stipulation is not required to protect roosting habitat in the Anvil Points cave and karst system. BLM's determination would be based on site-specific conditions and the type, amount, and duration of the associated impacts.

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Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases and to Other Land Uses and Management Actions under Alternatives I through V [1]

Stipulation	Alternatives	Objective	Measures and Areas Applied	Exception or Modification Criteria
CSU W-7 Moderate Risk Habitat for Colorado River Cutthroat Trout 13,520.5 acres	III, IV, V	Protect Colorado River cutthroat trout from most indirect impacts in areas of Moderate Risk Habitat.	The BLM may require special design, construction, operation, mitigation, and reclamation measures, including relocation, by more than 200 meters to protect habitat and supporting ecological functions in areas designated as Moderate Risk Habitat for Colorado River cutthroat trout.	The BLM may determine that the level of protection available under a CSU stipulation is not required to protect the Colorado River cutthroat trout from most potential indirect impacts in areas of Moderate Risk Habitat. These impacts could include reductions in water quality, water quantity, channel stability, bank stability, in-stream physical habitat, and adjacent riparian vegetation. BLM's determination would be based on site-specific conditions and the type, amount, and duration of the associated impacts.
CSU R-1 Special Recreation Management Area (SRMA) 2,460 acres	III	Protect recreation opportunities and settings within the SRMA.	The BLM may require special design, construction, operation, mitigation, and reclamation measures, including relocation by more than 200 meters, to protect recreation opportunities and settings in the SRMA.	The BLM may determine that the level of protection available under a CSU stipulation is not required to protect recreation opportunities and settings in the SRMA. BLM's determination would be based on site-specific conditions and the type, amount, and duration of the associated impacts.
TIMING LIMITATION (TL) STIPULATIONS APPLICABLE TO NEW OIL AND GAS LEASES AND TO OTHER LAND USES				
TL 1 Big Game Winter Habitat 25 acres	I, II, III	Protect winter habitat for deer and elk, including severe winter range, winter concentration areas, and critical habitat/winter range.	No activities or other sources of disturbance. Applied annually from December 1 through April 30.	The BLM may grant an exception for a winter season (typically following consultation with CDOW) if (a) monitoring studies indicate that, due to mild weather or other natural conditions, deer/elk are not occupying the winter range; (b) deer/elk are occupying the winter range, but the proposed activity would be transitory (duration of one day or less per month), and unlikely to significantly affect behavior or habitat quality in more than 1% of the winter range. The BLM will also consider the exact location, nature, and timing of the proposed activity and availability of a suitable alternative. A modification may be granted if monitoring data indicate that the TL is not needed to maintain appropriate populations of deer and elk.
TL 6 Raptor Nesting	All	Protect nesting and fledging habitat for raptors not protected by species-specific measures.	Within a 0.125-mile radius of a nest, no activities or other sources of disturbance with the potential to cause the nest not to	An exception or modification may be granted (a) if the BLM determines, in consultation with CDOW, that the requested activity could be performed during the period

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Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases and to Other Land Uses and Management Actions under Alternatives I through V [1]

Stipulation	Alternatives	Objective	Measures and Areas Applied	Exception or Modification Criteria
2,877.6 acres		Includes owls, northern harrier, accipiters, buteos, golden eagle, osprey, and falcons except the American kestrel.	be used or lead to nest failure, abandonment, or mortality of fledglings. Applied annually from February 1 through August 15.	of the TL without impairing behavior, nesting, or fledging success, and (b) the permitted disturbance would have a duration within the buffer zone of less than one day. BLM's determination would be based on based on species-specific behaviors, sensitivities, and habitat needs and on meteorological, ecological, or hydrological conditions during that period.
TL 10 Bald Eagle Nesting 474.2 acres	All	Protect nesting and fledging habitat of this Federally listed threatened species.	Within a 0.5-mile radius of a nest, no activities or other sources of disturbance that could cause the nest not to be used or lead to nest abandonment, failure, or mortality of fledglings. Applied annually from December 15 through June 15.	An exception or modification may be granted if the BLM determines, in consultation with USFWS through the ESA Section 7 process, that the requested activity could be performed during the period of the TL in a manner that would not affect behavior, nesting, or fledging success. The BLM's determination would be based on specific meteorological or ecological conditions during the period requested; the status of the nest (active or inactive); the exact location of the activity relative to the nest and any vegetation or topographic screening; the type, intensity, and duration of disturbance; and measures required by USFWS.
TL 11 Bald Eagle Roosting 474.2 acres (same as nesting areas)	All	Protect winter roosts of this Federally listed threatened species.	Within a 0.5-mile radius of a winter roost, no activities or other sources of disturbance that could cause the roost not to be used or to be abandoned after roosting has begun. Applied annually, November 15 through April 15.	An exception or modification may be granted if the BLM determines, in consultation with USFWS through the ESA Section 7 process, that the requested activity could be performed during the period of the TL in a manner that would not impair behavior, habitat use, or winter survival. The BLM's determination would be based on specific meteorological or ecological conditions during the period requested; the status of the roost (active or inactive); the exact location of the activity relative to the roost site and any vegetation or topographic screening; the type, intensity, and duration of disturbance; and measures required by USFWS.
TL 12 Peregrine Falcon	All	Protect nesting and fledging habitat of this State-listed	Within a 0.5-mile radius of the cliff-nesting complex on the Roan Cliffs, no	An exception or modification may be granted if BLM determines, in consultation with CDOW, that the

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Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases and to Other Land Uses and Management Actions under Alternatives I through V [1]

Stipulation	Alternatives	Objective	Measures and Areas Applied	Exception or Modification Criteria
917.1 acres		threatened species.	activities or other sources of disturbance that could cause abandonment of a nest or established territory. Applied annually, March 15 through July 31.	requested activity could be performed during the period of the TL without impairing behavior, nesting, or fledging success. The BLM's determination would be based on specific meteorological or ecological conditions during the period requested; the status of the roost (active or inactive); the exact location of the activity relative to the roost site and any vegetation or topographic screening; the type, intensity, and duration of disturbance; and availability of suitable options.
TL 13 Waterfowl and Shorebirds 40.1 acres	All	Protect nesting and brood-rearing habitats at the Fravert Reservoir Watchable Wildlife Area.	Within 0.25-mile of the nesting and production area of Fravert Reservoir, no activities or other sources of disturbance that could cause waterfowl and shorebirds not to nest or lead to nest failure or abandonment. Applied annually, April 15 through July 15 or until all young have hatched and dispersed from the production area.	An exception may be granted if BLM determines, in consultation with CDOW, that the requested activity could be performed during the period of the TL without impairing behavior, nesting, or fledging success. An exception could be based on species-specific behaviors, sensitivities, and habitat needs and on meteorological, ecological, or hydrological conditions during that period.

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[1] *NSO, CSU, and TL stipulations may overlap within and among categories. Acres of stipulations cannot be summed to calculate total area affected.*

Appendix D

Visual Resource Management (VRM) Classes and Objectives

Visual Resource Management (VRM) Classes and Objectives

Purposes of Visual Resource Classes

Visual resource classes are categories assigned to public lands and serve two purposes: (1) an inventory tool that delineates the relative value of the visual resources, and (2) a management tool that describes the visual management objectives. Visual resource classes are labeled Class I, Class II, Class III, and Class IV.

Visual Resource Inventory Classes

Visual resource inventory classes are assigned through the inventory process. Class I is assigned to areas where a management decision has previously been made to maintain a natural landscape. This includes areas such as national wilderness areas, the wild section of national wild and scenic rivers, and other Congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Classes II, III, and IV are assigned based on a combination of scenic quality, sensitivity level, and distance zones. Inventory classes are information in nature and provide the basis for considering visual values in the RMP process. They do not establish management direction and should not be used as a basis for constraining or limiting surface-disturbing activities.

Visual Resource Management Classes

Visual resource management classes are assigned through RMPs. The assignment of visual management classes is ultimately based on the management decisions made in RMPs. However, visual values must be considered throughout the RMP process. All actions proposed during the RMP process that would result in surface disturbances must consider the importance of the visual values and the impacts the project may have on those values. Management decisions in the RMP must reflect the value of visual resources. In fact, this value may be the driving force for some management decisions. For example, highly scenic areas that need special management attention may be designated as scenic Areas of Critical Environmental Concern and classified as VRM Class I based on the importance of the visual values. A map is developed in each RMP showing the approved visual resource management classes.

Objectives for Visual Resource Classes

Class I. The objective for this class is to preserve the existing character of the landscape. This call provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.

Class II. The objective for this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be visible but should 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.

Class III. The objective for this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape may be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV. The objective for this class is to provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape may be high. Management activities may dominate the view and be the major focus of view attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Monitoring

The visual contrast rating system described in BLM Manual 8400 will be used, where appropriate, in assessing proposals for projects on public lands or private lands with Federal subsurface mineral rights. Potential projects are assessed for changes in existing form, line, color, and texture to determine their compatibility and contrast with the existing VRM class. Procedures assess, and as needed revise and implement, measures of visual mitigation and rehabilitation activities conducted for surface-disturbing activities.

Visual Simulations

Simulations will be required for many actions to be conducted. These may be prepared by the proponent, private contractor, or the BLM. Visual simulations will be conducted for selected Key Observation Points (KOPs) as identified by the BLM. The simulations must be accurate, reliable, valid, and representative of the real-world depiction of the finished or interim proposed action on the landscape. Simulations will be prepared to scale and depict all parts of the proposed action. This includes structures and supporting infrastructure (roads, utilities, etc.), and the resulting disturbances to the surrounding landscape.

Simulations will be evaluated by the BLM for accuracy and will become part of the official files for the proposed actions. Simulations will form the basis for analysis and mitigation measures. Projects must conform to the mnitigation measures identified.

Appendix E

BLM Recreation Guidelines to Meet Public Land Health Standards in Colorado

Recreation Opportunity Spectrum (ROS) Classes

Hubbard Mesa SRMA Management Objectives for Alternatives II, III, and IV

E-1. BLM Recreation Guidelines to Meet Public Land Health Standards in Colorado

Recreation Guidelines to Meet Public Land Health Standards 1 and 2

1. Manage recreational activities to maintain sufficient vegetation on upland areas to protect the soil from wind and water erosion and to buffer temperature extremes.
2. Minimize disturbances and manage recreation use in riparian areas to protect vegetation, fragile soils, springs, and wetlands.
3. Plan and locate routes, trails, and developments away from riparian and wetland areas and highly erodible soils.
4. Reduce stream crossings to the minimal number dictated by the topography. Reduce sedimentation and compaction associated with stream crossings.
5. Manage watercraft types and uses as appropriate to protect riparian systems and water quality from adverse impacts.

Recreation Guidelines to Meet Public Land Health Standard 3

1. Manage recreational use on public lands to promote the survival and health of native plants and animals.
2. Protect against the establishment or spread of noxious weeds.
3. Protect wildlife habitat by preserving connectivity and avoiding fragmentation.
4. Minimize wildlife disturbances and artificial attractions such as feeding wild animals or improper disposal of garbage.
5. Protect plant and animal communities by limiting recreational use by type, season, intensity, distribution, or duration.

Recreation Guidelines to Meet Public Land Health Standard 4

1. Protect habitat for Federal and State threatened or endangered species and other special-status species.

Recreation Guidelines to Meet Public Land Health Standard 5

1. Manage recreational uses in coordination with other uses on public lands to achieve or exceed applicable water quality standards.
2. Control water quality impacts resulting from recreational use, such as human waste, trash, and other elements.

E-2. BLM Recreation Opportunity Spectrum (ROS) Classes			
ROS Class	Physical Setting Description	Social Setting Description	Administrative Setting Description
Urban	Near urban areas. Substantially modified environment. Numerous facilities to manage and accommodate intensive use.	High concentrations of people commonplace. In constant contact with other people.	On-site management controls and regulations are numerous and cannot go unnoticed. Intensively managed. Multiple activities may occur. Regular highway vehicles are present
Rural **(previously Semi-Urban)**	Within 0.5 mile developed areas and primary highways. Substantially modified environment having natural and manmade features (includes agricultural lands). Moderate number of facilities to manage use may exist.	Moderate to high degree co contact with others. Culturally modified landscape. People are almost continually in view.	On-site management controls and regulations are numerous and easy to see. Land uses obvious.
Front Country **(previously Roaded Natural)**	Within 0.5 mile of light-duty roads and areas with high route density. Resource modifications evident but balanced by the surrounding natural appearing environment.	Moderate to high degree of contact with others. See an average of 30 or more groups per day and fewer when away from roads. Human use alterations may be dominant.	Visitor management controls are noticeable but harmonize with the landscape. Basic visitor information facilities are present. Land uses like grazing are evident but fit into the natural landscape. OHV use occurs.
Middle Country **(previously Semi-Primitive Motorized)**	Within 0.5 mile of primitive motorized routes (4wd, high clearance). Resource modifications evident but balanced by the surrounding natural appearing environment. Some rustic facilities such as bulletin boards signs and motorized trails.	Moderate to high degree of contact with others. See an average of 15 or more groups per day and less when away from roads. Human use alterations easily noticeable.	A few subtle management controls or visitor information facilities present. Land uses are still subtle but still easy to see. Motorized use occurs (4wds, ATVs, and motorcycles).
Back Country **(previously Semi-Primitive Non-Motorized)**	At least ½ mile from primitive motorized routes but not greater than 3 miles from all motorized routes. Largely unmodified natural appearing environment. Few primitive facilities such as signs and trails.	Little contact with others. See an average of 6 to 15 groups per day. Evidence of others subtly noticeable but not drawing attention when recreating.	A few subtle management controls or visitor information facilities present. Land uses are subtle. No motorized use.
Primitive	Greater than 3 miles from all motorized routes. Unmodified natural environment, at least 5,000. Few to no facilities.	Very little contact with others. See an average of 6 or fewer groups per day. Evidence of others unnoticeable.	No onsite visitor management or information facilities. Land uses generally unnoticeable. No motorized or mechanized uses.

E-3. Management Objectives for the Hubbard Mesa Special Management Recreation Area (SRMA) under Alternatives II, III, and IV

The management objectives of this SRMA are as follows: *By the year 2007, manage the SRMA so that 85 percent of visitors and community residents responding to a visitor/community surve report at least a "moderate" realization of the targeted experiences/benefits (i.e., 3.0 on a probability scale where 1 = not at all, 2 = somewhat, 3 = moderate, and 4 = complete/total realization).*

Targeted Experiences/Outcomes

Targeted Experiences	**Targeted Outcomes (on-site and off-site)**
Escaping everyday responsibilities and other people for awhile.	• Better mental health through reduced tension & anxiety • Stress relief • Higher satisfaction with life
Enjoying frequent access to outdoor physical activity	• Improved physical fitness / better health • Greater cultivation of an outdoor-oriented lifestyle • Challenge • Quality of life • Positive contributions to local economy.
Enjoying the areas wildlife, scenery, views, and aesthetics	• Greater environmental awareness and stewardship • Greater aesthetic appreciation

To produce the targeted experiences and outcome opportunities, the BLM and its partners will need to manage the physical, social, and managerial conditions as follows:

Targeted Setting Prescriptions (Rural ROS Class)

Physical Attributes – Some modifications in the existing natural-appearing landscape elements (form, line, color, and texture) are acceptable. Manage motorized and mechanized use with directional signs and erosion controls. Install interpretive signage at access points as needed.

Social Attributes – Moderate to high degree of contact with others is acceptable. Land users are often in view. Vegetation may be impacted along travel routes and use areas.

Managerial Attributes – Onsite management controls and regulations are numerous and easy to see. Guide visitors with regulatory and informational signs, maps and/or brochures. Funding through user fees is not preferred. Restrict mountain bikes and other non-motorized use to designated routes in Alternative II and III and allow cross-country travel in Alternative IV. Adjust recreation use according to other land uses. Initiate educational efforts and signing to keep visitors off private property. Implement regular law enforcement patrols to access points, infrequent to interior areas. Visitor contact by field personnel, seasonal employees, and volunteer patrols is the preferred method to gain visitor compliance.

Targeted Activity Prescriptions

Manage for the activities of mountain biking and motor sports. Other activities such as hunting will continue to take place, but the BLM and its partners will not focus funding or implementing actions for enhancement of those activities.

Appendix F

Standards for Public Land Health in Colorado

BLM Guidelines for Livestock Grazing Management in Colorado

F-1. Standards for Public Land Health in Colorado

Standards for Public Land Health describe conditions needed to sustain public land health and relate to all uses of public lands. Standards are applied on a landscape scale and relate to the potential of the landscape. The Secretary of the Interior approved BLM Colorado's Standards for Public Land Health and Guidelines for Livestock Management (see F-2, below) on February 3, 1997.

Standard 1: *Upland soils exhibit infiltration and permeability rates that are appropriate to soil type, climate, landform, and geologic processes. Adequate soil infiltration and permeability allows for the accumulation of soil moisture necessary for optimal plant growth and vigor, and minimizes surface runoff.*

Indicators:

- Expression of rills and soil pedestals is minimal.
- Evidence of actively eroding gullies (incised channels) is minimal.
- Canopy and ground cover are appropriate.
- There is litter accumulating in place and is not sorted by normal overland water flow.
- There is appropriate organic matter in soil.
- There is diversity of plant species with a variety of root depths.
- Upland swales have vegetation cover or density greater than that of adjacent uplands.
- There are vigorous, desirable plants.

Standard 2: *Riparian systems associated with both running and standing water function properly and have the ability to recover from major disturbance such as fire, severe grazing, or 100-year floods. Riparian vegetation captures sediment, and provides forage, habitat, and bio-diversity. Water quality is improved or maintained. Stable soils store and release water slowly.*

Indicators:

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

Standard 3: *Healthy, productive plant and animal communities of native and other* *desirable species are maintained at viable population levels commensurate with the potential for the species and habitat. 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.*

Indicators:

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

<u>Standard 4:</u> *Special status, threatened and endangered species (federal and state), and other plants and animals officially designated by the BLM, and their habitats are maintained or enhanced by sustaining healthy, native plant and animal communities.*

Indicators:

- All the indicators associated with the plant and animal communities standard apply.
- Suitable habitat supports stable and increasing populations of endemic and protected species.
- Suitable habitat is available for recovery of endemic and protected species.

<u>Standard 5:</u> *The water quality of all water bodies, including ground water where applicable, located on or influenced by BLM lands will achieve or exceed the Water Quality Standards established by the State of Colorado. Water Quality Standards for surface and ground waters include designated beneficial uses, numeric criteria, narrative criteria, and anti-degradation requirements set forth under State law as found in (5 CCR 1002-8), as required by Section 303(c) of the Clean Water Act.*

Indicators:

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

F-2. BLM Guidelines for Livestock Grazing Management in Colorado

Guidelines are the management tools, methods, strategies, and techniques (e.g., best management practices) designed to maintain or achieve healthy public lands as defined by the standards. In response to public concern about management of livestock grazing on western public lands, BLM began developing new regulations for livestock grazing administration. The Secretary of the Interior approved BLM Colorado's Standards for Public Land Health (see F-1, above) and Guidelines for Livestock Management on February 3, 1997.

1. Grazing management practices promote plant health by providing for one or more of the following:
    - periodic rest or deferment from grazing during critical growth periods;
    - adequate recovery and regrowth periods;
    - opportunity for seed dissemination and seedling establishment.

2. Grazing management practices address the kind, numbers, and class of livestock; the season, duration, distribution, frequency, and intensity of grazing use; and livestock health.

3. Grazing management practices maintain sufficient residual vegetation on both upland and riparian sites to protect the soil from wind and water erosion to assist in maintaining appropriate soil infiltration and permeability and to buffer temperature extremes. In riparian areas, vegetation dissipates energy, captures sediment, recharges ground water, and contributes to stream stability.

4. Native plant species and natural revegetation are emphasized in the support of sustaining ecological functions and site integrity. Where reseeding is required on land treatment efforts, emphasis will be placed on using native plant species. Seeding of non-native plant species will be considered based on local goals, native seed availability and cost, persistence of non-native plants and annuals/noxious weeds on the site, and composition of non-natives in the seed mix.

5. Range improvement projects are designed consistent with overall ecological functions and processes with minimum adverse impacts to other resources or uses of riparian/wetland and upland sites.

6. Grazing management will occur in a manner that does not encourage the establishment or spread of noxious weeds. In addition to mechanical, chemical, and biological methods of weed control, livestock may be used where feasible as a tool to inhibit or stop the spread of noxious weeds.

7. Natural occurrences such as fire, drought, flooding, and prescribed land treatments should be combined with livestock management practices to move toward the sustainability of biological diversity across the landscape, including the maintenance, restoration, or enhancement of habitat to promote and assist the recovery and conservation of threatened, endangered, or other special status species, by helping to provide natural vegetation patterns, a mosaic of successional stages, and vegetation corridors, thus minimizing habitat fragmentation.

8. Colorado Best Management Practices (BMPs) and other scientifically developed practices that enhance land and water quality should be used in the development of activity plans prepared for land use.

Appendix G

Management Prescriptions for Maintenance of Wilderness Characteristics, Roan Plateau Planning Area RMPA/EIS – Alternative II

Management Prescription for Maintenance of Wilderness Characteristics Roan Plateau Planning Area RMPA/EIS – Alternative II

Introduction

The Federal Land Policy and Management Act (FLPMA) recognizes that public lands can be managed to maintain wilderness characteristics within BLM's multiple-use mandate. Under the inventory authority of Section 201of FLPMA, lands within the Roan Plateau Planning Area were inventoried and found to have wilderness characteristics. This land use planning process (conducted under the authority of Section 202 of FLPMA) identifies management opportunities for those lands. No new Wilderness Study Areas (WSAs) as defined in Section 603 of FLPMA will be established in this plan.

BLM will analyze the effects of managing the following lands to maintain wilderness characteristics:

- East Fork Parachute Creek Unit
- Northeast Cliffs Unit
- Southeast Cliffs Unit

The detailed management prescriptions for these areas are presented below.:

Identification of Lands

The BLM inventoried lands for wilderness character with public participation in 1999 and 2000 (BLM, GSFO, Wilderness Inventory Reports, 1999, 2000). Three areas were found to have wilderness character: the Northeast Cliffs, Southeast Cliffs, and East Fork of Parachute Creek.

The former Naval Oil Shale Reserve (NOSR) lands were not under BLM jurisdiction when FLPMA was enacted, and were therefore not part of the original wilderness inventory of public lands performed pursuant to Sections 201 and 603 and FLPMA. Instead, as newly acquired lands, they fall under the general inventory and planning authority of Sections 201 and 202.

Lands within the former NOSR 1 and 3 were inventoried for wilderness character using procedures identified in the BLM Wilderness Inventory Handbook (dated September 27, 1978) and Colorado Wilderness Review Procedures (dated June 18, 1997).

Wilderness character is defined as land:

1. having been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable.
2. having outstanding opportunities for solitude and/or a primitive and unconfined type of recreation.
3. having at least 5,000 acres of land or of sufficient size as to make practicable its preservation and use in unimpaired condition.
4. that may contain supplemental values such as, ecological, geological, or other features of scientific, educational, scenic, or historical value.

Management Prescriptions

__General management guidance.__ The following management prescription would apply for those lands identified for maintenance of wilderness characteristics. Generally, surface-disturbing activities or activities that involve permanent placement of structures are not consistent with the maintenance of wilderness characteristics. Specific allowances are made for:

- ***valid existing rights***. Prior-existing rights will be allowed to continue. New discretionary uses that create valid existing rights will not be allowed if they would detract from the wilderness values.

- ***administrative activities***. BLM will authorize activities that will maintain wilderness characteristics. BLM will authorize uses to protect human health and safety of persons within the area.

Allowed activities include:

- managing fire, fuels, weeds, insects, and diseases;
- completing recurring Federal mineral surveys;
- continuing established livestock grazing;
- allowing for commercial services to the extent necessary to provide for appropriate recreational opportunities; and
- allowing for adequate access to private and state in-holdings.

Prohibited activities, with exceptions, include:

- new permanent or temporary roads,
- use of motorized equipment or motorized vehicles,
- landing of aircraft,
- new permanent structures or developments, and
- mechanical transport.

Exceptions to prohibited activities include:

- emergencies associated with search and rescue operations and fire;
- uses and facilities considered grandfathered at the time of the inventories,
- valid existing rights,
- uses and facilities that maintain the area's wilderness characteristics, or are the minimum necessary for public health and safety;
- reclamation activities designed to maintain wilderness characteristics; and
- administrative uses

Specific guidance for the management of public lands having wilderness character

For most activities, the general guidance described above is sufficient for the future management of public lands to maintain wilderness characteristics. However, for specific activities the following provides additional guidance or clarification.

Land Disposals, Rights-of-Way (ROWs), and Use Authorizations. Lands identified as containing wilderness characteristics will be retained in public ownership. They will not be disposed through any means, including public sales, exchanges, patents under the Recreation and Public Purposes Act, State selections or other actions (except where a vested right was established prior to October 21, 1976)

The BLM will acquire State and private in-holdings when practicable. In unique situations and subject to public review, exchanges may be made involving Federal and non-Federal lands when such action would significantly benefit that area's wilderness characteristics.

Prior existing rights, such as leases under the Recreation and Public Purposes Act, leases/ permits under 43 CFR 2920, and ROWs may continue. These also could be renewed if they are still being used for their authorized purpose. New authorizations, leases, permits, and ROWs will not be authorized. Development and authorizations, including permits associated with existing oil and gas leases, will be allowed.

Travel. New temporary routes are allowed where the BLM determines they are necessary to meet the minimum requirements to administer and protect the area's wilderness characteristics, to protect human health and safety, or if necessary to manage fire, fuels, weeds, insects, and diseases. The construction of new permanent roads will not be allowed. Construction of non-motorized and non-mechanized trails may be allowed as long as it does not detract from the area's wilderness characteristics.

No motorized or mechanized travel will be allowed within areas containing wilderness characteristics.

Locatable Minerals

Existing and new mining operations will be regulated using 43 CFR 3809 to prevent unnecessary and undue degradation of the lands.

Leasable Minerals. Existing mineral leases represent a valid existing right. These rights are dependent upon the specific terms and conditions of each lease. Existing leases will be regulated to prevent unnecessary or undue degradation within the terms and conditions under which they were issued.

No new leases will be issued in Alternative II on lands managed to maintain wilderness characteristics. Mineral exploration will be allowed if it does not degrade the area's wilderness characteristics. Seismic and inventory information gathering by helicopter or other means not requiring road upgrading may be allowed.

Salable Minerals. No material sales would be allowed.

Grazing. Livestock grazing can be compatible with managing lands with wilderness characteristics. Livestock grazing and the activities and facilities that support a grazing program are permitted to continue. The construction of new grazing facilities may be permitted if they are primarily for the purpose of protecting wilderness characteristics and more effective management of resources. Grazing activities and maintenance of facilities can continue in the same manner and degree that was conducted at the time of the inventory.

Fire Management. Fire management will be consistent with the GSFO Fire Management Plan. Fires will be controlled to prevent the loss of human life, resources, or property. Reclamation would be initiated to mitigate the impacts as soon as possible.

- ***Prescribed fire*** will be allowed in conformity with the fire management plan and maintenance of wilderness characteristics. Light-on-the-land fire management techniques will be applied.
- ***Fuel treatments*** may be conducted where impacts would not degrade wilderness characteristics.

Control of Insects, Disease, and Invasive Species. Insects, disease, and invasive species may be controlled using the least impacting tool necessary to manage and maintain a healthy landscape.

Vegetative manipulation to control noxious, exotic, or invasive species is allowed when there is no effective alternative and control is necessary to maintain natural ecological balances within the area. Control may include mechanical, chemical, and biological treatment, provided it will not cause adverse impacts to wilderness characteristics.

Watershed Rehabilitation. Watershed rehabilitation may involve any treatments needed that do not detract from the areas wilderness characteristics.

Forestry. Trees may be cut when necessary for insect and disease control, fuel treatments, hazard reduction, or in emergency situations such as fire. Reforestation using native species may occur following a fire or other natural disaster. Removal of forest products and stand conversion will not be permitted. Tree improvement, seed collection, and pine-nut gathering may be permitted if activities maintain the area's naturalness.

Recreation. Primitive and unconfined recreational uses such as hiking, camping, horseback riding, rock climbing, caving, fishing, hunting, trapping, cross-country skiing, snowshoeing, etc., are allowed on these lands. Recreational uses will not be allowed if they require:

- motor vehicles or mechanical transport (e.g., mountain bikes), or
- permanent structures or developments (other than tents, tarpaulins, temporary corrals, and similar devices for overnight camping).

Commercial services will be permitted that enhance opportunities for realizing primitive and unconfined recreation. An example is a guide and outfitting service for hunting and fishing.

Recreational or hobby collecting of mineral specimens may be allowed. This use will be limited to hand collection and detection equipment.

Cultural and Paleontological Resources. Cultural and paleontological resources are recognized as unique and valuable. They are also important supplemental values to an area's wilderness characteristics.

Resource inventories, studies, and research involving surface examination will be permitted. Salvage of archeological and paleontological sites; rehabilitation, stabilization, reconstruction, and restoration work on historic structures; excavations; and extensive surface collection may also be permitted if they maintain the area's wilderness character.

Permanent physical protection, such as fences, will be limited to those measures needed to protect resources eligible for the National Register of Historic Places (NRHP) and will be constructed so as to minimize impacts on naturalness.

Wildlife Management. Fish and wildlife contribute to an area's wilderness characteristics. The BLM will continue to cooperate with State and Federal wildlife agencies in the management of resident wildlife species. Fishing, hunting, and trapping are allowable activities.

Stocking of wildlife and fish species native to the area may be permitted. Introduction of threatened, endangered, or other special-status species native to North America may be allowed. Certain permanent developments may be permitted to maintain or improve conditions for wildlife and fish, if the benefiting native species maintain or enhance wilderness characteristics and cannot be located outside of the area.

- ***Animal damage control*** – Actions aimed specifically at limiting or controlling damage caused by wildlife are allowed as long as the area's wilderness characteristics are maintained. Activities will be directed at single offending animals and must not jeopardize the continued presence of other animals.

Appendix H

Oil and Gas Reasonable Foreseeable Development (RFD) for the Roan Plateau Planning Area

February 5, 2004

Appendix H

Oil and Gas Reasonable Foreseeable Development (RFD), for the Roan Plateau Planning Area

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[**Note:** This document was prepared by the Colorado State office of the BLM.]

Summary

The Roan Plateau Planning Area can be divided into two areas: upper plateau and lower plateau (Figure H- 1). The Oil and Gas Reasonable Foreseeable Development (RFD) for the Planning Area is that 1,987 Mesaverde and Wasatch Federal mineral estate wells are forecast to be drilled within the Planning Area over the 20-year life of the plan. From these Federal mineral estate wells, 2,239 BCF[1] of gas and 4,856 MBO will be recovered over the next 20 years, predominantly from the Mesaverde formation. Of the 1,987 wells projected to be drilled, 335 are projected for the upper plateau and 1,652 for the lower plateau in the Planning Area.

While Coal Bed Methane exists in the Cameo Coal zone of the Mesaverde in the Planning Area, it is found at much deeper depths and does not have the well-developed natural fracture permeability exhibited elsewhere in the rocky mountain region. The Cameo Coal zone in the Planning Area produces little associated water (<4 BWPD) and is not expected to have the water disposal problems associated in other areas of the Rocky Mountains. The estimated technically recoverable gas resource within the Planning Area is calculated as 15,400 BCF, with Federal lands contributing 8,900 BCF of this amount. For Federal lands, the upper and lower plateau comprise 4,200 BCF and 4,700 BCF, respectively. Per Table 3c of the January 2003 *Scientific Inventory of Onshore Federal Lands Oil and Gas Resources and Reserves and the Extent and Nature of Restrictions or Impediments to their Development*, The Uinta/Piceance Basin contains 28,843 BCF of technically recoverable resources and proven reserves. The Planning Area represents 53% of this amount.

According to Dwights Energy data, only 13 dry holes were drilled out of 415 wells drilled in the Planning Area, representing a success rate of 97%. RFD projections for private and Federal minerals are summarized in Table H-2. Road, pipeline, and well pad disturbance projections are discussed in the RMPA/EIS for the Planning Area and are not part of this RFD.

Introduction

The Planning Area consists of 127,009 acres, of which 73,602 acres contain Federal minerals available for oil and gas development[2]. Of the 73,602 acres, about 18,066 acres are presently leased. Contained entirely within the Planning Area are NOSRs 1 and 3 which were transferred to the BLM from the Department of Energy (DOE) under the Defense Authorization Act of 1997. About 36,362 and 18,992 acres comprise NOSRs 1 and 3, respectively. 53,798 acres comprise the upper plateau which contains most of NOSR1. The upper plateau contains approximately 65% Federal and 35% private land. BLM leased 8,379 acres of the NOSRs 1and 3 effective May 1, 1999, to Barrett Resources (now Williams). Table H- 1 provides an area summary of the Planning Area.

The Planning Area contains parts of three active gas fields including the Grand Valley, Parachute, and Rulison (Figure H- 1). The major productive horizons include the Mesaverde Group and the Wasatch Formation. The deeper Mesaverde group is the principal development objective and includes the Williams Fork Formation, the Corcoran, the Cameo Coal Zone, and the Rollins Sandstone.

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[1] 1M = 1,000; 1B = 1MMM = 1,000,000,000; 1T = 1MB = 1,000,000,000,000; W = Water, O = Oil, G = Gas, D = Day.

[2] The Roan Planning Area of 127,009 acres was determined from the GSFO "roanplat_pby" GIS shape file. The public oil and gas minerals were obtained from the GSFO "Rplstmno" and "Nosr_parcel" GIS shape files.

Development started in the 1940s. According to Dwights Energy October 2001, data, 415 wells have been drilled within the Roan Study Area. Of those drilled, 22 have been plugged and abandoned (P&A). Only 13 out of the 415 wells drilled were plugged and abandoned without production. 393 wells (291 Mesaverde, 87 Wasatch and 15 other) remain as productive wells as of October 2001, in the Planning Area. Of the 415 wells, 88 were drilled on Federal oil and gas minerals. Drilling started on Federal land on the NOSR in 1980, by the DOE. Figure H- 1 depicts mineral ownership, petroleum field boundaries, land and mineral ownership and existing leases within the Planning Area. Production is mainly gas with a little associated condensate mainly from the Mesaverde.

Geology

The DOE has prepared two recent reports discussing reserves, development potential, and geology for the NOSRs 1 and 3. The first is entitled, "Naval Oil Shale Reserves 1 and 3 Oil and Gas Reserves Evaluation" and the second is entitled, "Naval Oil Shale Reserve No. 3 Commercial Development Study." Both were prepared in July 1998. In addition, Ron Gunnifson, BLM Colorado State Office Geologist, prepared a report on the geologic potential of the area on October 14, 1999. The following paragraph and list of assumptions incorporate information from those reports, except where otherwise noted.

The major productive horizons include the Mesaverde Group and the Wasatch Formation. The deeper Mesaverde group is the principal development objective and includes the Williams Fork Formation, the Corcoran, the Cameo Coal Zone, and the Rollins Sandstone (see Figure H- 5 for stratigraphic column). While Coal Bed Methane exists in the Cameo Coal zone, it lacks the well-developed natural fracture permeability associated with prolific water and gas flows exhibited in some areas of the northern San Juan Basin and on the Divide Creek anticline in the eastern Piceance Basin.

The Wasatch and Mesaverde produce little or no water and the Mesaverde will produce some associated condensate. Both zones contain multiple lenticular sandstones that are limited in horizontal extent. A typical well may encounter 10 to 25 or more of these lenses. Also, there is virtually no continuity of these sands even in closely spaced wells (±1,000 feet). While deeper, the primary drilling target is the Mesaverde which has about eight times the average pay section, three times the permeability and 40% greater porosity. In the lower plateau, depth to the Wasatch is about 3500 feet and to the Mesaverde is about 9000 feet. On the upper plateau where NOSR 1 is located, depths are about 2000 to 3000 feet greater. The greater overburden and elevation will negatively impact development but the topography on top of the plateau is sufficiently flat to make drilling possible over most of the entire surface. In addition to greater snow depths that will limit access, additional drilling costs and less porosity and permeability can be expected on the plateau.

Based on the above reports, Mesaverde reserves range between 0.7 and 1.88 BCF/Well and initial well production averaging 1360 MCF/D. Wasatch reserves are estimated to be about 0.7 BCF/Well and initial well production averages 270 MCF/D. During an April 2001 spacing hearing before the Colorado Oil and Gas Conservation Commission, Williams estimated Mesaverde reserves to be 1.25 to 1.86 BCF /Well. For just the existing four leases in the NOSR, Williams is planning on drilling 50 wells per year for the next 10 years.

Oil and Gas Activity

Past Development. In the early 1980s, private companies began to develop natural gas reserves in the Rulison, Parachute, and Grand Valley Fields, just outside of NOSR3. In 1985, to protect Federal gas resources from drainage, DOE initiated its own drilling program. DOE drilled 24 wholly owned wells and entered into joint ownership or Communitization Agreements (CAs) with private developers for some 25 to 30 additional wells. The wells in which the U.S. holds and interest are located along the southern boundary of the reserve. This area is referred to in the DAA as the "developed tract of Oil Shale Reserve Numbered 3."

From Dwights Energy Data, as of May 1, 1999, Cumulative gas and oil production from the Mesaverde and Wasatch was 124 BCF and 188 MBO for the Planning Area. Cumulative gas and oil production from just Federal oil and gas minerals of the Mesaverde and Wasatch as of May 1, 1999, was 26 BCF and 49 MBO for the Planning Area. Production is summarized in Table H- 1.

Drilling on Federal mineral estate from 1980 to 1991 was sporadic, averaging less than three wells per year. Since 1991, activity had increased, averaging about six wells per year, a total of 79 wells by October 2001. The number of wells drilled annually on Federal and private mineral estate is depicted on Figure H- 2.

Present Development

During January 1999, a Supplemental Environmental Impact Statement (SEIS) covering impacts from oil and gas leasing and development in the Glenwood Springs Resource Area, including the developed portion of the NOSR was completed. The undeveloped portion of the NOSR3 and NOSR 1 were not included in the analysis. The production area of the NOSR covers 12,029 acres. During March 1999, 8,379 acres of this area was divided into four parcels and leased. The effective date of the leases is May 1, 1999. As of June, 2001, the Automated Fluid Minerals Support System (AFMSS) report GLB.89 reveals that there are 109 completed and proposed well bores, including 76 producing gas wells, 3 drilling wells, 26 Notices of Stakings/Applications for Permits to Drill (NOS/APDs), four abandoned wells and 1 dual completion. These completions and proposed wells are located on the 4 NOSR leases and on adjacent land covered by 29 Communalization Agreements.

During Fiscal Year (FY) 2000, there were 17 directional wells permitted on Federal leases in the Planning Area. While directional drilling is generally more expensive in this area, directional drilling allows for wells to be drilled on a common pad resulting in less surface disturbance. Currently, the operator of the NOSR leases (Williams) is proposing 160 Federal wells for this area to be drilled from 39 new locations and 21 existing locations. The environmental assessment for this proposal is the Wheeler to Webster Geographic Area Proposal and is dated July 2002. This averages to be two to three wells per location with as many as seven wells on a single location. Down-hole spacing for the Mesaverde is 20 acres per well. Williams reports that the 20-acre wells perform as well or better than wells drilled at 40-acre spacing. In addition, Williams is currently piloting 10-acre Mesaverde spacing on 320 acres of private land in the area. During an April 10, 2003, Colorado Oil and Gas Association spacing hearing, Williams provided the results of the pilot. Based on the pilot, it was determined that 20-acre well spacing would recover only 40% to 45% of the gas in place. Wells drilled on 10-acre spacing would recover 80% of the gas in place. As such, little or no production interference was exhibited between wells and the 10-acre spacing is supported.

On the upper plateau, an additional 2000 to 3000 feet of Wasatch must be penetrated. The operator reports that this additional overburden presents drilling challenges, including sloughing clays and water flows, which have not been overcome as of yet. Neither a Mesaverde well nor a directional well has yet to be drilled on the upper plateau. A review of four Allen Point Wasatch wells located on the upper plateau reveal that drilling times were seven times the drilling times of an average lower plateau Wasatch well. Additionally, the upper plateau is limited to a single suitable access road, weather allows for drilling only five months of the year, and an average Mesaverde well drilling and completion would be extended to 30 days.

Planning Area Production. Between May 1, 1999, and June 1, 2001, cumulative gas and oil production from the Planning Area has increased from 124 BCF and 188 MBO to 173 BCF and 260 MBO. Monthly gas production from the Planning Area between the same periods increased from 1,584 MMCF to 2,304 MMCF. Monthly oil production decreased slightly from 2,780 BO to 2,695 BO. Between the same periods, Federal oil and gas minerals cumulative production has increased from 26 MMCF and 49

MBO to 36 MMCF and 68 MBO. Monthly Federal gas and oil has increased from 327 MMCF and 864 BO to 550 MMCF and 885 BO. These figures support a production increase of about 40% of Federal and private land to 70% on just Federal land between the periods. As of June 1, 2001, cumulative gas production from the Mesaverde is 26 BCF and 10 BCF from the Wasatch. From these figures, one can conclude that Mesaverde is about 72% of the total production. Cumulative Total and Federal water production is 1,139 and 318 BW as of June 1, 2001. Production figures are from the October 2001 Dwights Energy Data and are summarized in Table H-1.

From FY 2000 AFMSS data, net government production from the four NOSR leases and on adjacent land covered by 29 Communalization Agreements (CAs) is about 9,005 MCFGD, which represents about 4% of the Federal Colorado production of 201,164 MCFGD from the FY 2000 Minerals Management Service's State Mineral Summaries report. 9,005 MCFGD also represents about 3% of gas production from the Piceance basin (265,374 MCFGD), and about 5% of gas production from the Grand Valley, Rulison, and Parachute fields (167,978 MCFGD) according to Dwights Energy as of June 1, 2001.

Over the period from 1994 to 2001, production from the Piceance Basin has inclined at about 5% per year (Figure H- 3) and production from the Grand Valley, Rulison, and Parachute fields has inclined at about 19% per year (Figure H-4).

Reasonable Foreseeable Development

The Reasonable Foreseeable Development (RFD) is the level of oil and gas development activity that an objective reviewer might reasonably expect to occur over a specified range of time. The actual amount of future oil and gas development activity is dependent on many factors, such as actual field life, commodity prices, changes in technology, availability of infrastructure to transport the product, inflation, availability of capital, legislation, and taxes.

RFDs for this area in the past have been based upon historical development rates and have been consistently low in estimating development activity - Appendix B of the 1991 Final Colorado Oil and Gas Leasing and Development EIS (FEIS) forecast 54 wells to be drilled on BLM lands for the period of 1989, throughout 2010, with 36 expected within a high oil and gas potential areas, known as Region 4 [GSFO]. The projections were subsequently increased to 90 wells total and 72 in the GSFO. By 1997, or 6 years after implementation of the FEIS, 72 wells had been authorized in the GSFO.

Section 4.20 of the 1999 FSEIS forecast 300 BLM wells to be drilled from 1999 to 2018 in Region 4 with 65 or 70 wells projected for the four Naval Oil Shale Reserve (NOSR) leases. Three years after the FSEIS implementation, 12 wells were drilled on the NOSR with an application for 160 additional wells as covered in a July 2002 Environmental Analysis. As such, more of an emphasis is being placed on recent oil and gas activity, operator plans and the geology of the productive horizons, rather than on historical drilling for development of this RFD.

Exploration activity on the upper plateau will be limited due to one suitable access road, a weather window for drilling of five months, 3000 feet of additional unconsolidated Wasatch zone which all combine to result in less favorable well economics and fewer wells as compared to the lower plateau area. It is assumed that anticipated directional drilling difficulties due to the extra 3000 feet of overburden would make directional drilling infeasible. Also, wells drilled on the upper plateau would be limited by five drilling rigs drilling for five months per year and would take 30 days average time to drill each well. As such, the ultimate development number of wells for the upper plateau would be limited to an RFD of 380 Mesaverde wells and 127 Wasatch wells or a total of 507 wells as presented in Table H- 2. This represents an average of 125-acre spacing for the Mesaverde (47,638 acres/380 wells) for the upper plateau.

For the lower plateau Mesaverde, it is assumed that some of the lower plateau would not support 10-acre spacing. Given that the Planning Area has exhibited a 97% success ratio, it is further assumed that the entire area is capable of development at 20-acre spacing. As such, it is assumed that 80% of the lower plateau would be drilled on 10-acre downhole spacing and the remaining 20% would be drilled on 20-acre downhole spacing. For purpose determining the number of well pads, it is assumed that all Mesaverde wells would be drilled on 40-acre surface locations. For the Wasatch, wells would be co-located with Mesaverde wells every 160 acres on the lower plateau and co-located with every fourth Mesaverde well on the upper plateau. For the RFD on the lower plateau, the number of wells is limited by an estimated number of wells that can be developed during the projected life of the Planning Area (20 years). Recent estimates from Williams are that they will drill approximately 100 private and Federal wells per year in this area. This year, Encana is projecting drilling 200 wells in the nearby Grass Mesa/Hunter's Mesa units and currently has 20 drilling rigs running. Williams holds most all of the 18,066 acres that are presently leased within the Planning Area. 16,476 acres of the lower plateau remain to be leased. An average, weighted by acreages yields about 148 wells per year for the lower plateau ((16,476*200 + 18,066*100) / 16,476 + 18,066). Adding the upper plateau's projected 507 wells over 20 years (25 wells/year) yields a total of about 173 wells per year or 3,460 Federal and private wells within the Planning Area (See Note 10 of Table H- 2).

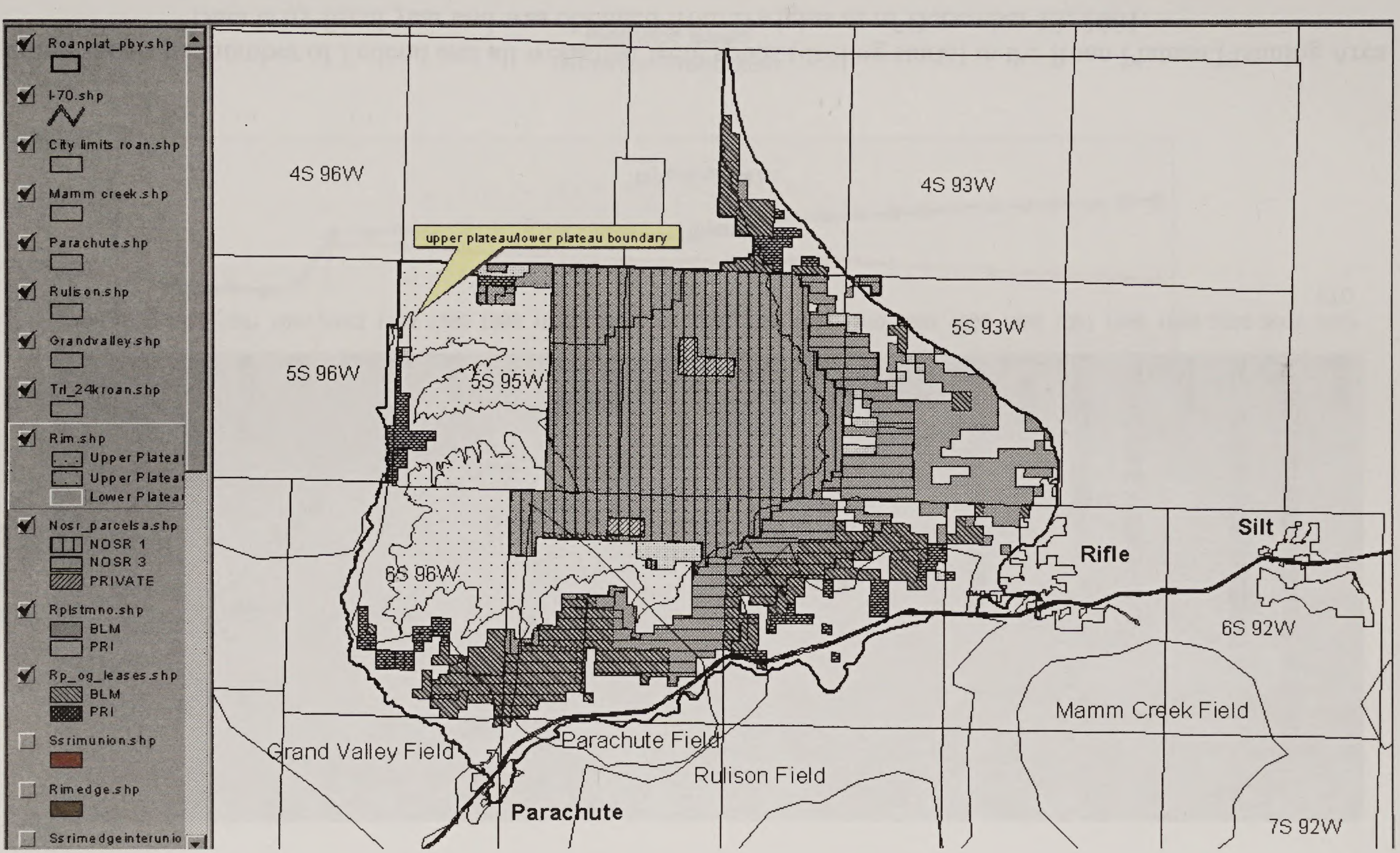
RFD Assumptions. Based on the above information, the following assumptions were used in the RFD. Results are presented in Table H- 2:

1. All potentially productive areas are open under standard lease terms and conditions (i.e., lease form without stipulations).
2. The surface covered by lands in excess of 50% slopes will be precluded from use. However, directional drilling of 1400-foot* offsets will be utilized to obtain reserves otherwise precluded by steep slopes.
3. Wasatch reserves will be 0.7BCF/Well and development will occur on 160-acre downhole spacing throughout the lower plateau and at one Wasatch well for every 4 Mesaverde wells on the upper plateau.
4. Based upon a 4/10/03 Colorado Oil and Gas Conservation Commission (COGCC) 10-acre spacing hearing data that Williams submitted, Mesaverde reserves will be 1.17 BCF/well and will occur on 10-acre downhole spacing on 80% of the lower plateau and 20-acre spacing on 20% of the lower plateau.
5. With the exception of the upper plateau, for 10-acre downhole spacing, an average of 4 Mesaverde wells will be drilled from a single 40-acre location - one well drilled vertically and the other three drilled directionally. For 20-acre downhole spacing, an average of 2 Mesaverde wells will be drilled from a single 40-acre location – one drilled vertically and the other drilled directionally.
6. Because of anticipated directional drilling, access and weather limitations on the upper plateau, the total number of upper plateau wells is 507 (30.4 days/yr*5 rigs*1well/30 days*5 months*20 yrs). While actual well spacing may be closer, average well spacing is at 125 acres (47,638 acres/507 wells).
7. Because of overall rig availability limitations and 20-year RFD projection limit, 148 wells per year will be assumed to be the maximum number of wells that can be drilled on private and Federal lands on the lower plateau.
8. Surface spacing for the Mesaverde will generally be at 40 acres throughout the Planning Area.
9. Wasatch wells will share Mesaverde well pads.
10. Development of the Wasatch will occur after much of the Mesaverde development because of the greater reserve and initial

production potential and the fact that not much recent emphasis has been placed on the Wasatch (last Wasatch well was drilled in 1994). Development of the upper plateau will occur after much of the lower plateau is developed because of more favorable economics (last upper plateau well was completed in November 1990).

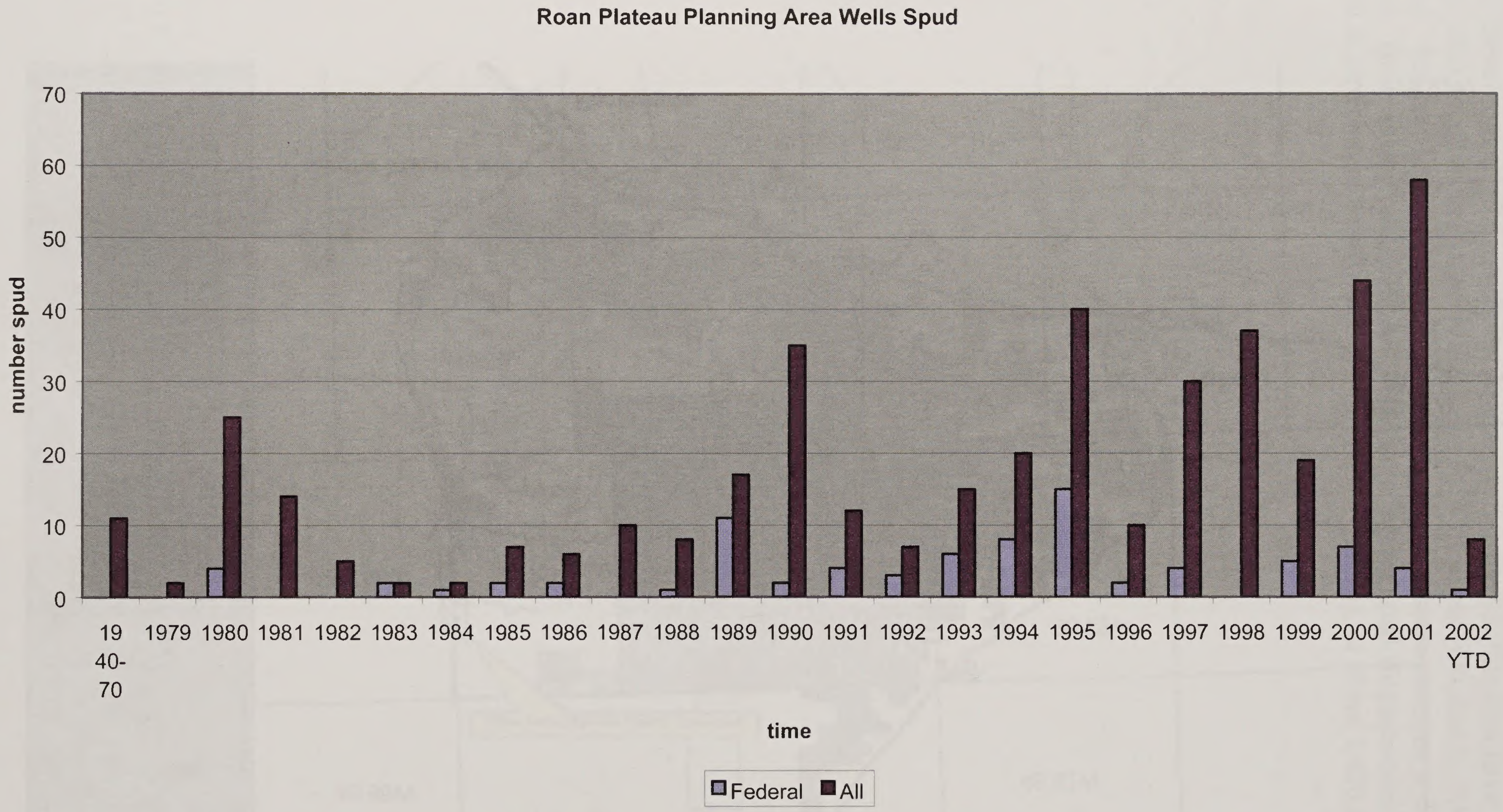
* Wells drilled on 20-acre spacing mathematically provide for individual well drainage of 526 feet. Typical directional wells drilled in this area have horizontal displacements of about 800 feet to 900 feet. Therefore, wells can obtain reserves a distance equal to a well's horizontal displacement plus its drainage radius (offset), or about 1,400 feet.

Figure H-1. Roan Plateau Planning Area



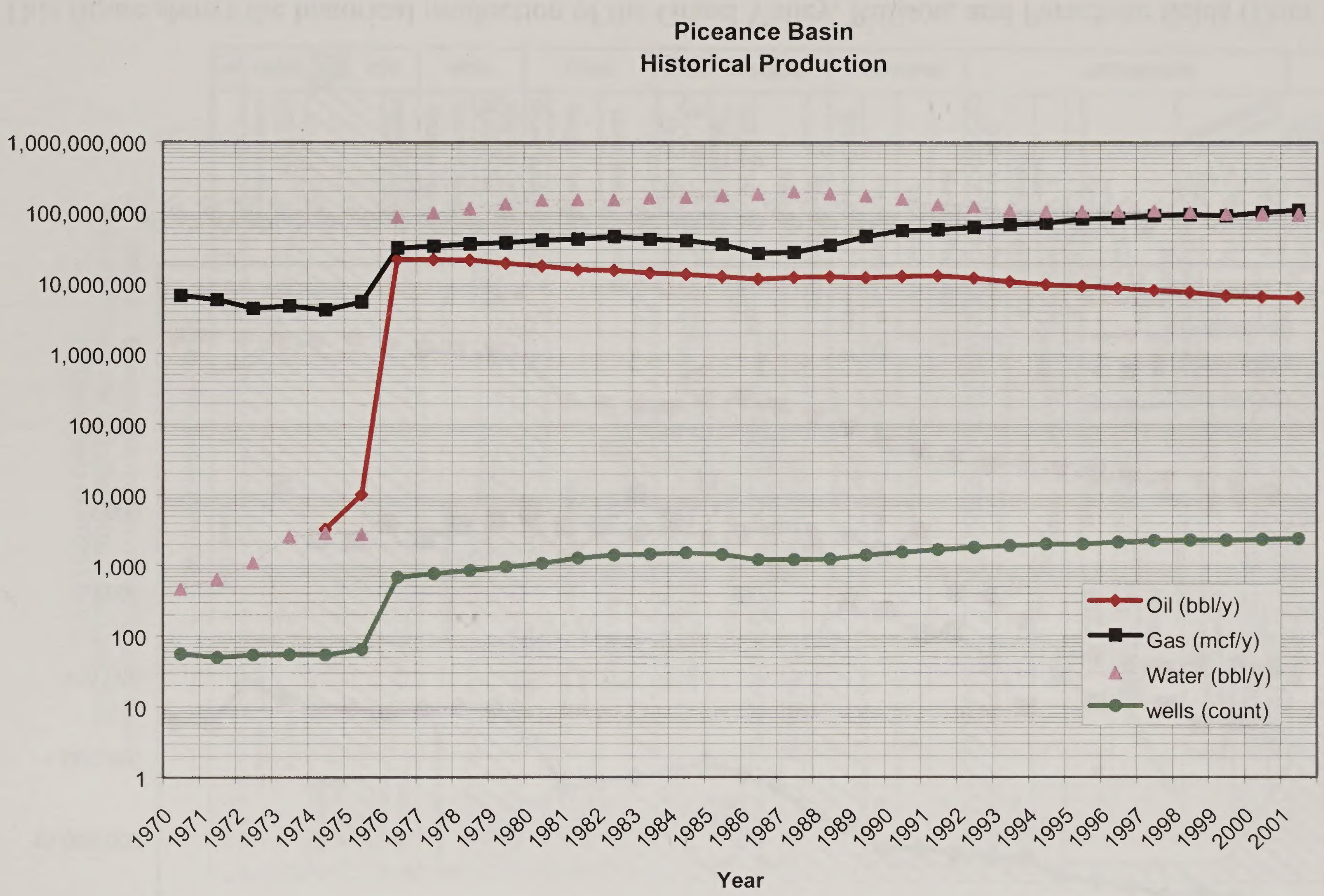
This plat shows the boundaries of the Roan Plan Area, NOSRs 1 and 3, Federal leases, mineral and surface estates and petroleum field boundaries.

Figure H-2



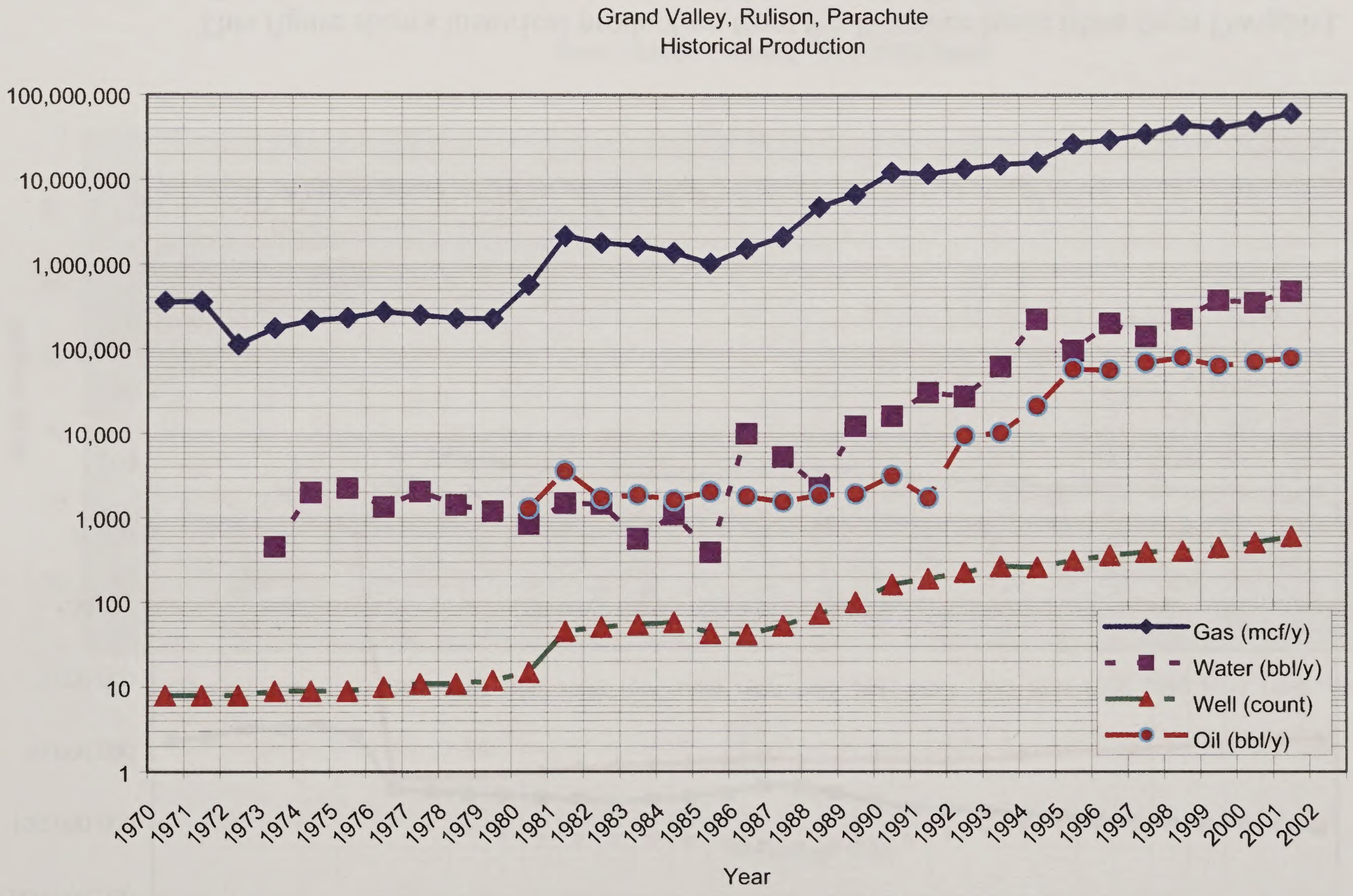
This graph shows the number of Federal and all wells that were spuds (drilling starts) in the Roan Plateau Planning Area. Data is by fiscal year and was obtained from Dwights as of December 13, 2001.

Figure H-3



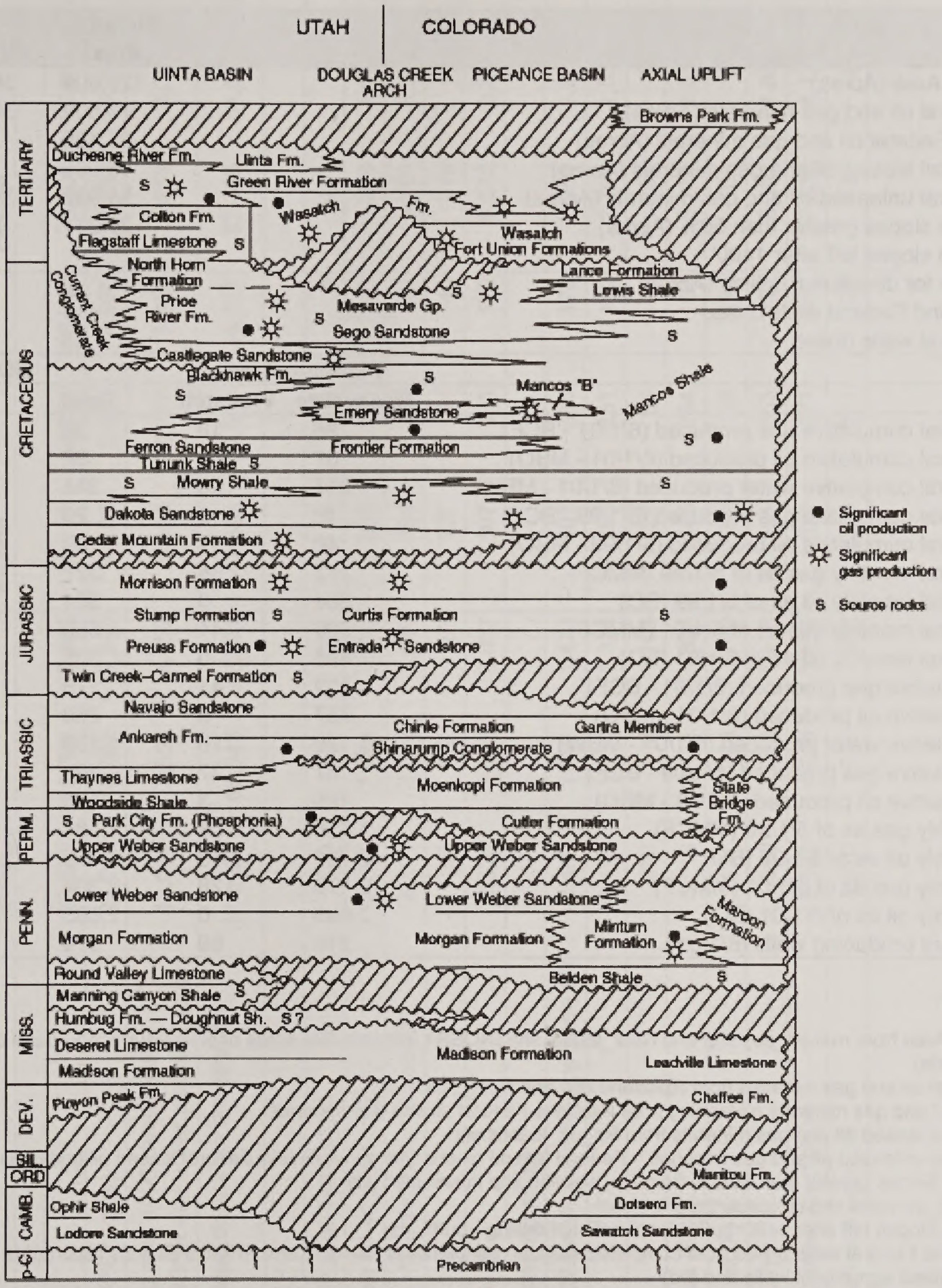
This figure shows historical production from the Piceance basin (data from Dwights). For the last 8 years, gas production exhibits a nominal incline of about 5% per year.

Figure H-4



This figure shows the historical production of the Grand Valley, Rulison, and Parachute fields (Data from Dwights).
The Planning Area contains production from all three of these fields.
For the last 8 years, gas production exhibits a nominal incline of about 19% per year.

Figure H-5



Modified from Sanborn (1971, 1981)

Source: Stratigraphic column of the Piceance Basin (from USGS web site http://certnetra.cr.usgs.gov/1995 OGData/Region3/PR20ST.JPG).

Table H-1 Oil and Gas Summary

		Planning Area	NOSR1	NOSR3
1	Total Area (Acres)	127,009	36,362	18,992
2	Federal oil and gas minerals (Acres)	73,602	36,362	18,992
3	Non-Federal oil and gas minerals (Acres)	53,405	0	0
4	Federal leased oil and gas minerals (Acres)	18,066	166	8,213
5	Federal unleased oil and gas minerals (Acres)	54,932	36,196	10,779
6	Steep slopes greater than 50% (Acres)	29,211	5,357	7,359
7	Steep slopes left after 1400' buffer for directional drilling (Acres)	0	0	0
8	Fee and Federal wells drilled	415	0	79
9	Federal wells drilled	88	0	41

		Planning Area			NOSR 1	NOSR 3
		Mesaverde	Wasatch	Total	Total	Total
10	Federal cumulative gas produced (6/1/01 - BCF)	26	10	36	0	17
11	Federal cumulative oil produced (6/1/01 - MBO)	67	1	68	0	20
11'	Federal cumulative water produced (6/1/01 - MBW)	317	0	318	0	158
12	Federal cumulative gas produced (5/1/99 - BCF)	18	9	26	0	13
13	Federal cumulative oil produced (5/1/99 - MBO)	48	1	49	0	18
14	Federal monthly gas as of 5/1/99 (MMCF)	272	56	327	0	123
15	Federal monthly oil as of 5/1/99 (BO)	864	0	864	0	206
16	Federal monthly gas as of 6/1/01 (MMCF)	509	41	550	0	224
17	Federal monthly oil as of 6/1/01 (BO)	885	0	885	0	121
18	cumulative gas produced (6/1/01 - BCF)	132	41	173	0	17
19	cumulative oil produced (6/1/01 - MBO)	257	3	260	0	20
19'	cumulative water produced (6/1/01 - MBW)	1,129	10	1,139	0	158
20	cumulative gas produced (5/1/99 - BCF)	87	37	124	0	13
21	cumulative oil produced (5/1/99 - MBO)	185	3	188	0	18
22	monthly gas as of 5/1/99 (MMCF)	1,428	156	1,584	0	123
23	monthly oil as of 5/1/99 (BO)	2,767	13	2,780	0	206
24	monthly gas as of 6/1/01 (MMCF)	2,176	128	2,304	0	224
25	monthly oil as of 6/1/01 (BO)	2,695	0	2,695	0	121
26	Current producing wells (6/1/01)	210	69	279	0	34

Notes:

1. Total Area from roanplt_pby.shp and Nosr_parcel.shp (NOSR1 includes 924 acres of privatesurface/Federal oil and gas minerals)
2. Federal oil and gas minerals from Rplstmno.shp and Nosr_parcel.shp
3. Non-oil and gas minerals = planning area total less Federal oil and gas minerals
4. Federal leased oil and gas minerals from Rp_og_leases.shp
5. Federal unleased oil and gas minerals = Federal leased oil and gas minerals less Federal leased oil and gas minerals
6. Steep Slopes greater than 50% is from Rp_slope50.shp intersected with
7. NOSR_parcelsa.shp (slopeparcelsinter.shp)
8. Steep Slopes left after 1400' buffer for directional drilling - buff5.shp
9. Fee and Federal wells drilled from completed wells in roanplatwells1001.shp and AFMSS GLB.89 report (this report includes associated agreement wells and fed)
10. Federal wells drilled from roanplatfedwells1001.shp and nosrwells1001.shp
11. Federal cumulative gas from roanfedwellsmv.mdb; roanfedwellswasatch.mdb and nosrwells.mdb
12. Current wells producing from roanwellsmv.mdb;roanwellswasatch.mdb and nosrwells.mdb

This table provides a development summary of wells, cumulative gas production and monthly gas rate at the Time of the sale (5/1/99) and as of the last data point (6/1/01) for the NOSRs and Planning Area. Non-Federal and Federal oil and gas mineral estate acreages are also provided

Table H-2 Reasonable Foreseeable Development

	PLANNING AREA			UPPER PLATEAU			LOWER PLATEAU		
	Federal+ Private	Federal	Private	Federal+ Private	Federal	Private	Federal+ Private	Federal	Private
Area distribution									
Oil and gas minerals (Acres)	127,005	73,602	53,403	53,798	34,758	19,040	73,207	38,844	34,363
Steep slopes greater than 50% (Acres)	29,092	16,552	12,540	6,160	3,257	2,903	22,932	13,295	9,637
50% Steep slopes remaining after 1400' directional drilling on all areas except NOSR and upper plateau (Acres)	12,011	7,559	4,452	6,160	3,257	2,903	5,851	4,302	1,549
Oil and gas minerals after steep slopes are directionally drilled (Acres)	114,994	66,043	48,951	47,638	31,501	16,137	67,356	34,542	32,814
Preliminary wells									
Existing Wells (#, as of 6/1/01, see Table H- 1)	415	88	327	4	0	4	411	88	323
New Mesaverde wells (before 10-acre spacing, #)	3,596	1,945	1,651	380	251	129	3,216	1,693	1,523
New Mesaverde wells (80% -10 acre, 20%- 20 acre, #)	6,134	3,294	2,840	380	251	129	5,754	3,043	2,711
New Wasatch wells (#)	445	278	167	127	84	43	318	194	124
Total wells (lines 7 and 8, #)	6,579	3,572	3,007	507	335	172	6,072	3,237	2,835
RFD wells, pad numbers, and reserves									
Total RFD wells (limited by 173 wells/year development) (#)	3,460	1,987	1,473	507	335	172	2,953	1,652	1,301
Mesaverde RFD wells	3,178	1,804	1,373	380	251	129	2,798	1,553	1,244
Wasatch RFD wells	282	183	100	127	84	43	155	99	57
Mesaverde gas RFD reserves (BCF)	3,719	2,111	1,606	445	294	151	3,274	1,817	1,456
Wasatch gas RFD reserves (BCF)	197	128	70	89	59	30	108	69	40
Total gas RFD reserves (BCF)	3,916	2,239	1,676	534	353	181	3,382	1,886	1,495
Mesaverde and total oil RFD reserves (MBO)	8,553	4,856	3,694	1,023	677	347	7,530	4,179	3,348
New Mesaverde and Wasatch well pads (#)	1,220	717	502	380	251	129	839	466	373

See notes on following page

Notes to Table H-2:

The Planning Area includes NOSR 1, NOSR 3, and other areas. NOSR1 consist of mostly upper plateau and some lower plateau areas. Well and reserve projections exclude existing wells.

1. Oil and gas minerals obtained from the Glenwood Springs Field Office (GSFO).
2. Steep Slopes greater than 50% from the GSFO.
3. Steep Slopes left after 1,400' buffer for directional drilling is from buff5.shp for the entire planning area and estimated based on acreage for the upper and lower plateau areas.
4. Oil and gas minerals less steep slopes remaining after directional drilling.
5. Fee and Federal wells drilled obtained from completed wells in roanplatwells1001.shp and AFMSS GLB.89 report (this report includes associated agreement wells and fed). Federal wells drilled from raanplatfedwells1001.shp
6. Upper Plateau: Because of activity limitation due to one suitable access road, drilling weather window of 5 months, 3000 feet of additional unconsolidated Wasatch zone and less favorable well economics as compared to the lower plateau area, it is assumed that wells drilled on the upper plateau would be limited by 5 drilling rigs drilling for 5 months per year and would take 30 days average time to drill each well and thus limit the total number of upper plateau wells to 507 wells (30.4days/yr*5rigs*1well/30 days*5months*20 yrs). In addition, anticipated directional drilling difficulties due to the extra 3000 feet of unconsolidated Wasatch zone would make directional drilling infeasible. As such, MV wells will be on single well pads except when collocated with a Wasatch well. Based on 4 MV wells drilled for every Wasatch well, the 507 wells would consist of 127 Wasatch and 380 Mesaverde wells.

   Lower Plateau: The rest of the planning area would be drilled at 20-acre downhole spacing on 40-acre surface locations with 20-acre surface exceptions when drilling under steep slopes. The existing wells from Table H-1 were subtracted from this total leaving the projected new wells. For this calculation, it is assumed that 75% of the wells are Mesaverde and 25% of the wells are Wasatch. To find the split between upper and lower plateau and private and Federal, a ratio of acreages was used.
7. Sum of Mesaverde Federal RFD wells and Additional Mesaverde wells on 10-acre spacing. Additional Mesaverde wells on 10-acre spacing - recent tests conducted by Williams support development on 10-acre spacing.

   Assuming there will be some areas not supporting 10-acre spacing, 80% of the area, less the upper plateau, will be assumed to be developed on 10-acre spacing utilizing existing 40-acre surface locations. While actual spacing may be closer, for the purpose of well pad number calculations, the upper plateau will be drilled on an average of 125-acre spacing for the Mesaverde (47,638 acres/380 MV wells) because of access, rig availability, and weather limitations.
8. Downhole spacing of 160 acres per Wasatch well on lower plateau and a Wasatch well for every 4 MV wells on upper plateau.
9. Sum of Mesaverde wells, including those spaced at 10 acres, and Wasatch wells. To determine the number of RFD wells, this number will be reduced based on a 20-year projected activity in Note 10 below.
10. Williams holds all of the 18,066 acres that are leased within the RPA. Recent estimates from Williams are that they will drill between 50 and 150 wells per year. This year, Encana is projecting drilling 200 wells in the nearby Grass Mesa/Hunters Mesa units and currently has 20 rigs running. While this may be an exceptional year for Encana, it does represent the company's capability to obtain rigs and develop. From above, 16,476 (34,542 - 18,066) acres of the lower plateau remain to be leased. An average, weighted by acreages yields about 148 wells per year (16,476*200 + 18066*100)/(16,476+18066) on private and Federal acreage for the lower plateau. Adding the upper plateau's projected 507 wells over 20 years (25 wells/year) yields a total of about 173 wells per year.
11. Mesaverde RFD wells is the ratio of the total RFD wells (line 10) to the total wells (line 9) times the Mesaverde wells (line 7).
12. Wasatch RFD wells is the ratio of the total RFD wells (line 10) to the total wells (line 9) times the Wasatch wells (line 8).
13. Mesaverde gas reserves (2/16/2003 article published in the GSPI). 1.17 BCF/Well
14. Wasatch gas reserves (1998 DOE NOSR3 Commercial Development study).0.7 BCF/Well
15. Mesaverde oil reserves (1998 DOE NOSRs1+3 Oil and Gas Reserves Evaluation). 0.0023 BO/MCF
16. Mesaverde: 40-acre drill islands (2 wells per island for 20-acre spacing, 4 wells per island, for 10-acre spacing) on all lands beside the upper plateau. On the upper plateau, 1 Mesaverde well per 40-acre pad.
17. Wasatch: an additional Wasatch well is added on Mesaverde locations for every 8 - 20-acre Mesaverde wells and for every sixteen 10-acre Mesaverde wells drilled on all lands beside the upper plateau and for every 4 Mesaverde wells drilled the upper plateau lands (I.e., no additional well pads for Wasatch). It is assumed that 75% of wells will be Mesaverde and 25% of wells will be Wasatch.

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