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

# GLENWOOD SPRINGS FIELD OFFICE

## Roan Plateau Planning Area

### Including Naval Oil Shale Reserves Numbers 1 & 3

**Resource Management Plan Amendment & Environmental Impact Statement**

**Volume III**

**FINAL**
**August 2006**

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

# Final

# Roan Plateau
# Resource Management Plan Amendment
# and
# Environmental Impact Statement

## Volume III
## Appendices

**August 2006**

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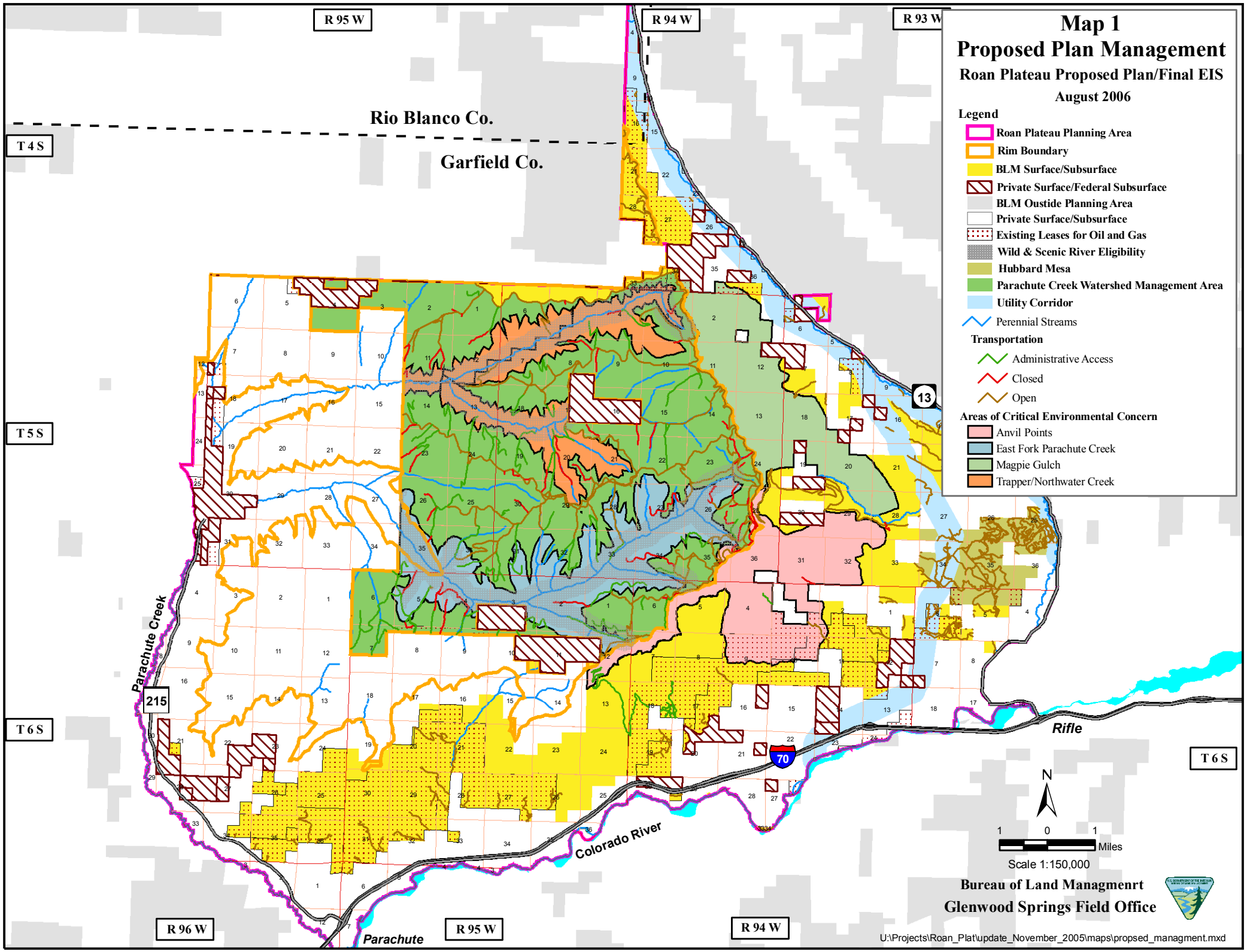
# APPENDIX A


Map 1
Proposed Plan Management
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Roan Plateau Planning Area
Rim Boundary
BLM Surface/Subsurface
Private Surface/Federal Subsurface
BLM Oustide Planning Area
Private Surface/Subsurface
Existing Leases for Oil and Gas
Wild & Scenic River Eligibility
Hubbard Mesa
Parachute Creek Watershed Management Area
Utility Corridor
Perennial Streams
Transportation
Administrative Access
Closed
Open
Areas of Critical Environmental Concern
Anvil Points
East Fork Parachute Creek
Magpie Gulch
Trapper/Northwater Creek
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
Parachute Creek
Colorado River
Parachute
Rifle
13
215
70
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1 0 1
Miles
Scale 1:150,000
Bureau of Land Managmenrt
Glenwood Springs Field Office
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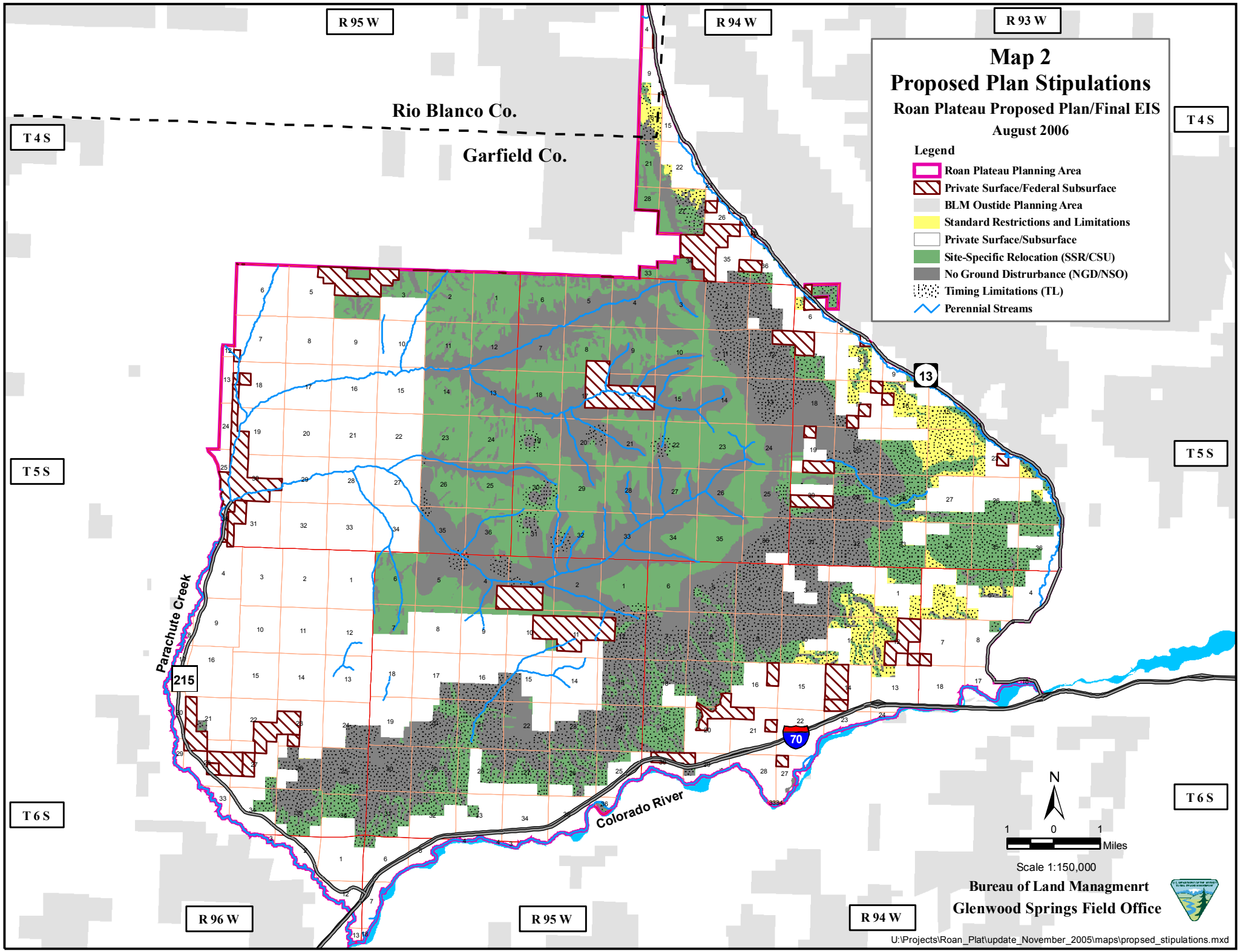
Map 2
Proposed Plan Stipulations
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Roan Plateau Planning Area
Private Surface/Federal Subsurface
BLM Oustide Planning Area
Standard Restrictions and Limitations
Private Surface/Subsurface
Site-Specific Relocation (SSR/CSU)
No Ground Distrurbance (NGD/NSO)
Timing Limitations (TL)
Perennial Streams
R 95 W
R 94 W
R 93 W
R 96 W
T 4 S
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Rio Blanco Co.
Garfield Co.
Parachute Creek
Colorado River
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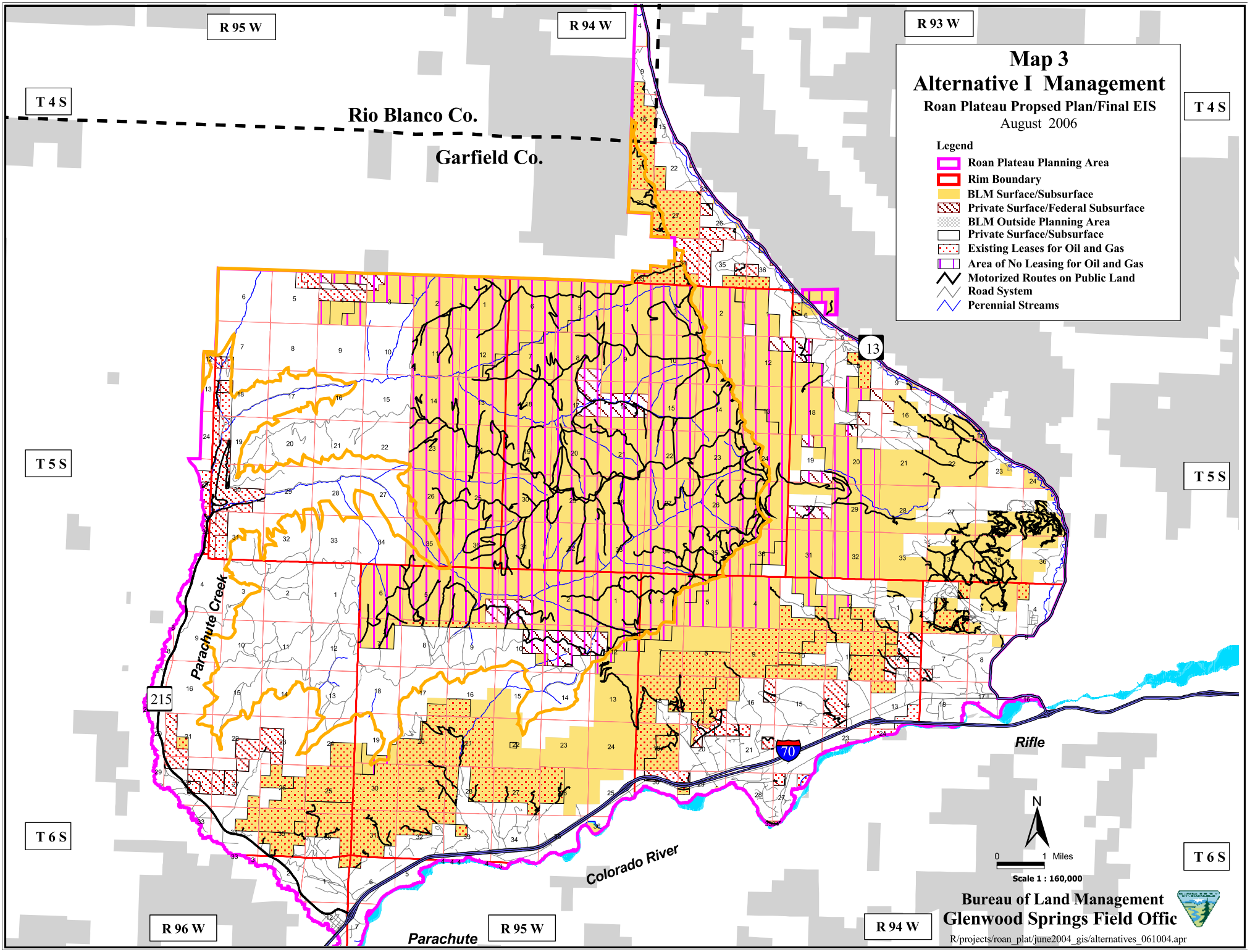
Map 3
Alternative I Management
Roan Plateau Propsed Plan/Final EIS
August 2006
Legend
Roan Plateau Planning Area
Rim Boundary
BLM Surface/Subsurface
Private Surface/Federal Subsurface
BLM Outside Planning Area
Private Surface/Subsurface
Existing Leases for Oil and Gas
Area of No Leasing for Oil and Gas
Motorized Routes on Public Land
Road System
Perennial Streams
R 95 W
R 94 W
R 93 W
T 4 S
T 5 S
T 6 S
R 96 W
Rio Blanco Co.
Garfield Co.
Parachute Creek
Colorado River
Parachute
Rifle
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1 Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Offic
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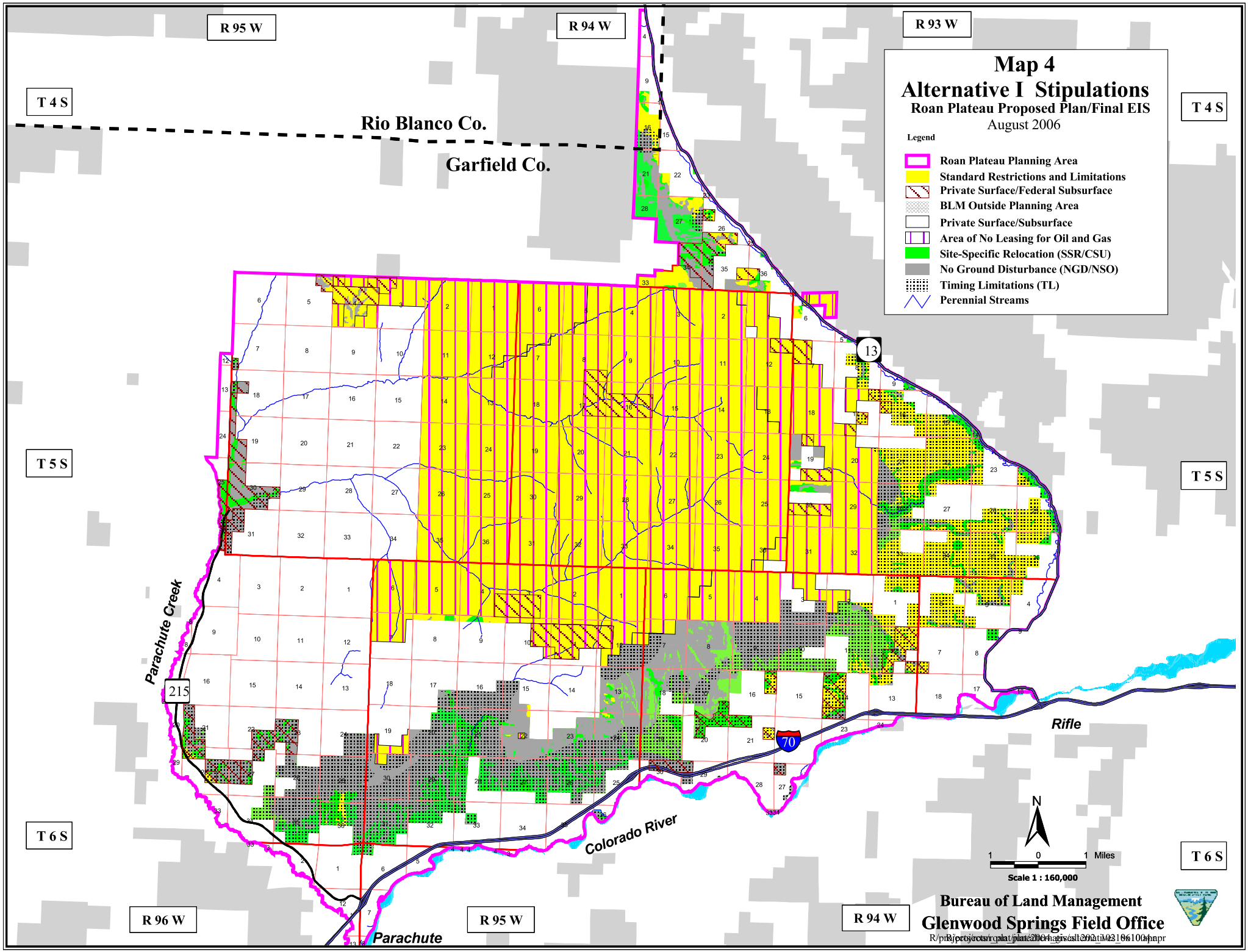
Map 4
Alternative I Stipulations
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Roan Plateau Planning Area
Standard Restrictions and Limitations
Private Surface/Federal Subsurface
BLM Outside Planning Area
Private Surface/Subsurface
Area of No Leasing for Oil and Gas
Site-Specific Relocation (SSR/CSU)
No Ground Disturbance (NGD/NSO)
Timing Limitations (TL)
Perennial Streams
R 95 W
R 94 W
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Rio Blanco Co.
Garfield Co.
Parachute Creek
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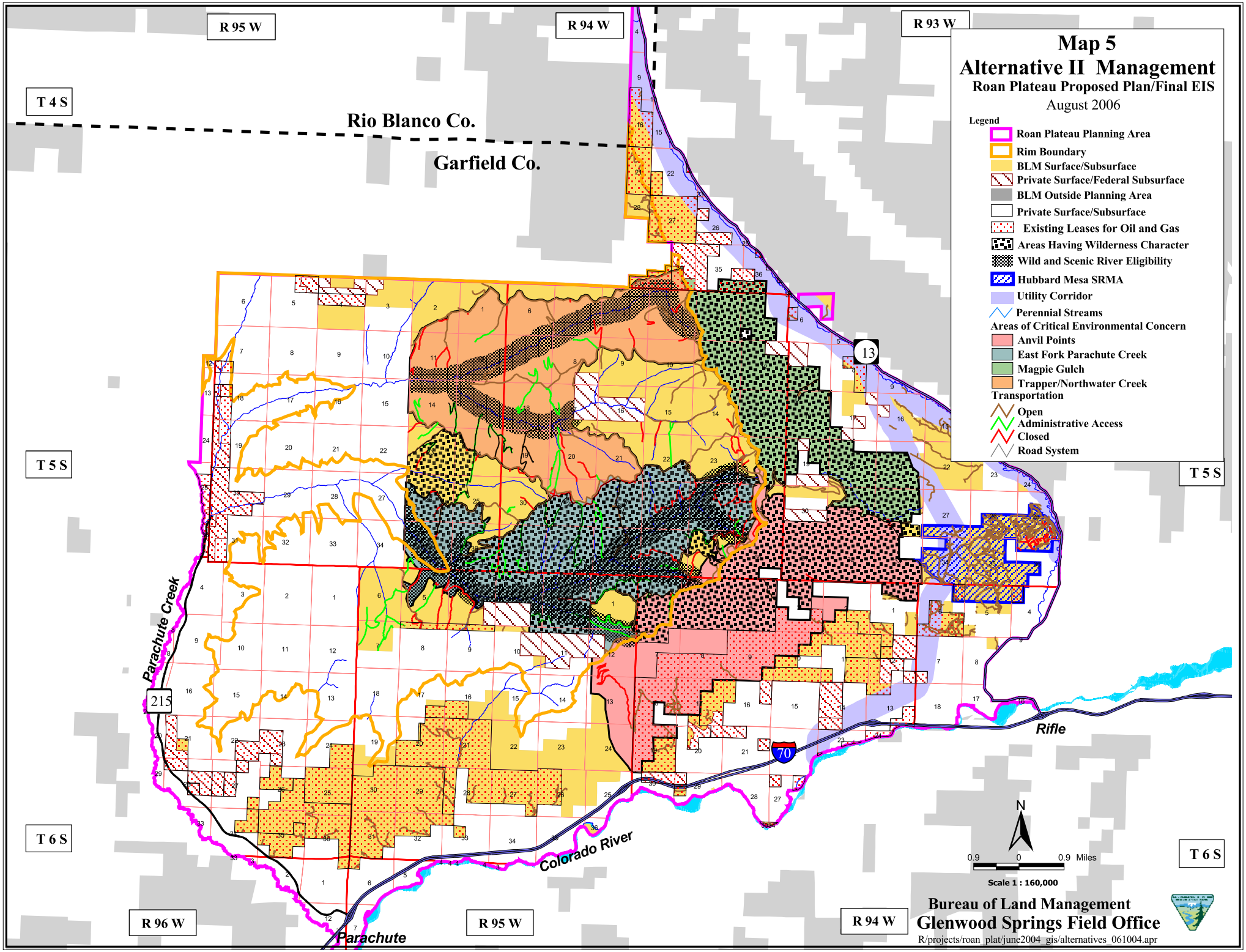
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office


Map 5
Alternative II Management
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Roan Plateau Planning Area
Rim Boundary
BLM Surface/Subsurface
Private Surface/Federal Subsurface
BLM Outside Planning Area
Private Surface/Subsurface
Existing Leases for Oil and Gas
Areas Having Wilderness Character
Wild and Scenic River Eligibility
Hubbard Mesa SRMA
Utility Corridor
Perennial Streams
Areas of Critical Environmental Concern
Anvil Points
East Fork Parachute Creek
Magpie Gulch
Trapper/Northwater Creek
Transportation
Open
Administrative Access
Closed
Road System
R 95 W
R 94 W
R 93 W
T 4 S
T 5 S
T 6 S
Rio Blanco Co.
Garfield Co.
Parachute Creek
Colorado River
Rifle
Parachute
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Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
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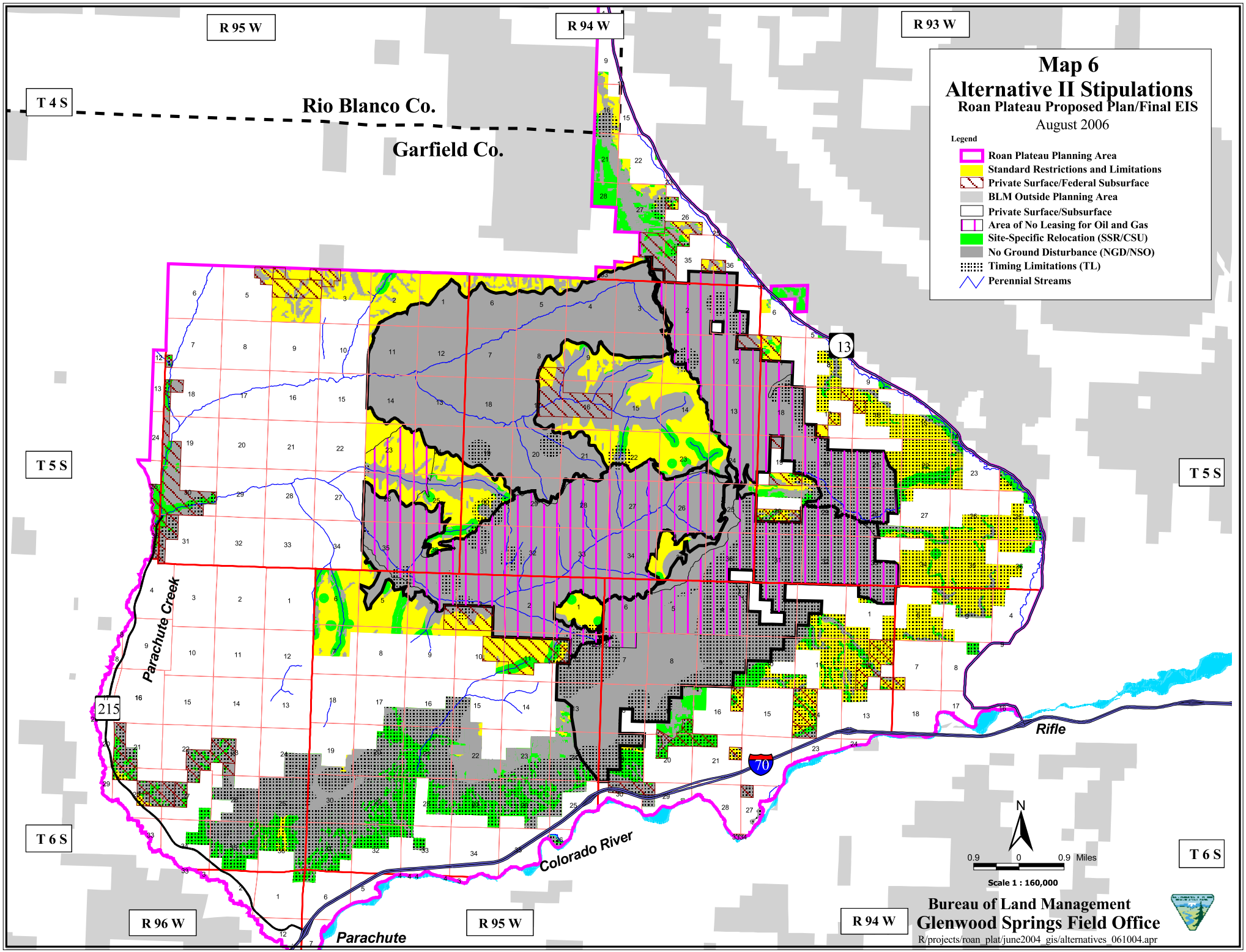
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Alternative II Stipulations
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Roan Plateau Planning Area
Standard Restrictions and Limitations
Private Surface/Federal Subsurface
BLM Outside Planning Area
Private Surface/Subsurface
Area of No Leasing for Oil and Gas
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No Ground Disturbance (NGD/NSO)
Timing Limitations (TL)
Perennial Streams
R 95 W
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Parachute Creek
Colorado River
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Scale 1 : 160,000
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Bureau of Land Management
Glenwood Springs Field Office
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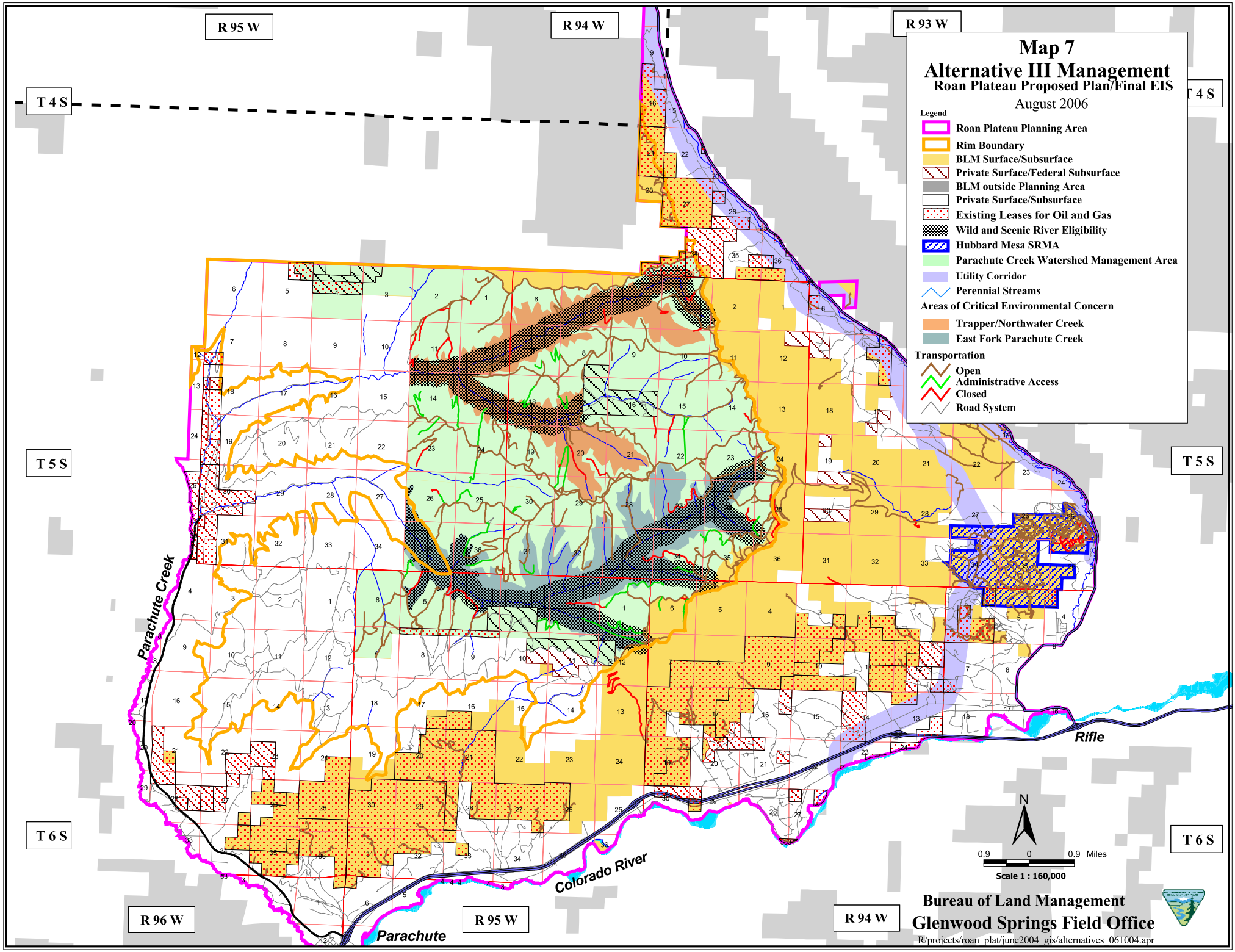
Map 7
Alternative III Management
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Roan Plateau Planning Area
Rim Boundary
BLM Surface/Subsurface
Private Surface/Federal Subsurface
BLM outside Planning Area
Private Surface/Subsurface
Existing Leases for Oil and Gas
Wild and Scenic River Eligibility
Hubbard Mesa SRMA
Parachute Creek Watershed Management Area
Utility Corridor
Perennial Streams
Areas of Critical Environmental Concern
Trapper/Northwater Creek
East Fork Parachute Creek
Transportation
Open
Administrative Access
Closed
Road System
R 95 W
R 94 W
R 93 W
T 4 S
T 5 S
T 6 S
R 96 W
Parachute Creek
Colorado River
Parachute
Rifle
N
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Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
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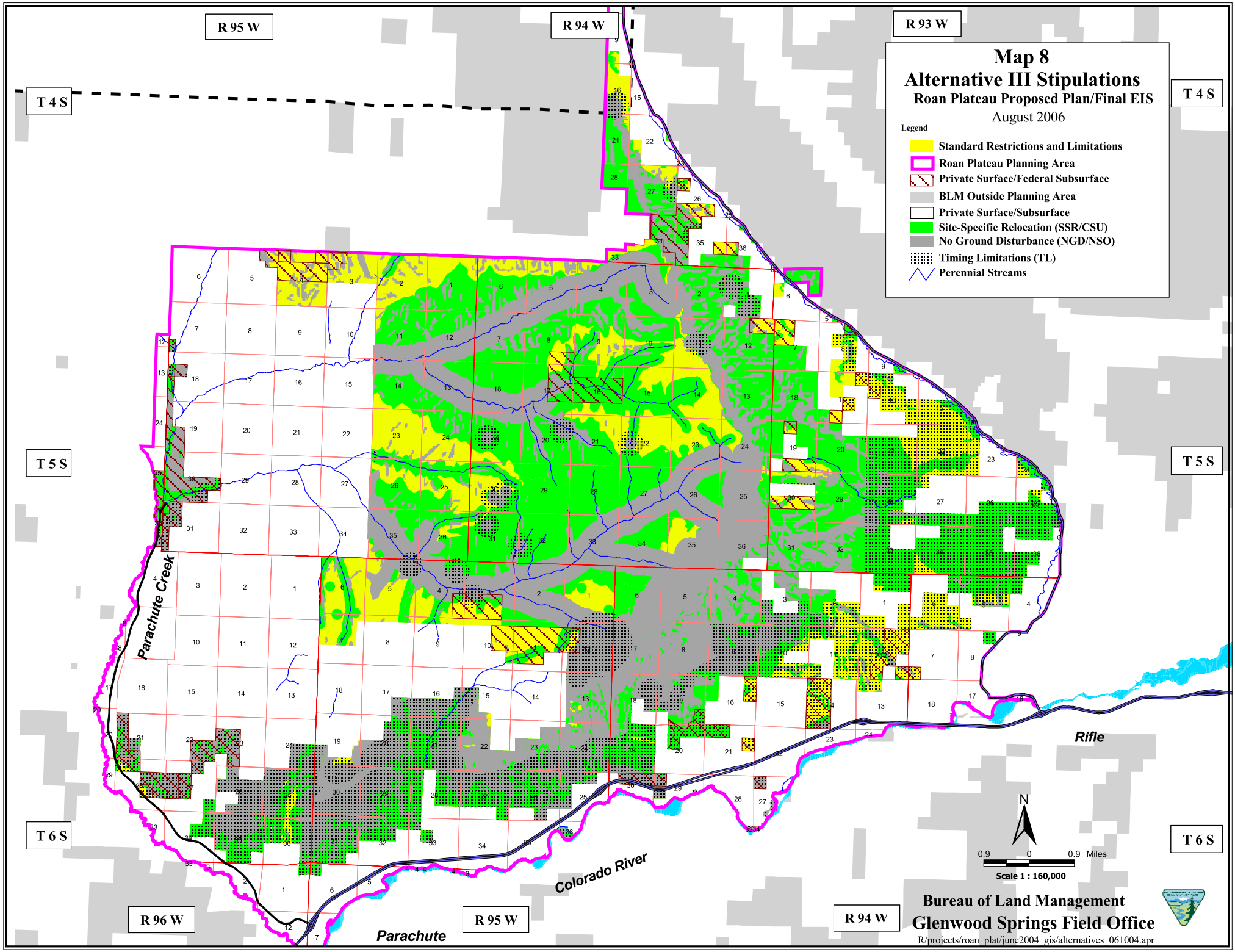
Map 8
Alternative III Stipulations
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Standard Restrictions and Limitations
Roan Plateau Planning Area
Private Surface/Federal Subsurface
BLM Outside Planning Area
Private Surface/Subsurface
Site-Specific Relocation (SSR/CSU)
No Ground Disturbance (NGD/NSO)
Timing Limitations (TL)
Perennial Streams
R 95 W
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Parachute Creek
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Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
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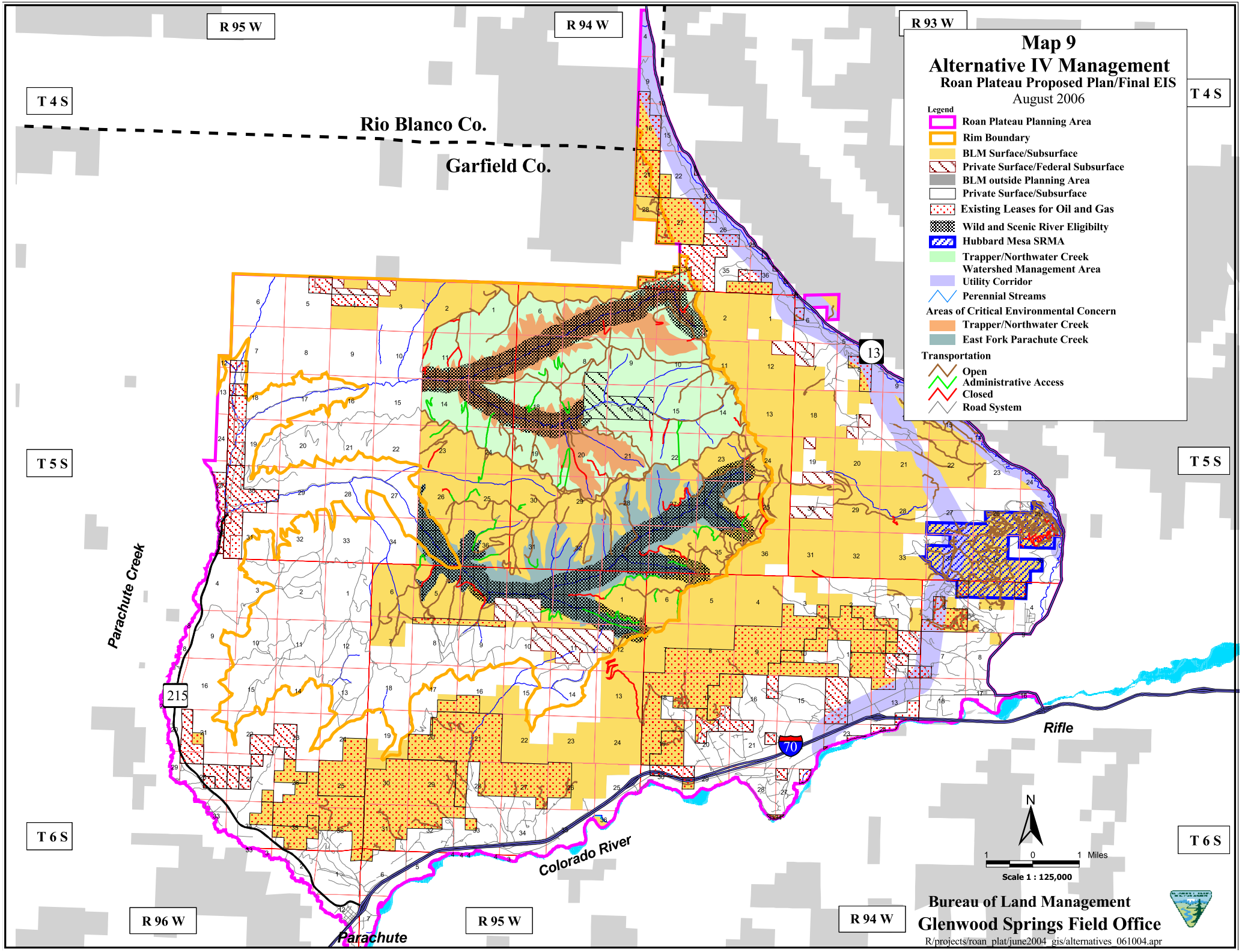
Map 9
Alternative IV Management
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Roan Plateau Planning Area
Rim Boundary
BLM Surface/Subsurface
Private Surface/Federal Subsurface
BLM outside Planning Area
Private Surface/Subsurface
Existing Leases for Oil and Gas
Wild and Scenic River Eligibilty
Hubbard Mesa SRMA
Trapper/Northwater Creek Watershed Management Area
Utility Corridor
Perennial Streams
Areas of Critical Environmental Concern
Trapper/Northwater Creek
East Fork Parachute Creek
Transportation
Open
Administrative Access
Closed
Road System
R 96 W
R 95 W
R 94 W
R 93 W
T 4 S
T 5 S
T 6 S
Rio Blanco Co.
Garfield Co.
Parachute Creek
Colorado River
Parachute
Rifle
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Scale 1 : 125,000
Bureau of Land Management
Glenwood Springs Field Office
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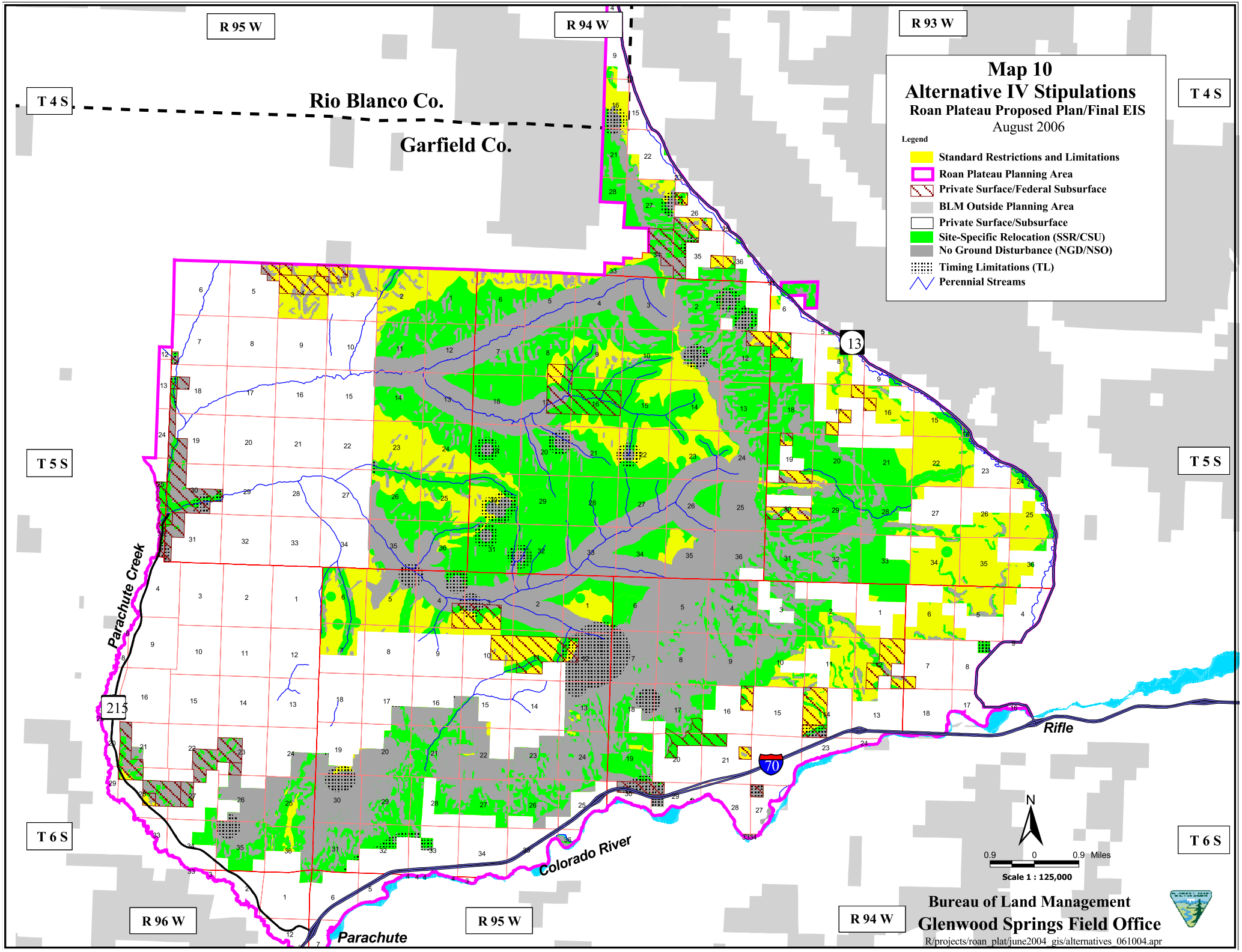
Map 10
Alternative IV Stipulations
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Standard Restrictions and Limitations
Roan Plateau Planning Area
Private Surface/Federal Subsurface
BLM Outside Planning Area
Private Surface/Subsurface
Site-Specific Relocation (SSR/CSU)
No Ground Disturbance (NGD/NSO)
Timing Limitations (TL)
Perennial Streams
R 95 W
R 94 W
R 93 W
T 4 S
T 5 S
T 6 S
R 96 W
Rio Blanco Co.
Garfield Co.
Parachute Creek
Colorado River
Parachute
Rifle
13
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0.9 0 0.9 Miles
Scale 1 : 125,000
Bureau of Land Management
Glenwood Springs Field Office
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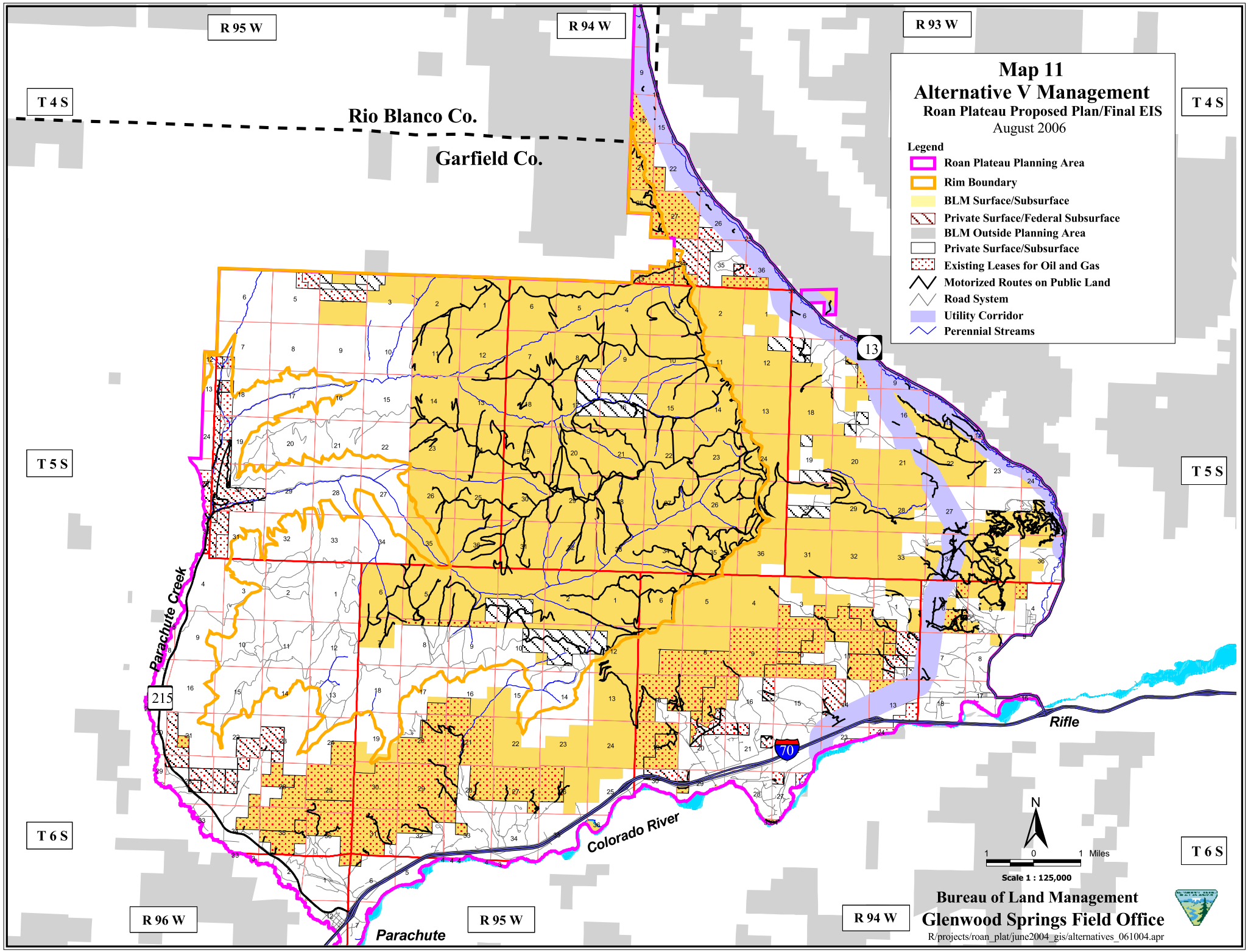
Map 11
Alternative V Management
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Roan Plateau Planning Area
Rim Boundary
BLM Surface/Subsurface
Private Surface/Federal Subsurface
BLM Outside Planning Area
Private Surface/Subsurface
Existing Leases for Oil and Gas
Motorized Routes on Public Land
Road System
Utility Corridor
Perennial Streams
R 95 W
R 94 W
R 93 W
T 4 S
T 5 S
T 6 S
R 96 W
Rio Blanco Co.
Garfield Co.
Parachute Creek
Colorado River
Rifle
Parachute
13
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Scale 1 : 125,000
Bureau of Land Management
Glenwood Springs Field Office
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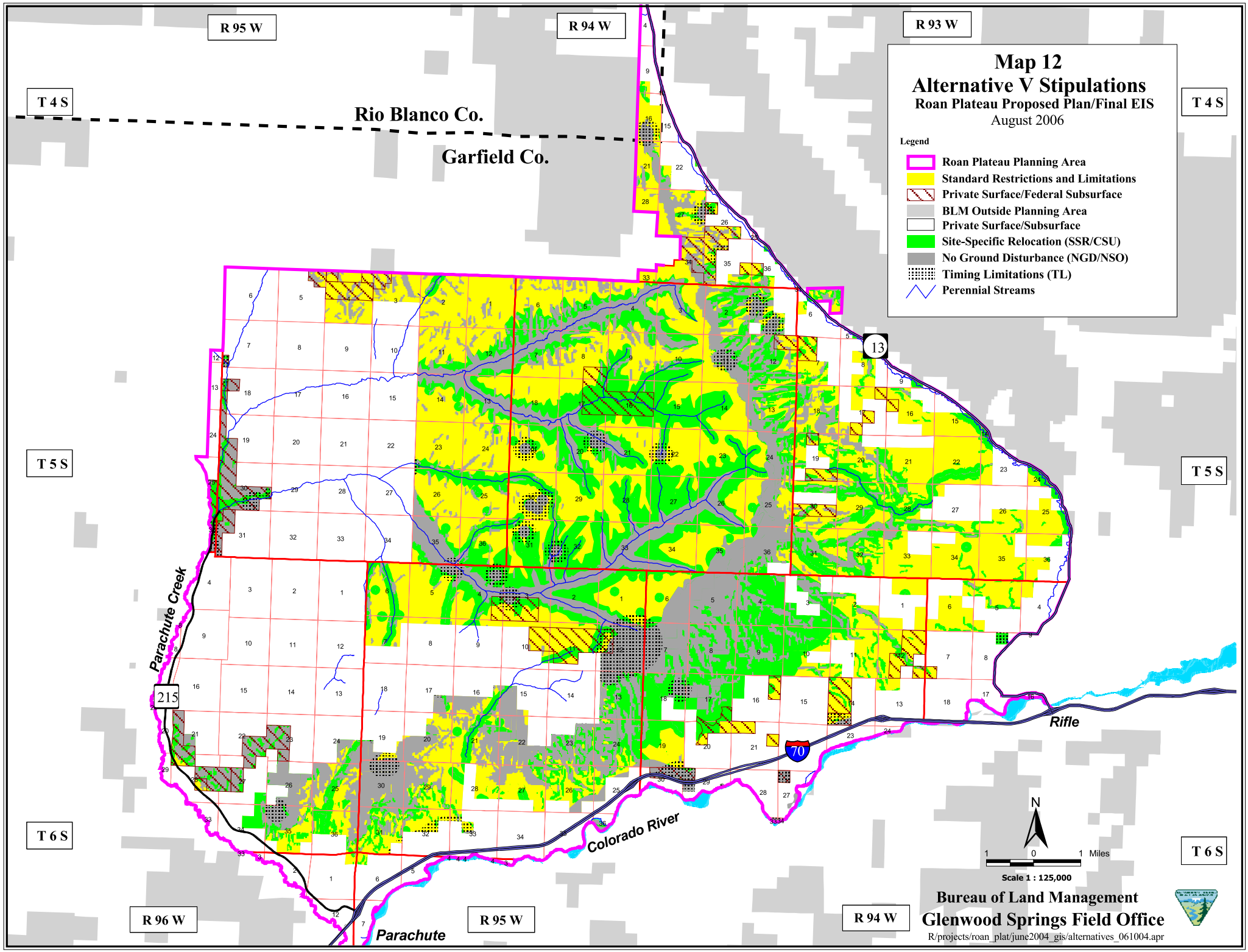
Map 12
Alternative V Stipulations
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Roan Plateau Planning Area
Standard Restrictions and Limitations
Private Surface/Federal Subsurface
BLM Outside Planning Area
Private Surface/Subsurface
Site-Specific Relocation (SSR/CSU)
No Ground Disturbance (NGD/NSO)
Timing Limitations (TL)
Perennial Streams
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.
Parachute Creek
Colorado River
Rifle
Parachute
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Scale 1 : 125,000
Bureau of Land Management
Glenwood Springs Field Office
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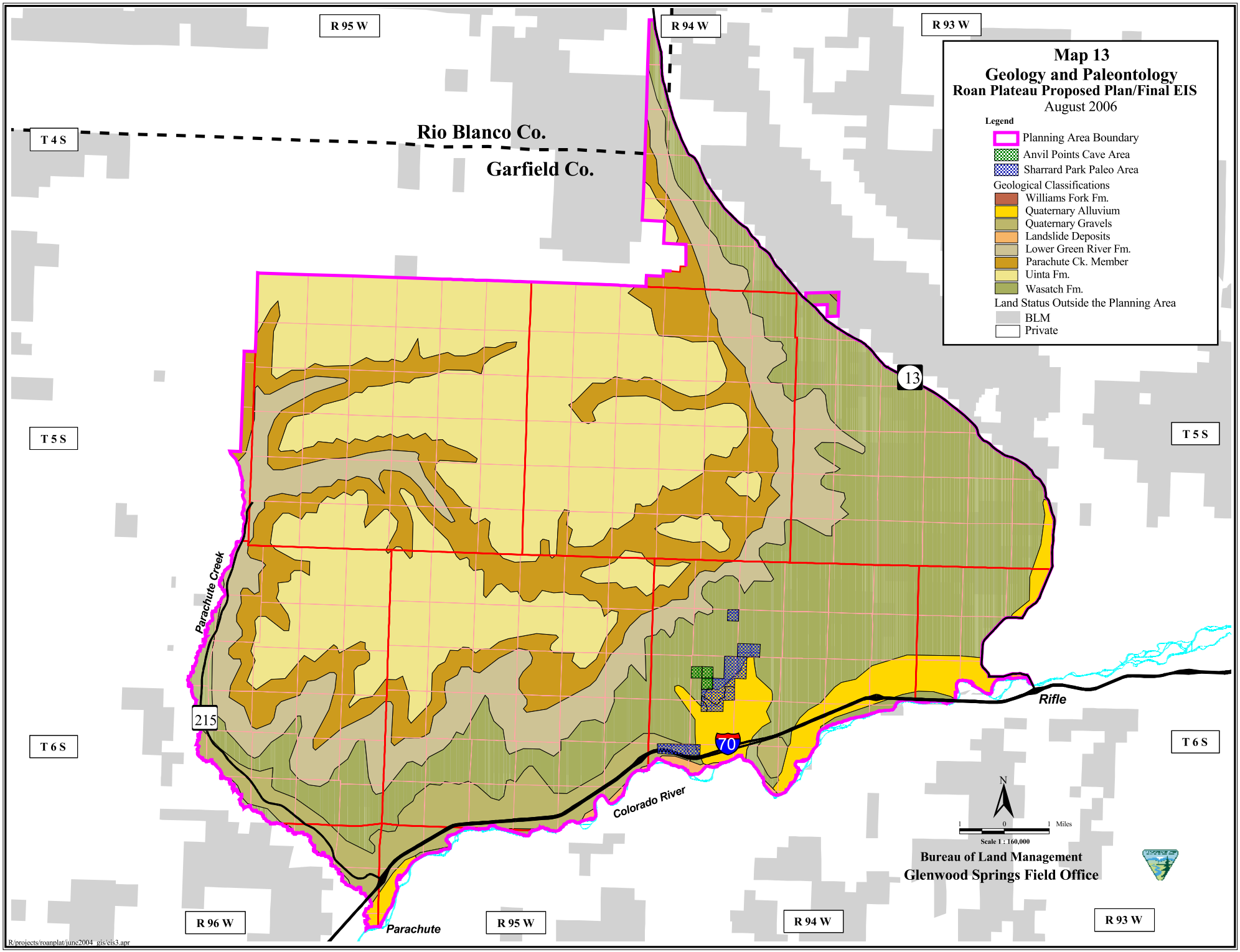
Map 13
Geology and Paleontology
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Planning Area Boundary
Anvil Points Cave Area
Sharrard Park Paleo Area
Geological Classifications
Williams Fork Fm.
Quaternary Alluvium
Quaternary Gravels
Landslide Deposits
Lower Green River Fm.
Parachute Ck. Member
Uinta Fm.
Wasatch Fm.
Land Status Outside the Planning Area
BLM
Private
R 95 W
R 94 W
R 93 W
T 4 S
T 5 S
T 6 S
Rio Blanco Co.
Garfield Co.
13
215
70
Parachute Creek
Colorado River
Rifle
Parachute
R 96 W
N
1 0 1 Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
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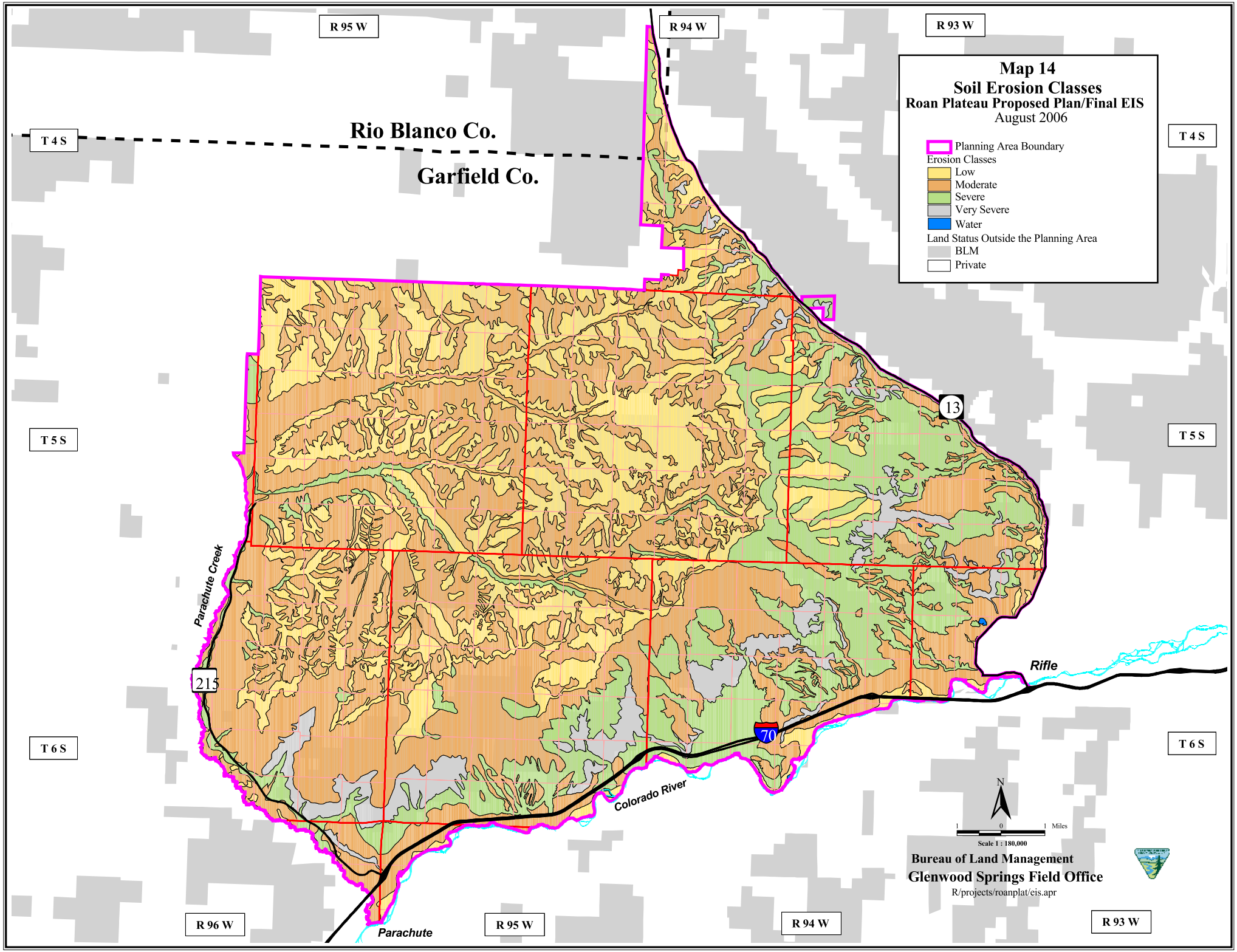
Map 14
Soil Erosion Classes
Roan Plateau Proposed Plan/Final EIS
August 2006
Planning Area Boundary
Erosion Classes
Low
Moderate
Severe
Very Severe
Water
Land Status Outside the Planning Area
BLM
Private
Rio Blanco Co.
Garfield Co.
R 95 W
R 94 W
R 93 W
R 96 W
T 4 S
T 5 S
T 6 S
Parachute Creek
Colorado River
Rifle
Parachute
13
215
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N
1 0 1 Miles
Scale 1 : 180,000
Bureau of Land Management
Glenwood Springs Field Office
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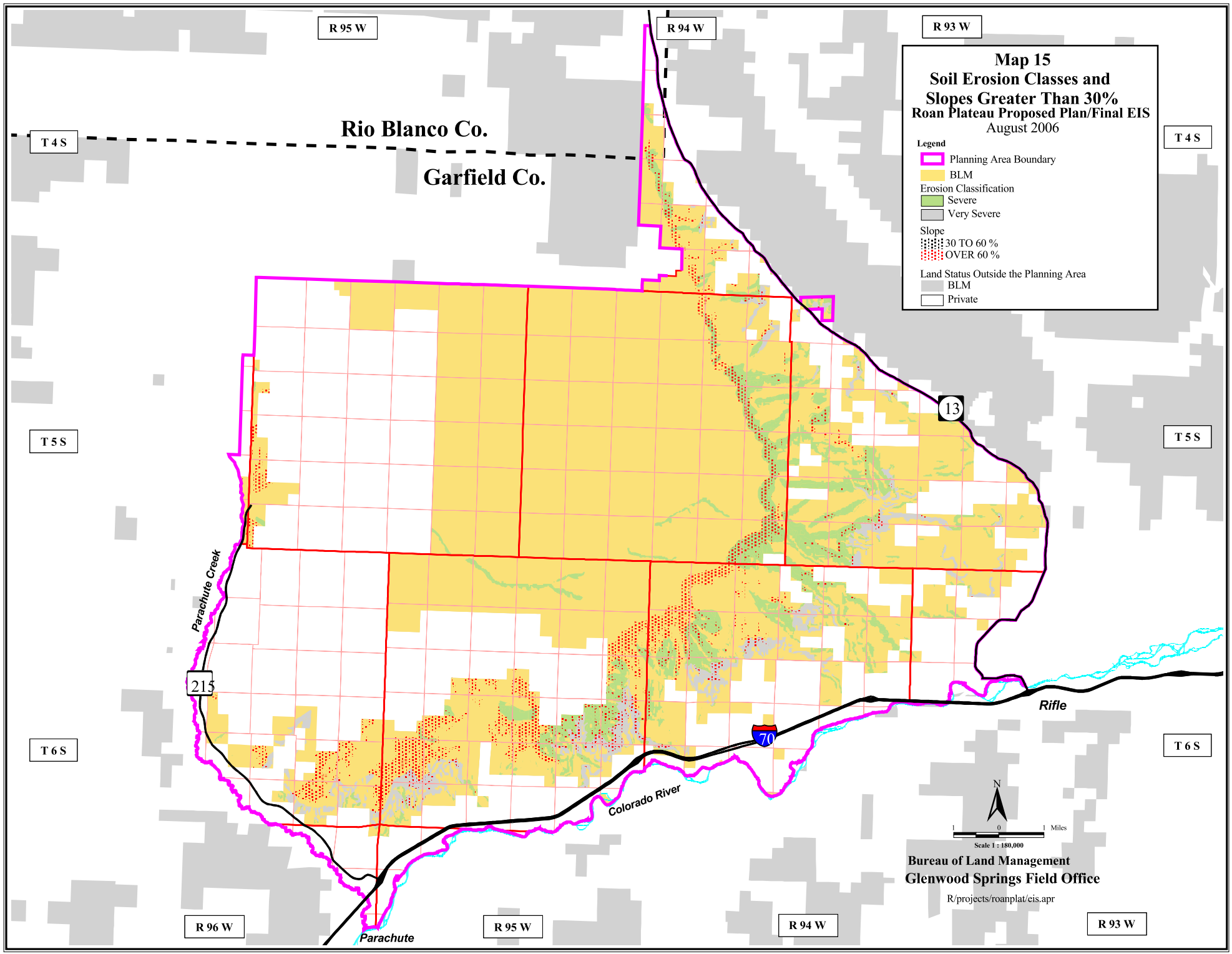
Map 15
Soil Erosion Classes and
Slopes Greater Than 30%
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Planning Area Boundary
BLM
Erosion Classification
Severe
Very Severe
Slope
30 TO 60 %
OVER 60 %
Land Status Outside the Planning Area
BLM
Private
Rio Blanco Co.
Garfield Co.
R 95 W
R 94 W
R 93 W
R 96 W
T 4 S
T 5 S
T 6 S
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Parachute Creek
Colorado River
Rifle
Parachute
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1 0 1 Miles
Scale 1 : 180,000
Bureau of Land Management
Glenwood Springs Field Office
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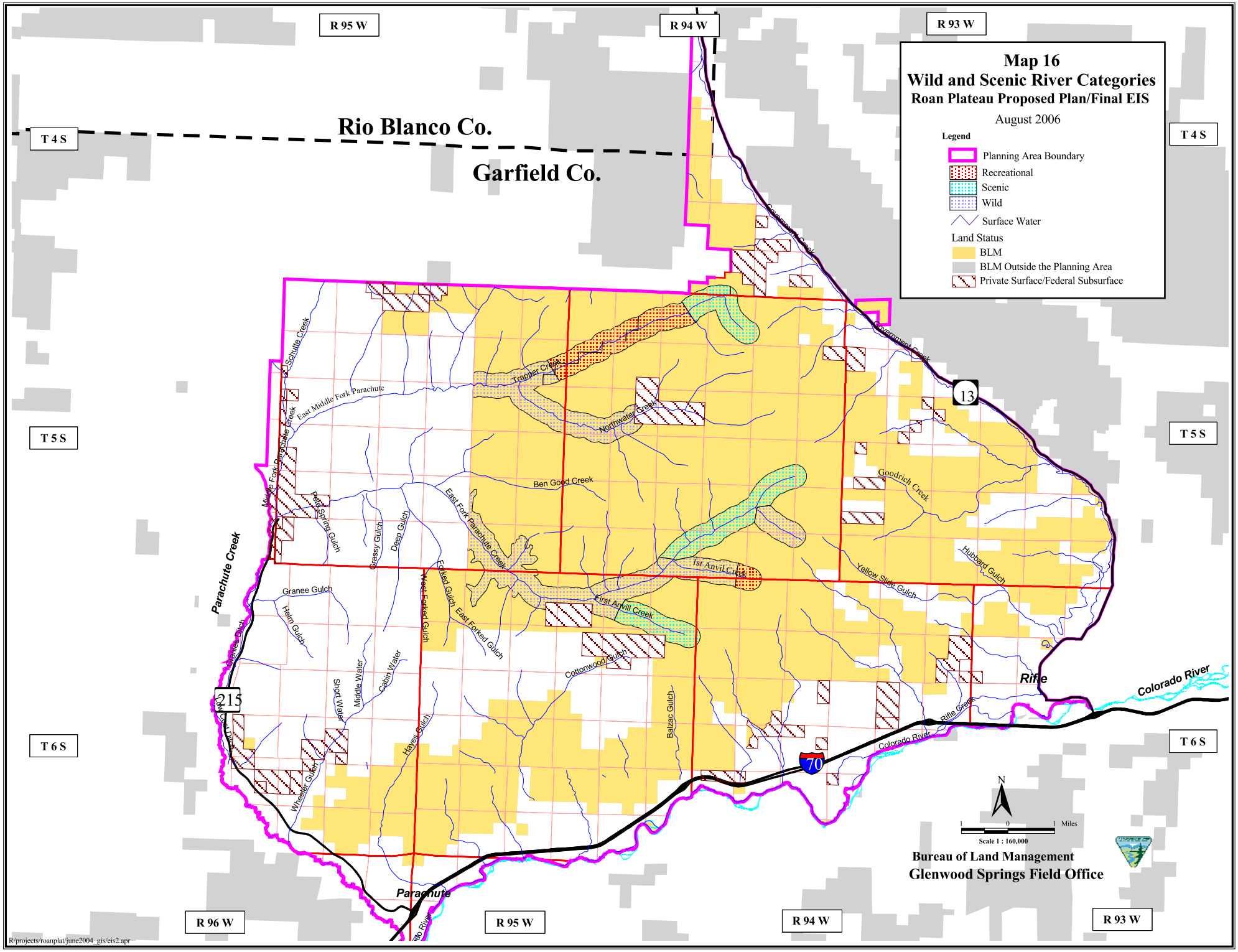
Map 16
Wild and Scenic River Categories
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Planning Area Boundary
Recreational
Scenic
Wild
Surface Water
Land Status
BLM
BLM Outside the Planning Area
Private Surface/Federal Subsurface
Rio Blanco Co.
Garfield Co.
R 95 W
R 94 W
R 93 W
R 96 W
T 4 S
T 5 S
T 6 S
Schutte Creek
East Middle Fork Parachute
Middle Fork Parachute Creek
Trapper Creek
Northwater Creek
Ben Good Creek
Government Creek
Goodrich Creek
Hubbard Gulch
Yellow Slide Gulch
1st Anvil Creek
First Anvil Creek
East Fork Parachute Creek
Petra Spring Gulch
Grassy Gulch
Deep Gulch
Forked Gulch
West Forked Gulch
East Forked Gulch
Granee Gulch
Helm Gulch
Granee Ditch
Parachute Creek
Short Water
Middle Water
Cabin Water
Wheeler Gulch
Hayes Gulch
Cottonwood Gulch
Balzac Gulch
Rifle Creek
Rifle
Colorado River
Parachute
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Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
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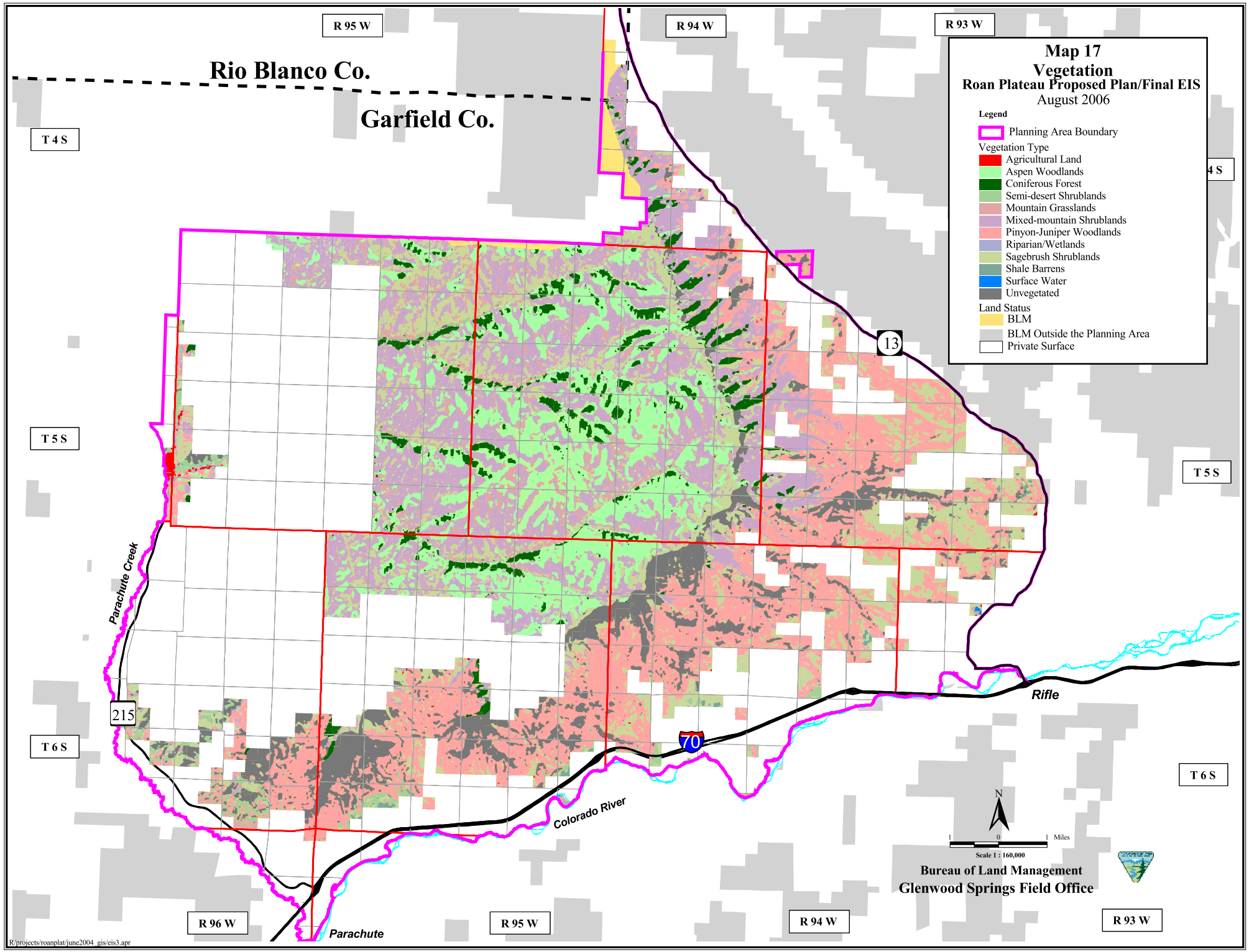
Map 17
Vegetation
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Planning Area Boundary
Vegetation Type
Agricultural Land
Aspen Woodlands
Coniferous Forest
Semi-desert Shrublands
Mountain Grasslands
Mixed-mountain Shrublands
Pinyon-Juniper Woodlands
Riparian/Wetlands
Sagebrush Shrublands
Shale Barrens
Surface Water
Unvegetated
Land Status
BLM
BLM Outside the Planning Area
Private Surface
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
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Parachute Creek
Colorado River
Rifle
Parachute
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Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
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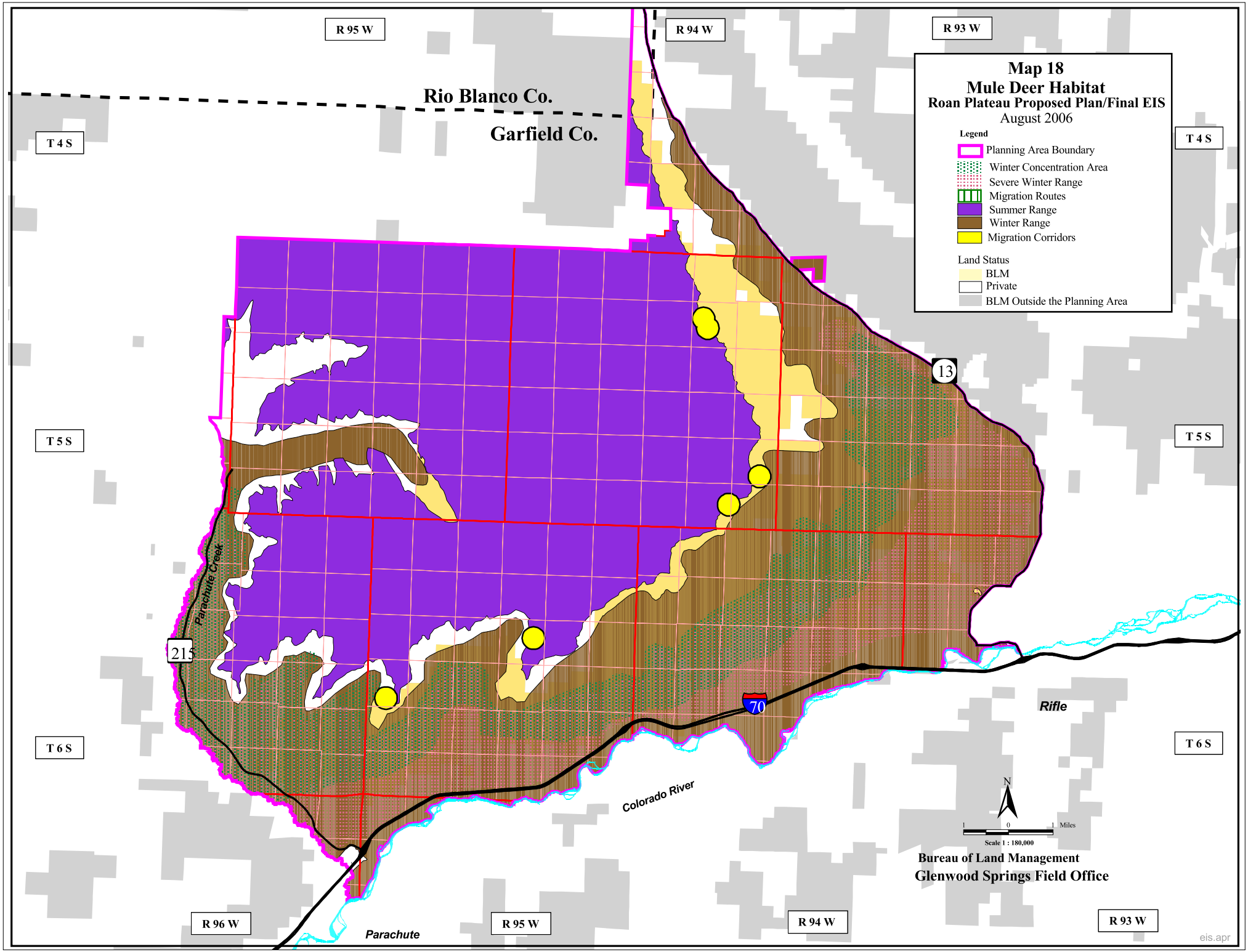
Map 18
Mule Deer Habitat
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Planning Area Boundary
Winter Concentration Area
Severe Winter Range
Migration Routes
Summer Range
Winter Range
Migration Corridors
Land Status
BLM
Private
BLM Outside the Planning Area
Rio Blanco Co.
Garfield Co.
R 95 W
R 94 W
R 93 W
R 96 W
T 4 S
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Rifle
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Scale 1 : 180,000
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Glenwood Springs Field Office
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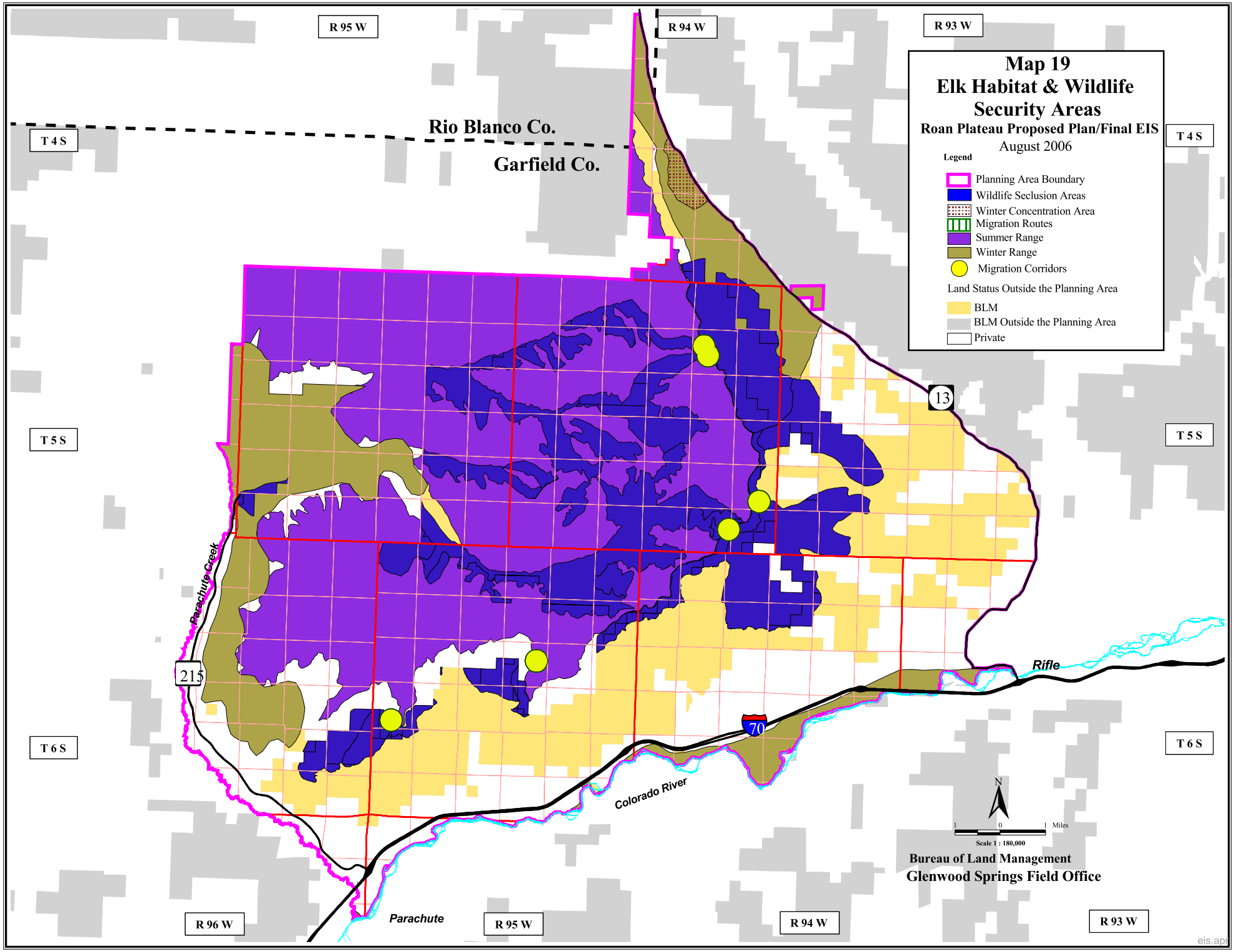
Map 19
Elk Habitat & Wildlife Security Areas
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Planning Area Boundary
Wildlife Seclusion Areas
Winter Concentration Area
Migration Routes
Summer Range
Winter Range
Migration Corridors
Land Status Outside the Planning Area
BLM
BLM Outside the Planning Area
Private
Rio Blanco Co.
Garfield Co.
R 95 W
R 94 W
R 93 W
R 96 W
T 4 S
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T 6 S
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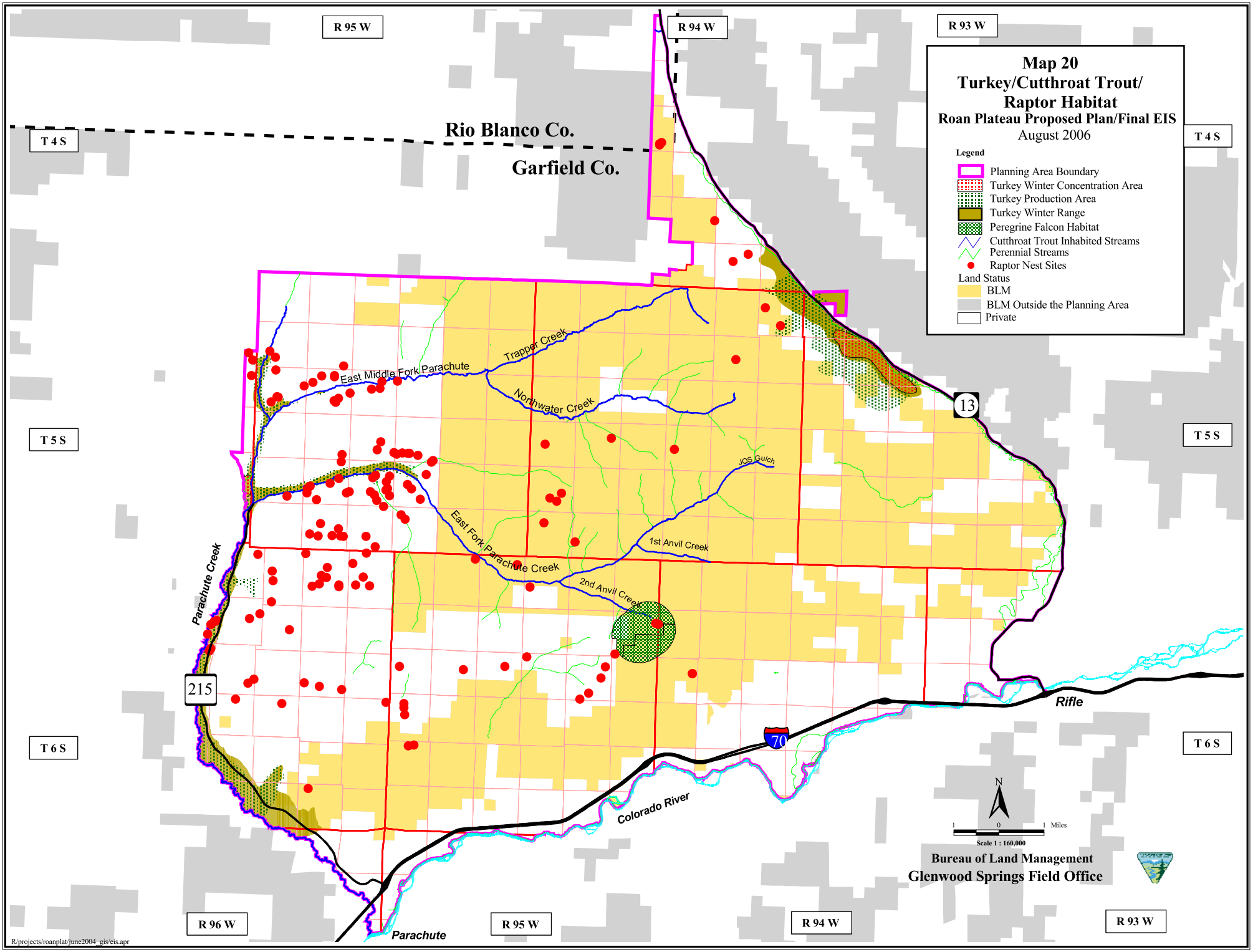
215
70
Parachute Creek
Colorado River
Rifle
Parachute
N
Miles
Scale 1 : 180,000
Bureau of Land Management
Glenwood Springs Field Office


Map 20
Turkey/Cutthroat Trout/
Raptor Habitat
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
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
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
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
13
215
70
N
1 0 1 Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
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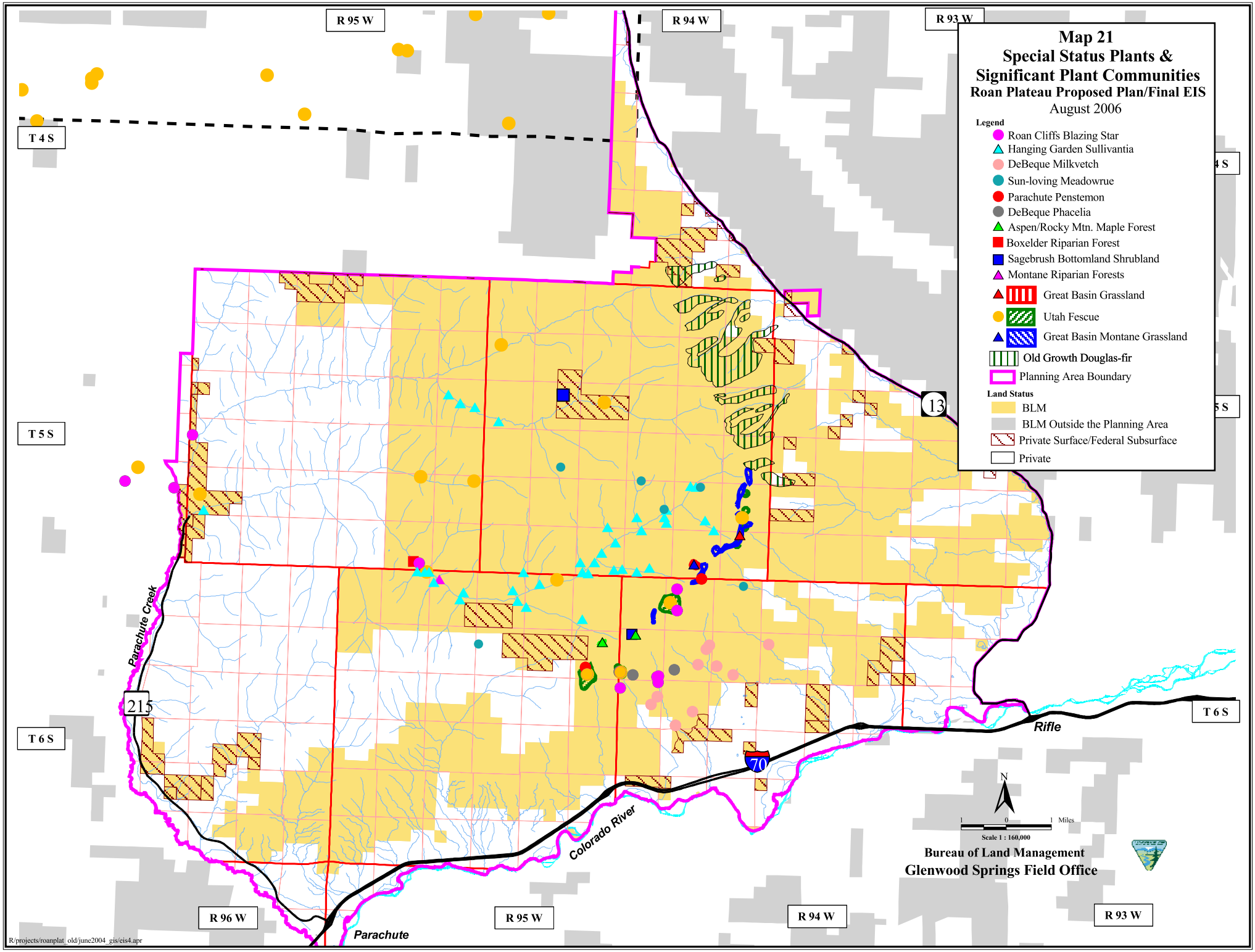
Map 21
Special Status Plants &
Significant Plant Communities
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Roan Cliffs Blazing Star
Hanging Garden Sullivantia
DeBeque Milkvetch
Sun-loving Meadowrue
Parachute Penstemon
DeBeque Phacelia
Aspen/Rocky Mtn. Maple Forest
Boxelder Riparian Forest
Sagebrush Bottomland Shrubland
Montane Riparian Forests
Great Basin Grassland
Utah Fescue
Great Basin Montane Grassland
Old Growth Douglas-fir
Planning Area Boundary
Land Status
BLM
BLM Outside the Planning Area
Private Surface/Federal Subsurface
Private
R 95 W
R 94 W
R 93 W
T 4 S
T 5 S
T 6 S
R 96 W
Parachute Creek
Colorado River
Parachute
Rifle
13
215
70
N
1 0 1 Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
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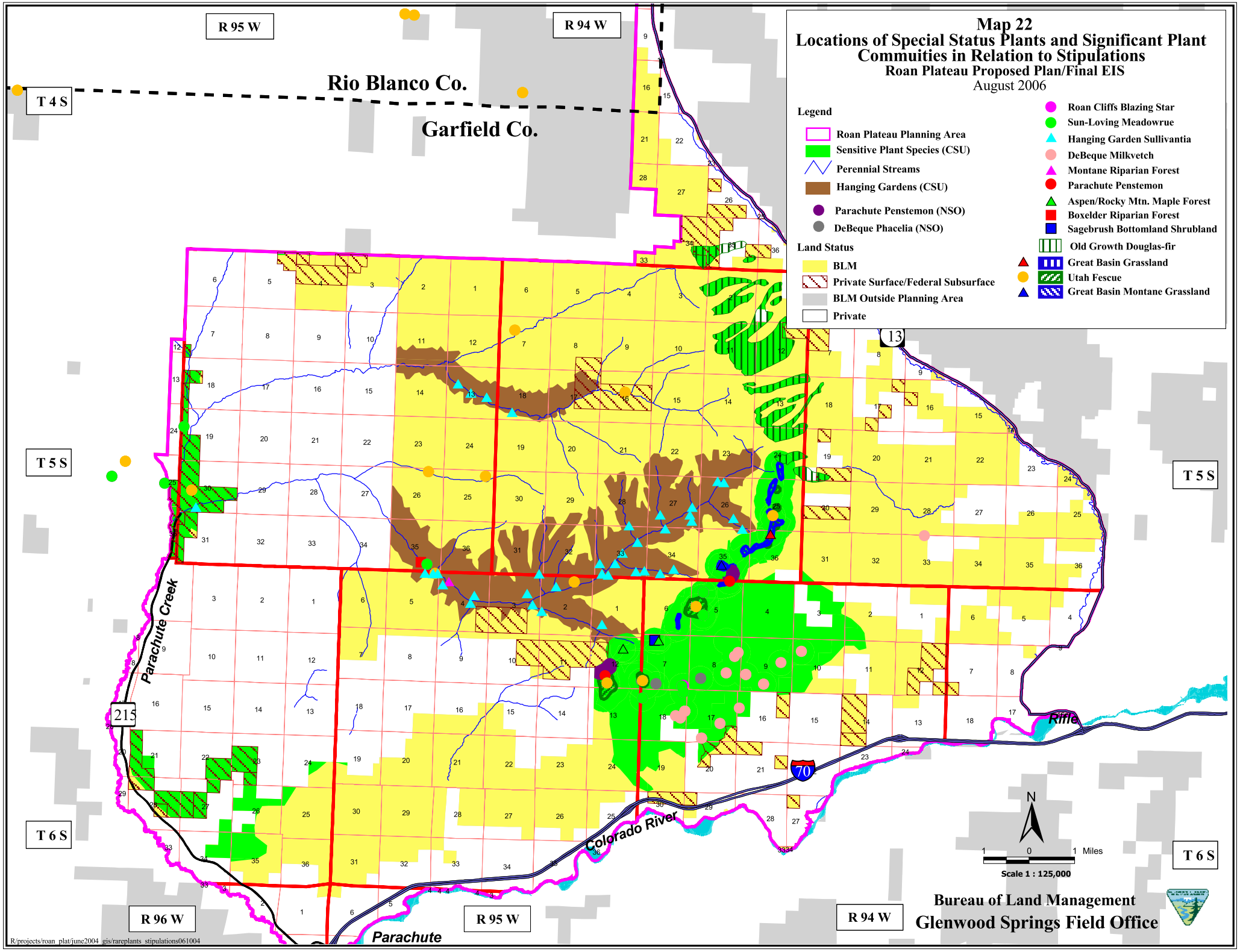
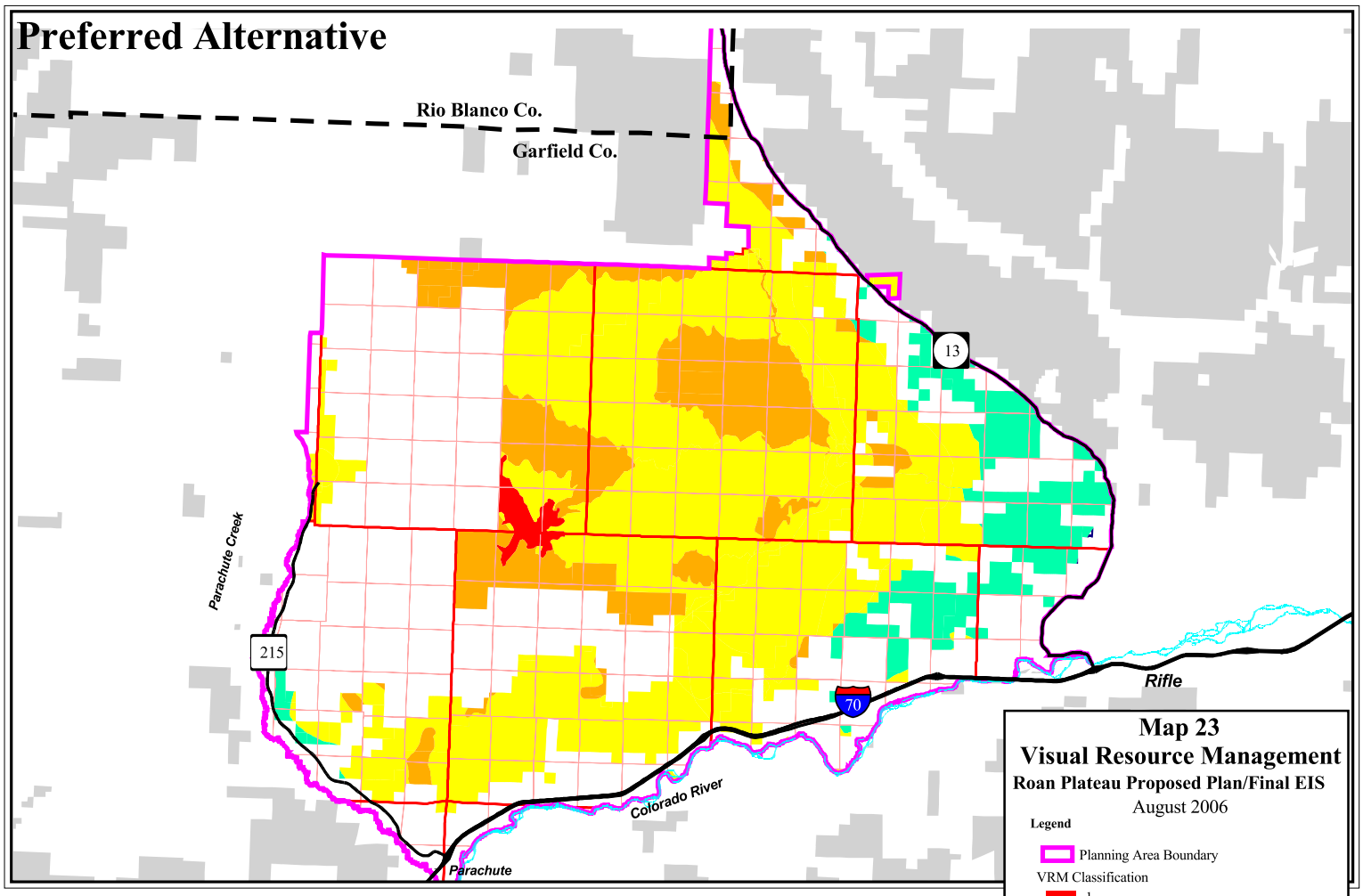
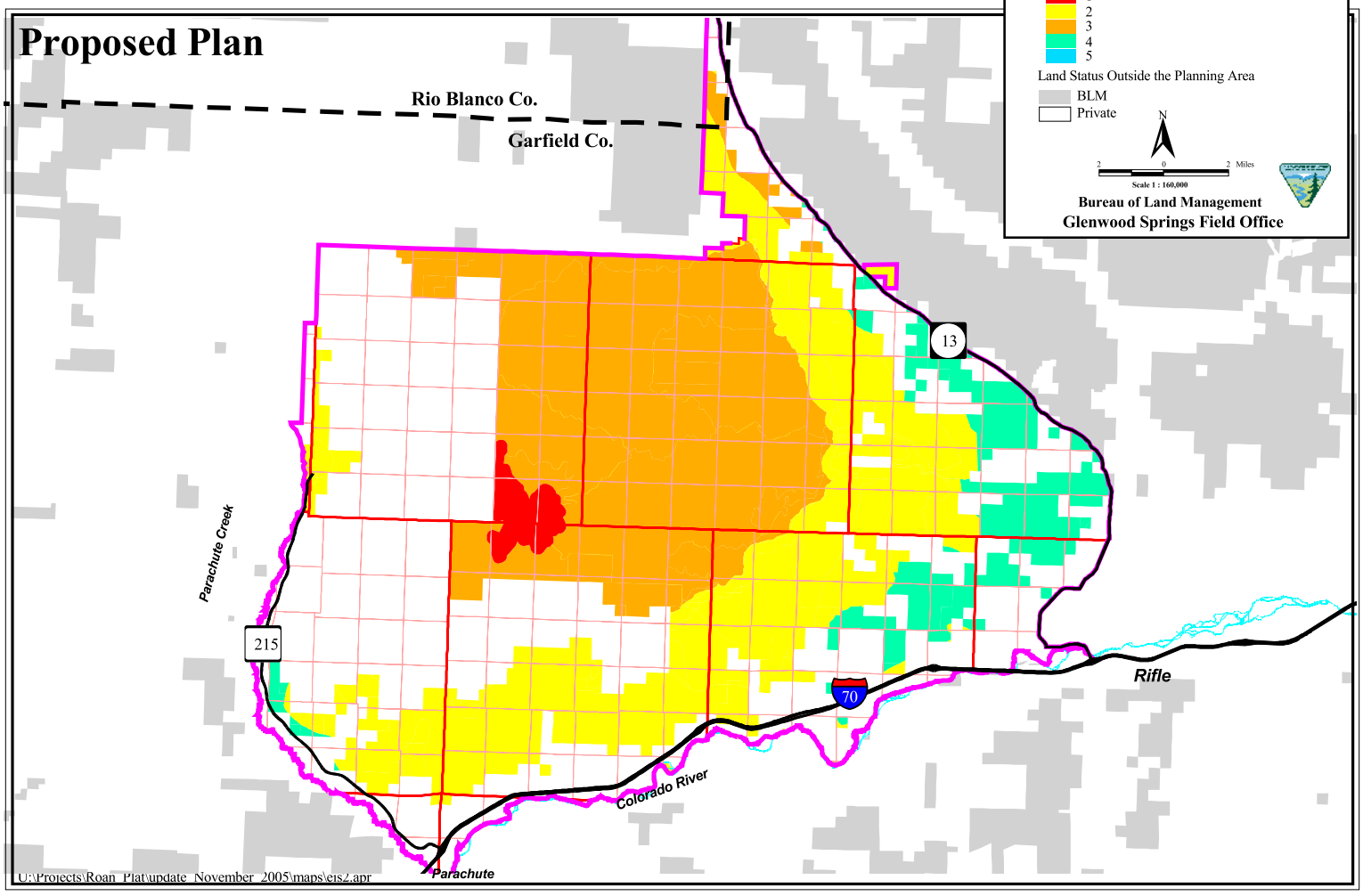

Map 22
Locations of Special Status Plants and Significant Plant Commuities in Relation to Stipulations
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Roan Plateau Planning Area
Sensitive Plant Species (CSU)
Perennial Streams
Hanging Gardens (CSU)
Parachute Penstemon (NSO)
DeBeque Phacelia (NSO)
Land Status
BLM
Private Surface/Federal Subsurface
BLM Outside Planning Area
Private
Roan Cliffs Blazing Star
Sun-Loving Meadowrue
Hanging Garden Sullivantia
DeBeque Milkvetch
Montane Riparian Forest
Parachute Penstemon
Aspen/Rocky Mtn. Maple Forest
Boxelder Riparian Forest
Sagebrush Bottomland Shrubland
Old Growth Douglas-fir
Great Basin Grassland
Utah Fescue
Great Basin Montane Grassland
R 95 W
R 94 W
Rio Blanco Co.
Garfield Co.
T 4 S
T 5 S
T 6 S
R 96 W
Parachute Creek
Colorado River
Parachute
Rifle
13
215
70
N
1 0 1 Miles
Scale 1 : 125,000
Bureau of Land Management
Glenwood Springs Field Office
R/projects/roan_plat/june2004_gis/rareplants_stipulations061004


Preferred Alternative
Rio Blanco Co.
Garfield Co.
13
Parachute Creek
215
70
Rifle
Colorado River
Parachute
Map 23
Visual Resource Management
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Planning Area Boundary
VRM Classification
1
2
3
4
5
Land Status Outside the Planning Area
BLM
Private
N
2
0
2 Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office


Proposed Plan
Rio Blanco Co.
Garfield Co.
13
Parachute Creek
215
70
Rifle
Colorado River
Parachute
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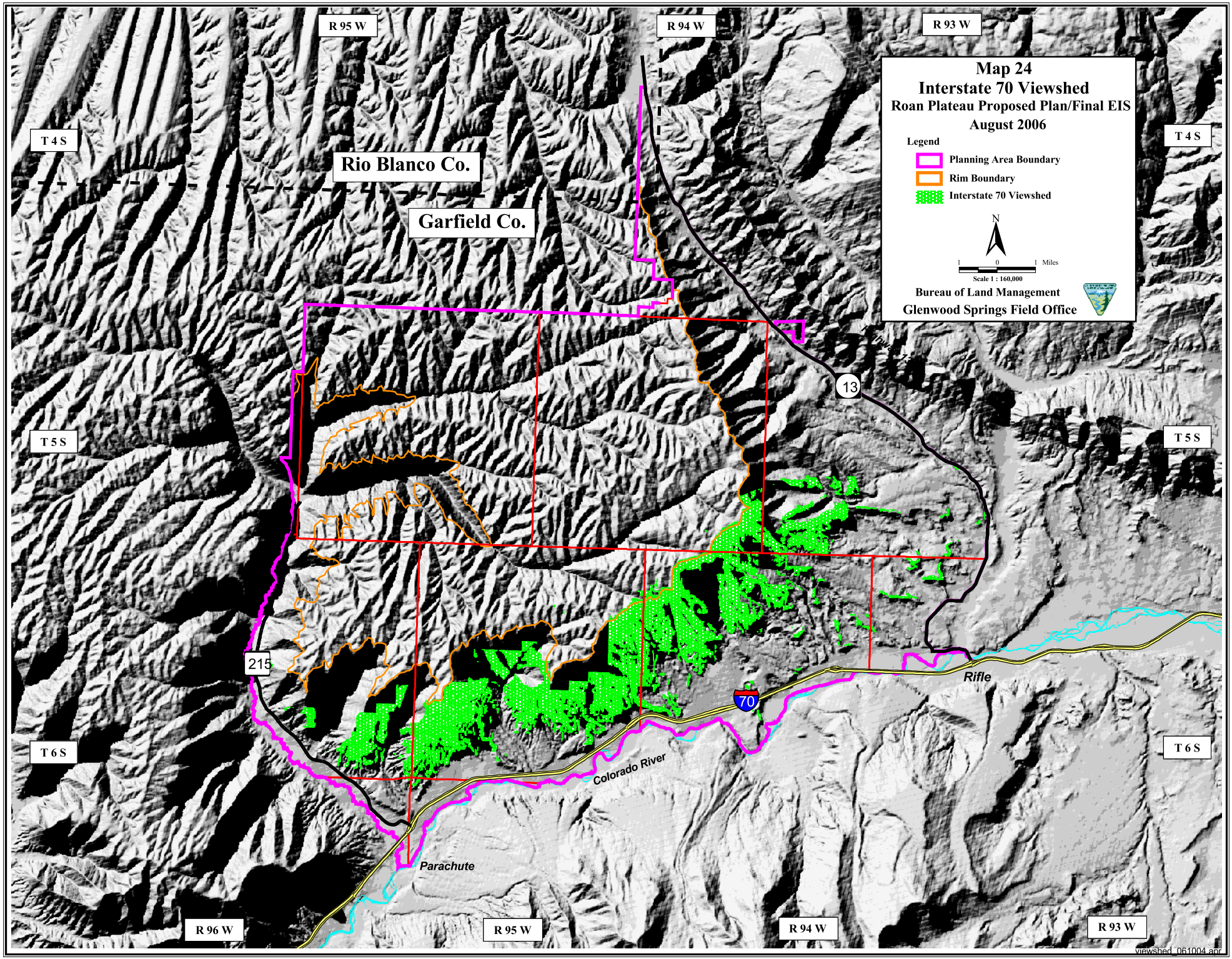
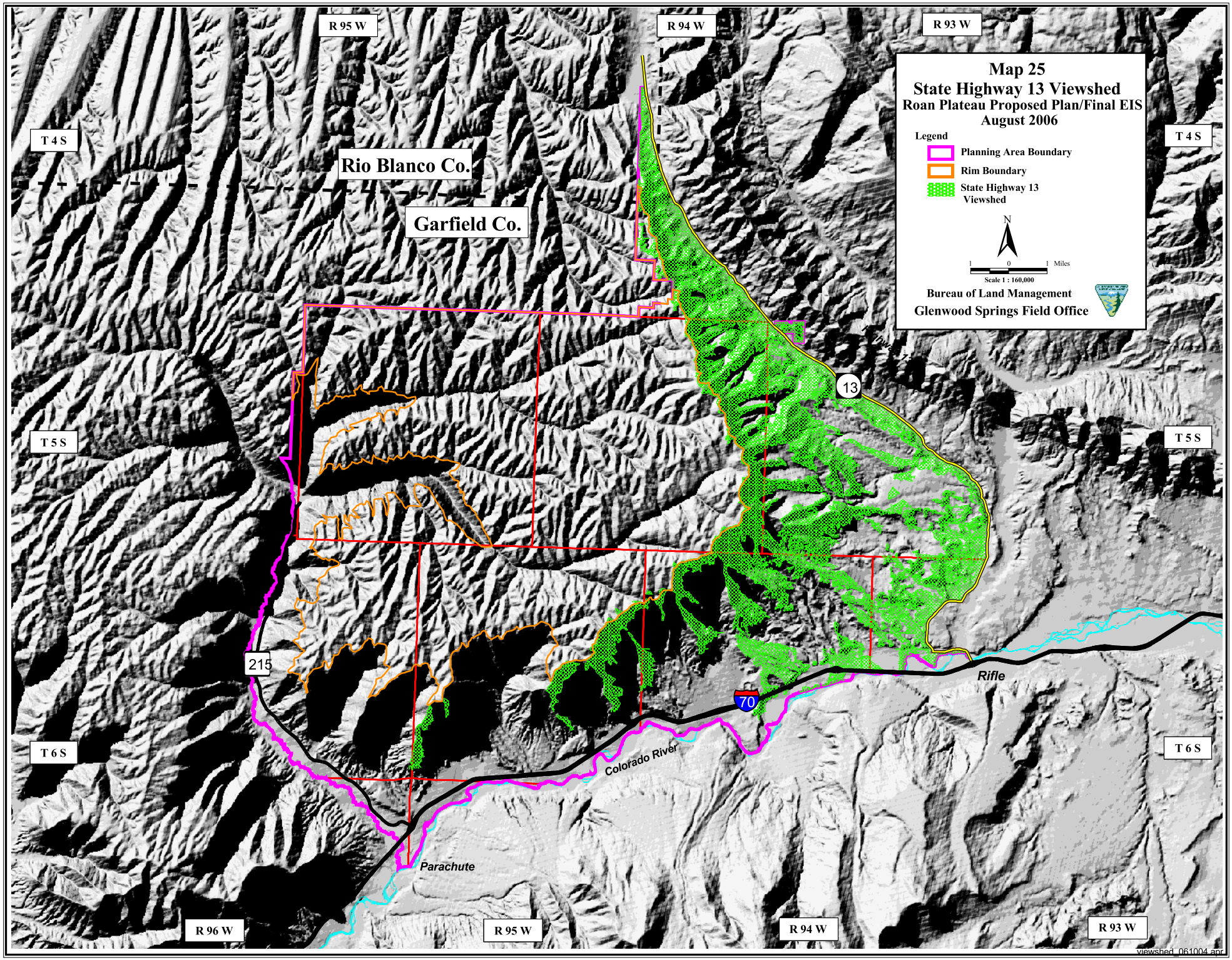
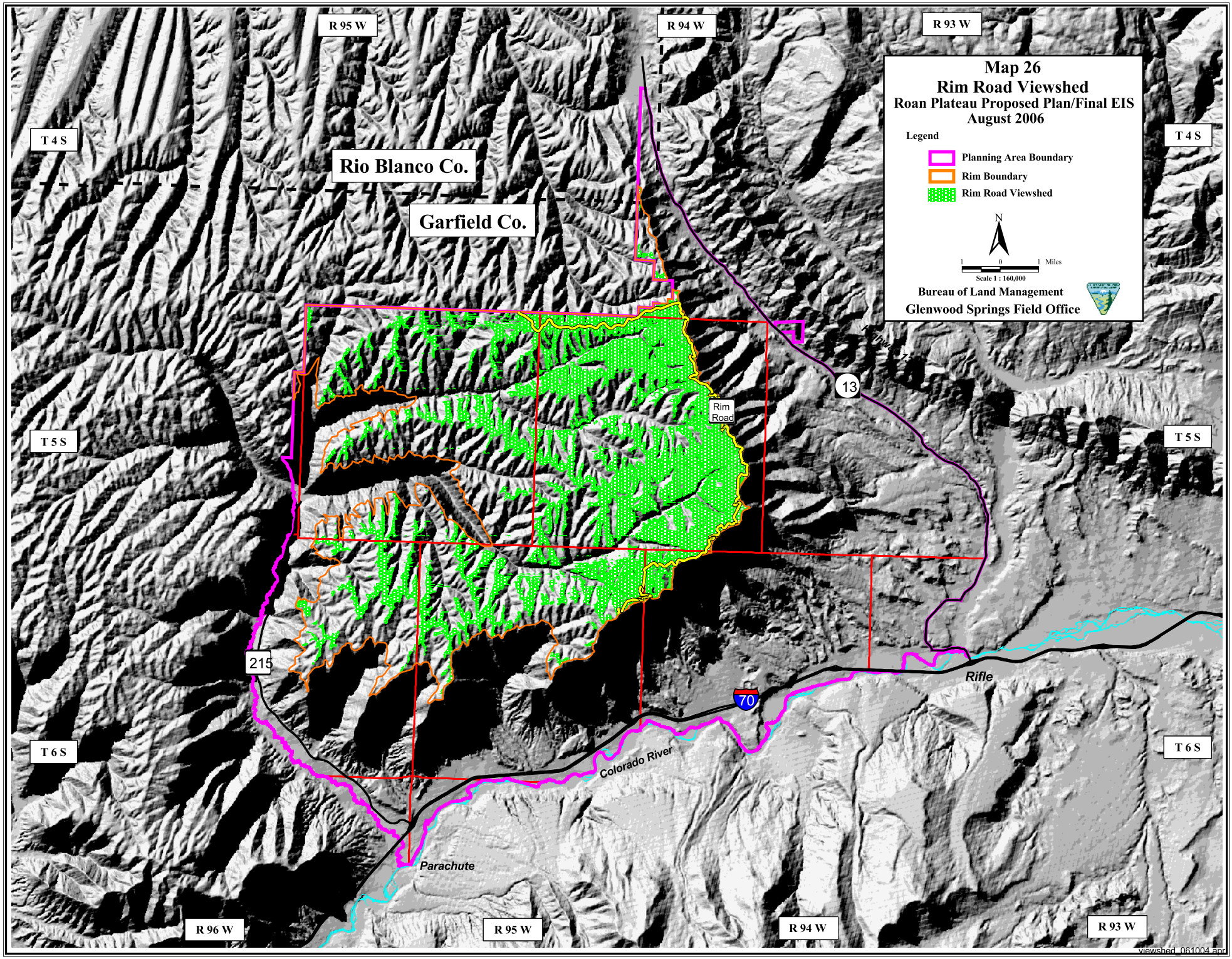
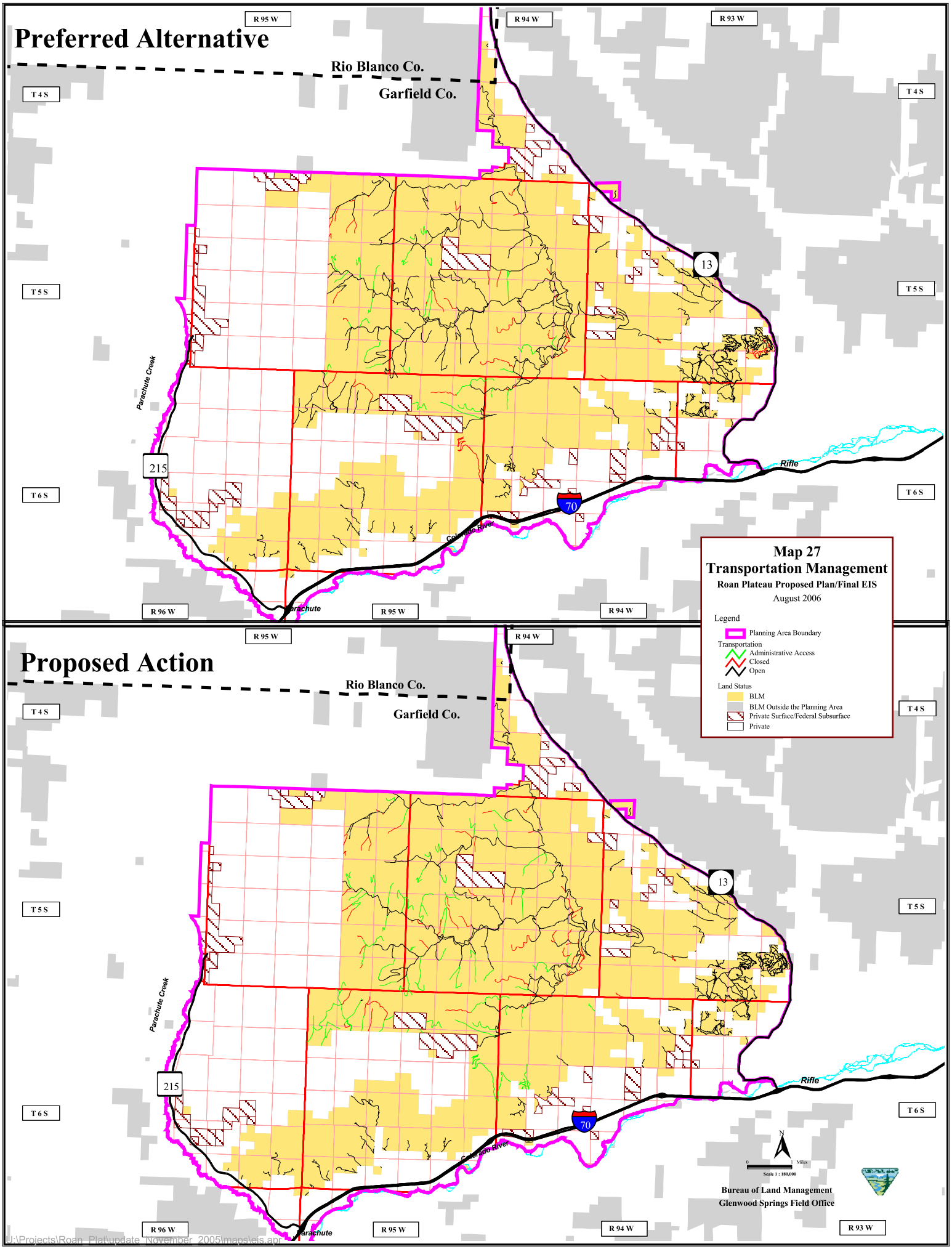

Map 24
Interstate 70 Viewshed
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Planning Area Boundary
Rim Boundary
Interstate 70 Viewshed
N
1 0 1 Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
R 95 W
R 94 W
R 93 W
T 4 S
T 5 S
T 6 S
Rio Blanco Co.
Garfield Co.
13
215
70
Rifle
Colorado River
Parachute
R 96 W
R 95 W
R 94 W
R 93 W
viewshed_061004.apr


Map 25
State Highway 13 Viewshed
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Planning Area Boundary
Rim Boundary
State Highway 13 Viewshed
N
1 0 1 Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
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
Rifle
Colorado River
Parachute
viewshed_061004.apr


Map 26
Rim Road Viewshed
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Planning Area Boundary
Rim Boundary
Rim Road Viewshed
N
1 0 1 Miles
Scale 1 : 160,000
Bureau of Land Management
Glenwood Springs Field Office
R 95 W
R 94 W
R 93 W
T 4 S
T 5 S
T 6 S
Rio Blanco Co.
Garfield Co.
Rim Road
13
215
70
Rifle
Colorado River
Parachute
R 96 W
R 95 W
R 94 W
R 93 W
viewshed_061004.apr

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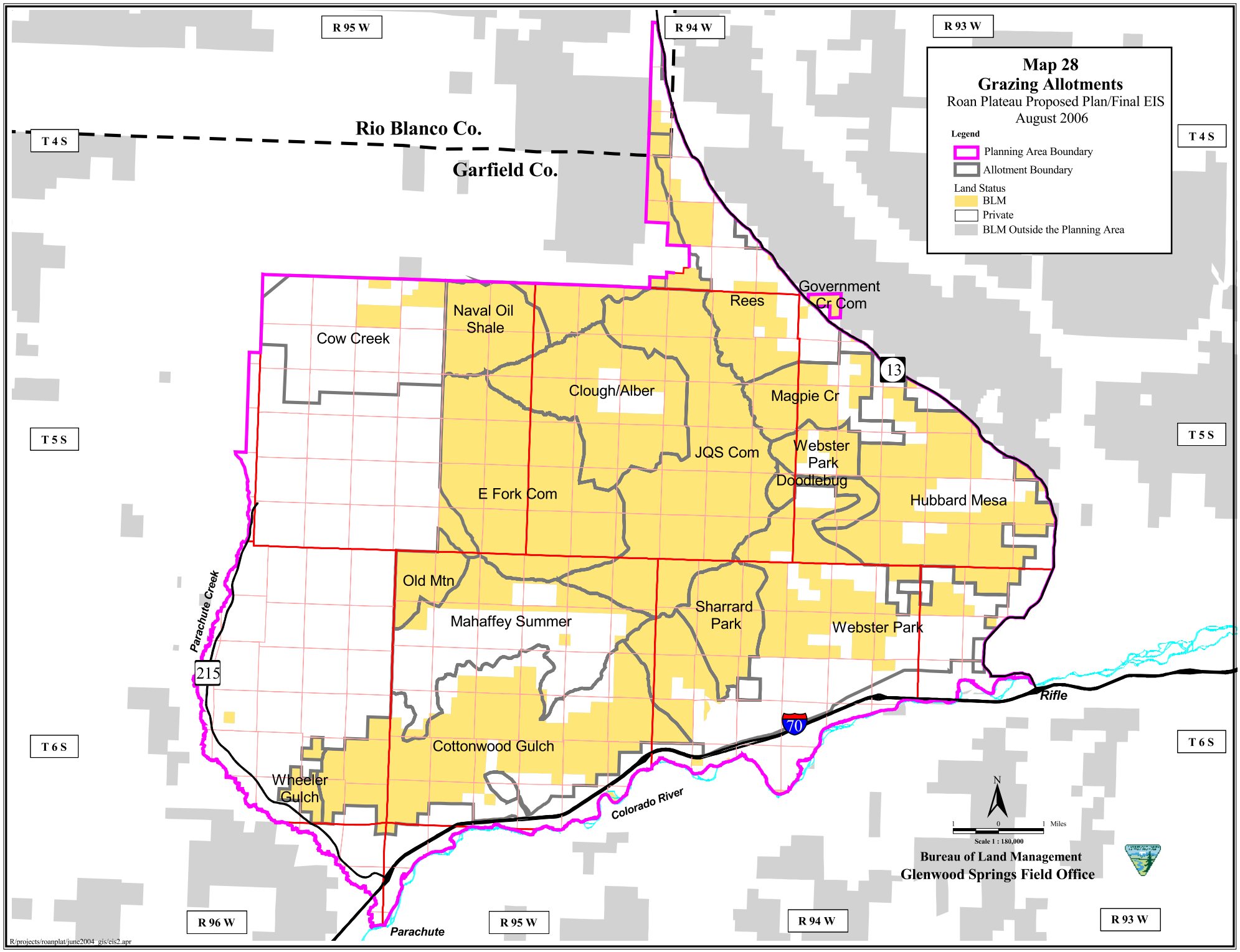
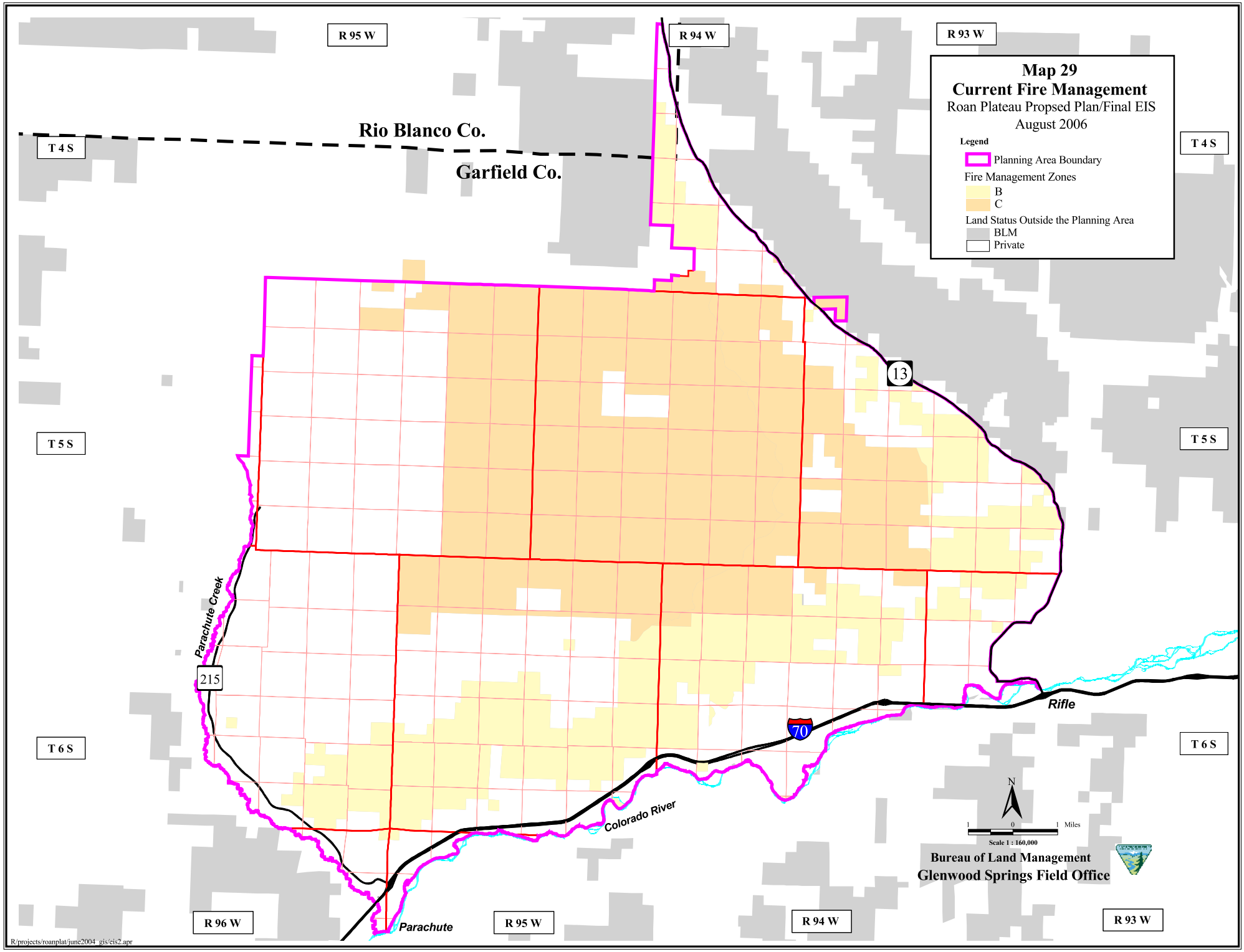

Map 28
Grazing Allotments
Roan Plateau Proposed Plan/Final EIS
August 2006
Legend
Planning Area Boundary
Allotment Boundary
Land Status
BLM
Private
BLM Outside the Planning Area
R 95 W
R 94 W
R 93 W
R 96 W
T 4 S
T 5 S
T 6 S
Rio Blanco Co.
Garfield Co.
Cow Creek
Naval Oil Shale
Rees
Government Cr Com
Clough/Alber
Magpie Cr
JQS Com
Webster Park
Doodlebug
E Fork Com
Hubbard Mesa
Old Mtn
Mahaffey Summer
Sharrard Park
Webster Park
Cottonwood Gulch
Wheeler Gulch
13
215
70
Parachute Creek
Colorado River
Rifle
Parachute
N
1 0 1 Miles
Scale 1 : 180,000
Bureau of Land Management
Glenwood Springs Field Office
R/projects/roanplat/june2004 gis/eis2.apr


Map 29
Current Fire Management
Roan Plateau Propsed Plan/Final EIS
August 2006
Legend
Planning Area Boundary
Fire Management Zones
B
C
Land Status Outside the Planning Area
BLM
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
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/eis2.apr

# APPENDIX B - M

# Appendix B

Information Related to Oil and Gas Leasing, Permitting, and Development

Description of Typical Oil and Gas Operations

Sample Oil and Gas Lease

# Appendix B

## 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. There are three laws which give the BLM its primary direction for oil and gas operations: the Mineral Leasing Act of 1920 (MLA) as amended, the National Environmental Policy Act of 1969 (NEPA), 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, 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.

Since leasing for oil and gas under MLA, impact analysis under NEPA, and management under FLPMA apply to the same lands during the leasing process, 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. The lease grants that a lessee has the right to use so 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 get 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 and 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 used; 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 industry and the public the conditions under which exceptions, modifications, or waivers of lease stipulations may be granted. It also should identify the documentation requirements for supporting an exception, modification, or waiver and any public notification associated with granting them. 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 the auction are available for non-competitive sale for a two-year period thereafter. Management decisions are incorporated in 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 the 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 and County of origin for their use. The other half goes into the Federal treasury earmarked for reclamation projects and other agencies.

**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 that are 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 have 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 it is decided 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 Resource Area 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 in the proposed APD. If the APD does not have the appropriate information and mitigation incorporated, the application may be modified or rejected. In most APDs in Colorado, the few RMP decisions not incorporated by the operator are attached to the approved application by the BLM as COAs.

Onshore Oil and Gas Order No. 1 requires a field 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 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 a written documentation of the environmental review for an APD and the development of mitigation (COAs). 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 if the public land is available for leasing and 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 from what was analyzed in a Field Development EA, a third layer 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 in 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.

Once the resource specialists have accumulated all of the information about the proposed well operation, they need to determine how it will be used to protect the environment. 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 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 form 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, any COAs that were suggested 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 a one-year, if so requested. However, this is not required by regulation.

Within 24-hours after the operator starts the actual drilling of the well, they must notify the BLM jurisdictional office. This is culled 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 and utilized for running casing identification logs, perforating and for 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 of royalties and compliance with the lease and permit safety and environmental requirements. Usually, the last evolution in the life of an oil or gas well is when it is depleted and cannot produce in paying quantities any longer. At this stage, the operator submits a plug and abandonment plan and it is reviewed, and if necessary, modified by the BLM petroleum engineer and approved. When the downhole plugging is completed, the operator submits a Subsequent Report of Abandonment which is review by the BLM. When surface reclamation is completed and the vegetation has had a chance to establish itself, 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 if 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 RPA will 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 RPA will result in 1.5 acres of surface disturbance and has an average length of 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 a plastic liner 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 Region 4 typically reuse water from their drilling mud in order to reduce their 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 RPA will take 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. This 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 Region 4 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 on-site 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 RPA, flowlines will primarily be built along the existing access road to minimize surface disturbance. Water and condensate are stored in on-site tanks and are removed by truck periodically. 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 will be partially reclaimed following well completion, based on a BLM-approved reclamation plan. This will include reclamation on that portion of disturbed areas that are not considered necessary during well production. Abandoned well locations will be completely 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 has 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 properly 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 Action

# Appendix C

## Resource Management Decision Stipulations for New Oil and Gas Leases and Other Lands Uses and Management Actions for the Proposed Plan

### 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 terms (see 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 a Condition of Approval (COA) during the permit process for oil and gas development.

If BLM deems it necessary to place additional restrictions on the rights of lessees in order to protect environmental resources, stipulations are appended to the lease. Stipulations clarify BLM's intent to protect known resources or resource values. Stipulations that would be applied to new oil and gas leases under the Proposed Plan are listed and described in Table C-1, below. Areas included within the various stipulations under the Proposed Plan, as well previously analyzed Alternatives I through V are shown on Maps 2, 4, 6, 8, 10, and 12 respectively, of Appendix A to this RMPA/EIS. The location and areas of specific stipulations are shown in Figures C-1 through C-29, below.

In prior planning efforts, BLM has explicitly stated the criteria for which exceptions, modifications, or waivers to a specific stipulation would apply. BLM no longer plans for exception to stipulations. Instead the conditions under which each stipulations would apply, and standards that must be met for their application, are explicitly stated (Table C-1). Exceptions may still be applied should unforeseen circumstances arise or new information become available. Likewise, these standards may be modified, as necessary, to provide the protections to resources for which they were intended. A waiver may still be applied, but only after following the rigorous testing process described below. The terms included in this discussion are defined in greater detail in the following:

- **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. BLM may grant an exception to the seasonal restriction (Timing Limitation) for all or part 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 (CSU) 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 of 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.

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 BLM has approval responsibility, and not only to oil and gas development. Restrictions on these other lands uses or management activities would be 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 the Proposed Plan, TLs 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 while new stipulations under the Proposed Plan 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 as a COA during the permitting process).

  Throughout the text of the Proposed Plan/Final 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 the Proposed Plan/Final EIS, new stipulations are designated as to which type they are (NSO, CSU, or TL) and described by the specific resource to which they apply.

| Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases Under the Proposed Plan [1] | |
|---|---|
| **Stipulation** | |
| NSO<br>Steep Slopes (>50%) | **Goal:** Protect soil stability and reduce the impacts of erosion.<br><br>**Objective:** Maintain soil stability and productivity and minimize impacts of soil erosion on other resources.<br><br>**Management Actions:**<br>No ground-disturbing activities on slopes steeper than 50%.<br>**Standards:**<br>▪ No ground-disturbing activities will be granted in areas of steep slopes that also are designated as wildlife movement corridors.<br>▪ Ground-disturbing activities in areas with slopes steeper than 50% will not be granted for access to areas with slopes less than 50%.<br>▪ Steep slopes ( >50%) – 16,550 acres |
| NSO<br>Threatened, endangered, or candidate species habitat | **Goal:** Provide for maintenance or recovery of species listed as threatened or endangered.<br><br>**Objective:** Protect occupied and immediately adjacent potential habitat crucial for the maintenance or recovery of species listed under the Endangered Species Act or by the State of Colorado as threatened or endangered (including proposed or candidate species under the ESA).<br><br>**Management Actions:**<br>No ground-disturbing activities within occupied habitat or immediately adjacent potential habitat necessary for maintenance or recovery of the species.<br>**Standards:**<br>▪ A ground-disturbing activity may be permitted if BLM determines, following Section 7 consultation with USFWS or with CDOW for State-listed species, that the requested activity would not impair values associated with maintenance or recovery of the species. In making this determination, BLM will consider the following resource factors: behavioral and ecological requirements of the species; the type, amount, and duration of the surface disturbance; the relative extent of available habitat; the relationship to topography and vegetation screening; current baseline data; the type, location, duration, and intensity of potential adverse effects; mitigation and conservation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect maintenance or recovery of the species or cause habitat to become unusable. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent |

[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 Under the Proposed Plan [1] | |
|---|---|
| **Stipulation** | |
| | of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified, and corrective measures as approved by BLM will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ If a species affected by this stipulation is removed from the Federal list, this stipulation would not apply to that species. However, other requirements will apply if the species remains classified as sensitive, or is otherwise protected.<br>▪ Habitat currently mapped as occupied or immediately adjacent potential – 195 acres |
| NSO<br>Raptor nest sites | **Goal:** Protect raptor nesting sites not otherwise protected.<br>**Objective:** Protect nesting of raptors not protected by the Endangered Species Act or other species-specific stipulation.<br>**Management Action:**<br>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).<br>**Standards:**<br>▪ Ground-disturbing activity may be permitted if BLM determines, following consultation with CDOW, that (a) 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; and (b) no practicable alternative is available. In making this determination, BLM will consider the behavioral and ecological requirements of the species; the type, amount, intensity, and duration of the surface disturbance; the relative extent of available habitat; the effects on both individuals of the species and supporting habitat; the relationship to topography and vegetation screening; current baseline data; the type, location, intensity, and duration of potential adverse effects; mitigation measures proposed to avoid, minimize, or offset the adverse effects; and other factors that may affect the species, or cause habitat to become unusable. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted |

[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 Under the Proposed Plan [1] | |
|---|---|
| **Stipulation** | |
| | scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Current raptor nest sites – 716 acres |
| NSO<br>Bald eagle nest or winter roost sites | **Goal:** Protect bald eagle nest or winter roost sites.<br>**Objective:** Protect nesting or winter roosting of this Federally listed threatened species.<br>**Management Actions:**<br>No ground-disturbing activities within 0.25 mile of designated bald eagle nesting or roosting habitat.<br>**Standards:**<br>▪ A ground-disturbing activity may be permitted if BLM determines, following Section 7 consultation with USFWS, that the requested activity would not impair values associated with maintenance or recovery of the species. In making this determination, BLM will consider the following resource factors: status of the nest or roost (active or inactive); behavioral and ecological requirements of the species; the type, amount, and duration of the surface disturbance; the relative extent of available habitat; the relationship to topography and vegetation screening; current baseline data; the type, location, duration, and intensity of potential adverse effects; mitigation and conservation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect maintenance or recovery of the species or cause habitat to become unusable. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that (a) documents anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified, and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Current bald eagle nest or winter roost sites – 32 acres |

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| Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases Under the Proposed Plan [1] | |
|---|---|
| **Stipulation** | |
| NSO<br>Wildlife security areas below the rim | **Goal:** Provide protection for wildlife security areas below the rim.<br><br>**Objective:** Protect important wildlife security areas, especially those for deer and elk.<br><br>**Management Actions:**<br>No ground-disturbing activities in areas that provide high-value habitats along and below the base of the Roan Cliffs.<br>**Standards:**<br>▪ A ground-disturbing activity may be permitted if BLM determines, following consultation with CDOW, that the requested activity would not impair values associated with maintenance of the species of interest. In making this determination, BLM will consider the following resource factors: behavioral and ecological requirements of the species; the type, amount, and duration of the surface disturbance; the relative extent of available habitat; the relationship to topography and vegetation screening; current baseline data; the type, location, duration, and intensity of potential adverse effects; mitigation and conservation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect maintenance or recovery of the species or cause habitat to become unusable. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; in such cases approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that (a) documents anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Wildlife security areas below the rim – 11,481 acres |
| NSO<br>High value special status fish species habitat | **Goal:** Protect Colorado River cutthroat trout from disturbing impacts.<br><br>**Objective:** Protect Colorado River cutthroat trout from direct and indirect impacts in high value habitat. |

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| Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases Under the Proposed Plan [1] | |
|---|---|
| **Stipulation** | |
| | **Management Actions:**<br>No ground-disturbing activities that would result in loss or degradation of areas designated as high value habitat for Colorado River cutthroat trout.<br>**Standards:**<br>▪ Prior to implementing any ground-disturbing activity or other project component in the area covered by this stipulation, the proponent will provide an assessment of potential impacts if any, to this resource value. The assessment will be based on current baseline data; the type, location, duration, and intensity of potential adverse effects; and mitigation measures proposed to avoid, minimize, or offset the adverse effects.<br>▪ A ground-disturbing activity may be permitted if BLM determines, following consultation with CDOW, that the requested activity would not impair values associated with maintenance of the species of interest. In making this determination, BLM will consider the following resource factors: 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, behavioral and ecological requirements of the species; the type, amount, and duration of the surface disturbance; the relative extent of available habitat; the relationship to topography and vegetation screening; current baseline data; the type, location, duration, and intensity of potential adverse effects; mitigation and conservation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect maintenance or recovery of the species of interest or cause habitat to become unusable. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; in such cases, approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ High value special status fish species habitat – 13,521 acres |
| NSO<br>Riparian and wetland habitat | **Goal:** Protect riparian and wetland habitat from ground-disturbing activities.<br>**Objective:** 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 |

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| Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases Under the Proposed Plan [1] | |
|---|---|
| **Stipulation** | |
| | recreation values.<br>**Management Actions:**<br>Ground-disturbing activities, including oil and gas facilities, roads, pipelines, electric transmission lines, communication facilities, and other sources of surface disturbance are limited to areas beyond the outer edge of riparian or wetland vegetation.<br>**Standards**:<br>▪ A ground-disturbing activity may be permitted if BLM determines that: (a) the activity will cause no loss of riparian vegetation or, if riparian vegetation 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 existing or similar species, including use of containerized 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 practicable alternative is available. Resource factors include topography and vegetation screening; current baseline data; the type, location, duration, and intensity of potential adverse effects; mitigation and conservation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect maintenance or enhancement of the resource values. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; in such instances approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that (a) documents anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Riparian and wetland habitat – 232 acres |
| NSO<br>I-70 Viewshed<br>(VRM Class II) | **Goal:** Protect view shed areas with high visual sensitivity.<br>**Objective:** Protect areas with high visual sensitivity within 5 miles of I-70.<br>**Management Actions:**<br>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 |

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| Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases Under the Proposed Plan [1] | |
|---|---|
| **Stipulation** | |
| | be easily noticed by the casual observer on I-70.<br>**Standards**:<br>▪ A ground-disturbing activity may be permitted if BLM determines that the requested activity would not impair values associated with VRM Class II objectives or degrade the visual characteristics of the viewshed below Class II standards. In making this determination, BLM will consider the following resource factors: retention of the overall landscape character on both a site-specific and cumulative basis including line, form, color, and texture; the extent to which the activity blends with characteristics of the natural landscape; the type, amount, and duration of the surface disturbance; the relative extent of viewshed characteristics and current conditions; the relationship to topography and vegetation screening; the type, location, duration, and intensity of potential adverse effects including line, form, color, and texture; mitigation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect the visual and aesthetic quality. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified, and corrective measures as approved by BLM will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ I-70 Viewshed (VRM Class II) – 10,937 acres |
| NSO<br>East Fork Falls Viewshed<br>(VRM Class I) | **Goal:** Protect East Fork Falls view shed from landscape modification.<br>**Objective:** 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)<br>**Management Actions:**<br>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.<br>**Standards**:<br>▪ A ground-disturbing activity may be permitted if BLM determines that the requested activity would not impair values associated with VRM Class I objectives or degrade the visual characteristics of the viewshed below Class I standards. In making this determination, |

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|---|---|
| **Stipulation** | |
| | BLM will consider the following resource factors: retention of the overall landscape character on both a site-specific and cumulative basis including line, form, color, and texture; the extent to which the activity blends with characteristics of the natural landscape; the type, amount, and duration of the surface disturbance; the relative extent of viewshed characteristics and current conditions; the relationship to topography and vegetation screening; the type, location, duration, and intensity of potential adverse effects including line, form, color, and texture; mitigation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect the visual and aesthetic quality. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified, and corrective measures as approved by BLM will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ East Fork Falls Viewshed (VRM Class I) – 1,615 acres |

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| Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases Under the Proposed Plan [1] | |
|---|---|
| **Stipulation** | |
| NSO<br>Anvil Points Claystone Cave | **Goal:** Protect scientific values in the Anvil Points Claystone Cave.<br><br>**Objective:** Protect the scientific and wildlife values of these caves.<br><br>**Management Actions:**<br>No ground-disturbing activities in the area encompassing the cave opening, subsurface features, and watersheds overlying the caves.<br>**Standards:**<br>▪ Prior to implementing any ground-disturbing activity or other project component in the area covered by this stipulation, the proponent will provide an assessment of potential impacts to this resource value. The assessment will be based on current baseline data; the type, location, duration, and intensity of potential adverse effects; and mitigation measures proposed to avoid, minimize, or offset the adverse effects.<br>▪ A ground-disturbing activity may be permitted if BLM determines that a proposed activity would not impair the cave values, supported by a demonstration of such based on monitoring data or other method with a high degree of scientific reliability, and considering the type, amount, duration, and timing of the activity; and after consultation with CDOW regarding wildlife habitat values.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Anvil Points Claystone Cave – 118 acres |
| NSO<br>Colorado River Corridor | **Goal:** Prevent ground-disturbing activities within the Colorado River Corridor.<br><br>**Objective:** Protect high-quality habitats and wildlife areas, water quality-benefits, and scenic qualities along the Colorado River.<br><br>**Management Actions:**<br>No ground-disturbing activities within 0.5 mile of high water mark on either side of river. |

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| Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases Under the Proposed Plan [1] | |
|---|---|
| **Stipulation** | |
| | **Standards:**<br>▪ A specific activity would be allowed if 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.<br>▪ Colorado River Corridor – 111 acres |
| CSU<br>Habitat for special status plant species populations and significant plant communities | **Goal:** Protect habitat for special status plant species and significant plant communities.<br>**Objective:** Protect and maintain the habitat and ecological processes that support special status plants and significant plant communities.<br>**Management Actions:**<br>BLM may require special design, construction, operation, mitigation, or reclamation measures, and/or relocation by more than 200 meters for any ground-disturbing activities, electric transmission lines, and other sources of disturbance within a watershed that would disturb, alter, or interrupt the hydrologic or ecological processes that support special status plant species or significant plant communities.<br>**Standards:**<br>▪ Site specific locations for ground-disturbing activities may be allowed within the CSU only if BLM determines that (a) the specific activity or requested change would not impair species health and ecological function of associated habitat. In making this determination, BLM will consider the status of the population; ecological requirements of the species; the type, amount, intensity, and duration of the surface disturbance; the relative extent of the population or community; the effects on both individuals of the species and populations; the relationship to topography and other vegetation; current baseline data; the type, location, intensity, and duration of potential adverse effects; mitigation measures proposed to avoid, minimize, or offset the adverse effects; and other factors that may affect the species or community. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and |

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|---|---|
| **Stipulation** | |
| | associated mitigation measures to be applied to future proposed activities.<br>▪ Habitat for special status plant species populations and significant plant communities – 12,656 acres |
| CSU<br>Riparian and wetland habitat | **Goal:** Protect and maintain riparian and wetland habitat.<br><br>**Objective:** 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.<br><br>**Management Actions:**<br>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.<br>**Standards:**<br>▪ BLM will consider the following resource factors: proper hydrological and ecological functioning; protection of habitat supporting the fish and wildlife resources; ecological requirements to maintain the riparian area; the type, amount, and duration of the surface disturbance; the relative extent and condition of the riparian area; the relationship to topography and surrounding vegetation; current baseline data; the type, location, duration, and intensity of potential adverse effects; mitigation and conservation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect maintenance or condition of the riparian area. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified, and corrective measures as approved by BLM will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Riparian and wetland habitat – 11,507 acres |

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|---|---|
| **Stipulation** | |
| CSU<br>Peregrine falcon cliff nesting complex | **Goal:** Protect peregrine falcon cliff nesting complex.<br><br>**Objective:** Protect nesting of this State-listed threatened species.<br><br>**Management Actions:**<br>Ground-disturbing activities may be relocated outside of the cliff-nesting complex along the Roan Cliffs.<br>**Standards:**<br>▪ Site specific locations for ground-disturbing activities may be allowed within the CSU only if, following consultation with CDOW, BLM determines that (a) the specific activity or requested change would not impair behaviors, habitat use and quality, and reproductive success of Peregrine falcon present within the area. In making this determination, BLM will consider the status of the nest (active or inactive); behavioral and ecological requirements of the species; the type, amount, intensity, and duration of the surface disturbance; the relative extent of available habitat; the effects on both individuals of the species and supporting habitat; the relationship to topography and vegetation screening; current baseline data; the type, location, intensity, and duration of potential adverse effects; mitigation measures proposed to avoid, minimize, or offset the adverse effects; and other factors that may affect the species, or cause habitat to become unusable. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Peregrine falcon cliff nesting complex – 367 acres |
| CSU<br>Wildlife security areas above the rim | **Goal:** Protect wildlife security areas above the rim.<br><br>**Objective:** Protect important security for wildlife, especially deer and elk. |

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|---|---|
| **Stipulation** | |
| | **Management Actions:**<br>Ground-disturbing activities may be relocated more than 200 meters to avoid wildlife security areas above the rim.<br>**Standards:**<br>▪ Specific locations for ground-disturbing activity may be permitted if BLM determines, following consultation with CDOW, that the requested activity would not impair values associated with maintenance of the species of interest. In making this determination, BLM will consider the following resource factors: behavioral and ecological requirements of the species; the type, amount, and duration of the surface disturbance; the relative extent of available habitat; the relationship to topography and vegetation screening; current baseline data; the type, location, duration, and intensity of potential adverse effects; mitigation and conservation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect maintenance or recovery of the species or cause habitat to become unusable. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; in such cases approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that (a) documents anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Wildlife security areas above the rim – 11,404 acres |
| CSU<br>Big game migration corridors | **Goal:** Protect critical habitat for continuation of big game herds<br>**Objective:** Protect contiguity and extent of big game migration corridors.<br>**Management Actions:**<br>Ground-disturbing activities may be relocated more than 200 meters to avoid big game migration corridors.<br>**Standards:**<br>▪ A site specific ground-disturbing activity may be permitted if BLM determines, following consultation with CDOW, that the requested activity would not impair values associated with big game migration corridors. In making this determination, BLM will consider the following resource factors: behavioral and ecological requirements of big game species; the type, amount, and duration of the surface |

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|---|---|
| **Stipulation** | |
| | disturbance; the relative extent of available habitat; the relationship to topography and vegetation screening; current baseline data; the type, location, duration, and intensity of potential adverse effects; mitigation and conservation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect maintenance or recovery of the species or cause habitat to become unusable. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; in such cases approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that (a) documents anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Big game migration corridors – 511 acres |
| CSU<br>Sensitive bat species habitat | **Goal:** Protect sensitive bat species and habitat.<br>**Objective:** Protect and preserve bat habitat values of the Anvil Points Claystone Cave.<br>**Management Actions:**<br>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.<br>**Standards:**<br>▪ A site specific ground-disturbing activity may be permitted if BLM determines, following consultation with CDOW, that the requested activity would not impair values associated with sensitive bat species habitat. In making this determination, BLM will consider the following resource factors: behavioral and ecological requirements of the bat species; the type, amount, and duration of the surface disturbance; the relative extent of available habitat; the relationship to topography and vegetation screening; current baseline data; the type, location, duration, and intensity of potential adverse effects; mitigation and conservation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect maintenance or recovery of the species or cause habitat to become unusable. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; in such cases approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that (a) documents anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors. |

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| **Stipulation** | |
| | ▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Sensitive bat species habitat – 118 acres |
| CSU<br>Wild and Scenic River Eligibility | **Goal:** Protect stream segments from ground-disturbing activities.<br>**Objective:** Protect stream segments eligible for a suitability study under the Wild and Scenic Rivers Act (WSRA).<br>**Management Actions:**<br>No ground-disturbing activities would be allowed within 0.25 mile of any stream segment(s) determined to meet criteria for eligibility for designation as a Wild and Scenic River. These include a total of 64 stream miles in portions of the East Fork Parachute Creek and Trapper/Northwater Creek drainages.<br>**Standards:**<br>▪ Specific locations for ground-disturbing activity may be permitted if BLM determines that the requested activity would not impair values associated with WSRA designation. In making this determination, BLM will consider the following resource factors: type and location of outstandingly remarkable values (ORVs); the type, amount, and duration of the surface disturbance; the relative extent of ORVs; the relationship to topography and vegetation screening; current baseline data; the type, location, duration, and intensity of potential adverse effects; mitigation and conservation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect ORVs, or which may affect the outcome of a suitability study. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; in such cases approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that (a) documents anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ Wild and Scenic River Eligibility – 7,883 acres |

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| Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases Under the Proposed Plan [1] | |
|---|---|
| **Stipulation** | |
| CSU<br>Erosive Soils and Slopes<br>(> 30%) | **Goal:** Minimize impacts of soil erosion on other resources.<br><br>**Objective:** Maintain soil stability and productivity and minimize impacts of soil erosion on other resources. Highly erosive soils are those in the "severe" and "very severe" erosion classes based on Natural Resources Conservation Service (NRCS) mapping.<br><br>**Management Actions:**<br>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%.<br>**Standards:**<br>▪ A site specific ground-disturbing activity may be permitted if BLM determines impair values associated with soil stability and productivity. In making this determination, BLM will consider the following resource factors: soil stability and productivity; minimization of soil erosion; site-specific conditions; the type, amount, and duration of the surface disturbance; the relationship to topography and vegetative cover; current baseline data; the type, location, duration, and intensity of potential adverse effects; mitigation and conservation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect soil stability. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; in such cases approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that (a) documents anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Erosive soils and slopes (> 30%) – 10,951 acres |
| CSU<br>VRM Class II areas below the rim | **Goal:** Protect the character of the landscape.<br><br>**Objective:** Preserve the existing character of the landscape to meet VRM Class II objectives in all areas designated at this class. |

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|---|---|
| **Stipulation** | |
| | **Management Actions:**<br>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.<br>**Standards:**<br>▪ Site specific ground-disturbing activity may be permitted if BLM determines that the requested activity would not impair values associated with VRM Class II objectives or degrade the visual characteristics of the portion of the viewshed below Class II standards. In making this determination, BLM will consider the following resource factors: retention of the overall landscape character on both a site-specific and cumulative basis including line, form, color, and texture; the extent to which the activity blends with characteristics of the natural landscape; the type, amount, and duration of the surface disturbance; the relative extent of viewshed characteristics and current conditions; the relationship to topography and vegetation screening; the type, location, duration, and intensity of potential adverse effects including line, form, color, and texture; mitigation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect the visual and aesthetic quality. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified, and corrective measures as approved by BLM will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ VRM Class II areas below the rim – 30,224 acres |
| CSU<br>VRM Class III areas above the rim | **Goal:** Protect the character of the landscape.<br>**Objective:** Preserve the existing character of the landscape to meet VRM Class III objectives in all areas designated at this class above the rim.<br>**Management Actions:**<br>BLM may require special design, construction, operation, mitigation, or reclamation measures, or relocation by more than 200 meters. |

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|---|---|
| **Stipulation** | |
| | **Standards:**<br>▪ Site specific ground-disturbing activity may be permitted if BLM determines that the requested activity would not impair values associated with VRM Class III objectives or degrade the visual characteristics of the viewshed below Class III standards. In making this determination, BLM will consider the following resource factors: partial retention of the overall landscape character on both a site-specific and cumulative basis including line, form, color, and texture; the extent to which the activity blends with characteristics of the natural landscape; the type, amount, and duration of the surface disturbance; the relative extent of viewshed characteristics and current conditions; the relationship to topography and vegetation screening; the type, location, duration, and intensity of potential adverse effects including line, form, color, and texture; mitigation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect the visual and aesthetic quality. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified, and corrective measures as approved by BLM will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ VRM Class III areas on top of plateau – 32,890 acres |
| CSU<br>Sharrard Park paleontological resources | **Goal:** Protect and preserve Sharrard Park paleontological resources.<br>**Objective:** Protect, preserve, or recover the scientifically significant fossil resources in this area.<br>**Management Actions:**<br>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 include requirements that (a) onsite personnel are informed of the potential for fossils, (b) notify BLM if any fossils are found, and (c) do not disturb fossils in any way. |

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|---|---|
| **Stipulation** | |
| | **Standards:**<br>▪ Site specific ground-disturbing activity may be permitted if BLM determines that the requested activity would not impair values associated with paleontological resources. In making this determination, BLM will consider the following resource factors: protection of paleontological resources; preservation of paleontological resources, recovery of paleontological resources; the type, amount, and duration of the surface disturbance; the relative extent of paleontological resources and current conditions; the relationship to naturally occurring protections or risks to the paleontological resource; topography; type, location, duration, and intensity of potential adverse effects; mitigation measures to avoid, minimize, or offset any adverse effects; and other factors that may affect the paleontological resource. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified, and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Sharrard Park paleontological resources – 750 acres |
| CSU<br>Parachute Creek high value watershed and Watershed Management Area (WMA) | **Goal:** Ensure protection of overall hydrologic function, ecosystem stability, functionality of wildlife habitat and botanical habitats, and enhancement of fisheries habitat; while making lands available for oil and gas leasing in an environmentally sound manner, under multiple use management.<br><br>**Objective:** Provide resource protections through actions that minimize disturbance, habitat fragmentation, and protect key habitats from disturbance; while providing for oil and gas leasing accordance with the Mineral Leasing Act (MLA) and the Federal Onshore Oil and Gas Leasing Reform Act (FOOGLRA) of 1987 (Reform Act) and applicable regulations under 43 CFR 3100 and in accordance with the decisions made through application of the Federal Land Policy and Management Act (FLPMA) and other laws applicable to public lands.<br><br>**Management Actions:**<br><br>Condition the development of oil and gas through sequencing and clustering of development, consolidation of disturbance and facilities, limiting the amount of unreclaimed disturbance, and limiting development and associated disturbance to the less environmentally sensitive ridge tops. |

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| Appendix Table C-1. Descriptions of Surface-Use Stipulations Applicable to New Oil and Gas Leases Under the Proposed Plan [1] | |
|---|---|
| **Stipulation** | |
| | **Standards:**<br>• Prior to exploration and/or lease development within the planning area, the operator must submit a Geographic Area Proposal (GAP) identifying projected activity (including well locations, pipelines, and facilities) during the next 2 to 5 years and appropriate mitigation.<br>▪ All oil and gas operations and activities on top of the plateau will be under the control of a single operator; BLM will directly control and manage the timing, location, and type of all operations by that single operator in accordance with the following decisions:<br>o Oil and gas development activities will be restricted to six specific development areas (Figure 2-1) along ridge tops on slopes less than 20 percent.<br>o Operations will be staged and sequenced over time.<br>o Development activities will be allowed on only one of six development areas at a time (See Figure 2-1); exploratory wells may be drilled in other areas sufficient to plan future drilling operations.<br>o Total unreclaimed surface disturbance will be limited to 350 acres at any given time.<br>o Five year interim reclamation standards must be met on 90 percent or more of disturbed lands within any given development area, as determined by BLM, prior to development operations being allowed in another development area.<br>o Drilling pads will be a minimum of approximately 2,640 feet apart; and development and production facilities will be clustered and designed to minimize surface impacts.<br>o Limit open and administrative motorized routes to approximately 138 miles. Allow exceptions only where necessary to reduce impacts, such as using a longer route to avoid a sensitive resource or reduce visual impacts and direct habitat loss.<br>o Implement innovative reclamation and performance-based monitoring standards<br>o Consolidate natural gas production facilities, roads, pipelines, and staging areas along roadways to minimize disturbance.<br>o Apply the resources protections detailed in this table, and in Tables 2-1, 2-2, and C-1. This includes NSO, CSU, and TL lease stipulations, and any COAs which may be current at the time of permitting.<br>o Before any on-the-ground lease operations are considered for approval by BLM on top of the plateau, lessees will reach formal agreement on one operator to conduct all operations on behalf of all the lessees. All lessees/leases will join a Federal Unitization Agreement, approved by BLM. The Unitization Agreement will be non-contracting. The agreement will allow BLM to directly control and manage the timing, location and type of all operations occurring on the entire top of the plateau. In effect, all of the leases will act administratively as a single lease; BLM will work with just one operator for the life of all oil and gas operations occurring on the top of the plateau. The Federal Unitization Agreement will (among other things) identify the agreed upon single operator, and provisions on how to allocate the benefits of gas and/or production to all of the leases.<br>▪ Site specific ground-disturbing activity may be permitted if BLM determines that the requested activity would not impair values associated with the WMA. In making this determination, BLM will consider the following resource factors: protection of ecological, hydrological, and habitat functions and resources; the type, amount, and duration of the surface disturbance; relationship to naturally occurring conditions; topography; type, location, duration, and intensity of potential adverse effects; mitigation measures to avoid, minimize, or offset any |

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|---|---|
| **Stipulation** | |
| | adverse effects; and other factors that may affect the paleontological resource. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ BLM will determine what level of protection available under this stipulation is required to protect Colorado River cutthroat trout and habitat, rare and/or significant natural plant communities, and municipal water supply and quality. BLM's determination would be based on site-specific conditions and the type, amount, and duration of the associated impacts.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified, and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Parachute Creek high value watershed and WMA – 33,575 acres |
| CSU<br>Hubbard Mesa Open OHV Riding Area | **Goal:** Protect off-highway-vehicle (OHV) riding opportunities within the Hubbard Mesa area.<br>**Objective:** Protect recreation opportunities within the Hubbard Mesa Riding Area.<br>**Management Actions:**<br>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.<br>**Standards:**<br>▪ Site specific ground-disturbing activity may be permitted if BLM determines that the requested activity would not impair values associated with OHV riding opportunities within the Hubbard Mesa area. In making this determination, BLM will consider the following resource factors: existing OHV use; existing OHV riding opportunities; anticipated future use; management of OHV use; type, amount, and duration of the surface disturbance; the relative extent of OHV use and current conditions; the relationship to topography and vegetation screening; the type, location, duration, and intensity of potential adverse effects; mitigation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect OHV riding opportunities. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above |

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|---|---|
| **Stipulation** | |
| | mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified, and corrective measures as approved by BLM will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Hubbard Mesa Open OHV Riding Area – 2,460 acres |
| TL<br>Big game winter range | **Goal:** Protect and maintain important deer and elk winter range.<br><br>**Objectives:** Protect and maintain physical and biological components important to deer and elk winter range and the obligate species, both on Federal lands, and across the landscape as a whole, as opportunities present. This includes reducing or eliminating stress induced impacts to deer and elk associated with human activity during critical winter months when animals are already stressed by environmental factors and concentrated on limited winter range.<br><br>**Management Action:**<br><br>Surface disturbance and human activities that lessen the quality of the deer and elk winter range will not be allowed from December 1 to April 30. Ongoing drilling and other activities and operations shall be designed and implemented such that the well bore is adequately secured and that all drilling and surface disturbing operations shall cease by December 1 in important and critical deer and elk winter habitats. In the event of unforeseeable and unplanned events, extensions not exceeding two weeks in duration may be authorized to ensure safe shut down of drilling operations, and conservation of mineral resources.<br><br>Human activities including visitations for production activities and well monitoring during the December 1 to April 30 timeframe shall be designed and carried out to minimize impacts. This includes well monitoring through telemetry, scheduling of all non-emergency well maintenance activities outside the December 1 to April 30 timeframe, conducting unavoidable and necessary on-the-ground visits between the hours 10:00 a.m. and 3:00 p.m., and minimizing on-the-ground visitations.<br><br>**Standards:**<br>▪ Site specific ground-disturbing activity between December 1 and April 30 may be allowed if BLM determines, following consultation with CDOW, that the requested activity would not impair values associated with the quantity and quality of the winter range for the species of interest. In making this determination, BLM will consider the following resource factors: minimization of the footprint of activities; fragmentation; impacts to winter range across the planning area as a whole; effectiveness of voluntary offsite mitigation of habitat with respect to quantity, quality and duration of both the surface disturbing activity and mitigation; the relative extent of available winter range; relationship to topography and vegetation screening; current baseline data; the type, location, duration, and |

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|---|---|
| **Stipulation** | |
| | intensity of potential adverse effects; mitigation and conservation measures to avoid, minimize, or offset the adverse effects; and other factors that may affect the winter range or cause winter range to become unusable. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; in such cases approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that (a) documents anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ This timing restriction limitation may not apply, and the restriction may be considered to be met, if BLM determines, following consultation with CDOW, that animals are not using the habitat, are not likely to utilize the habitat in a particular season, and that activities will not lessen overall habitat quality in future years.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Big game winter range – 34,668 acres |
| TL<br>Active raptor nest sites | **Goal:** Protect active raptor nest sites.<br><br>**Objective:** Protect nesting and fledging habitat for raptors not protected by species-specific measures. This includes owls, northern harrier, accipiters, buteos, golden eagle, osprey, and falcons except the American kestrel.<br><br>**Management Actions:**<br>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 be used or lead to nest failure, abandonment, or mortality of fledglings. Stipulations will be applied annually from February 1 through August 15.<br>**Standards:**<br>▪ Site specific ground-disturbing activity between February 1 and August 15 may be allowed if BLM determines, following consultation with CDOW, that the requested activity would not impair values, behaviors, or habitat associated nesting and fledging. In making this determination, BLM will consider the following resource factors: meteorological or ecological conditions during the period requested; potential to cause the nest not to be used or lead to nest failure; abandonment of the nest; mortality of fledglings; behavioral and ecological requirements of the species; the type, amount, intensity, and duration of the surface disturbance; the relative extent of available nesting and fledgling habitat; relationship to topography and vegetation screening; current baseline data; the type, location, intensity, and duration of potential adverse effects; mitigation measures proposed to avoid, minimize, or offset the adverse effects; and |

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|---|---|
| **Stipulation** | |
| | other factors that may affect the species, or cause habitat to become unusable. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Active raptor nest sites – 2,878 acres |
| TL<br>Bald eagle nest or winter roost sites | **Goal:** Protect bald eagle nest or winter roost sites.<br>**Objective:** Protect nesting, fledging, and winter roost habitat of this Federally listed threatened species.<br>**Management Actions:**<br>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.<br>Stipulations will be applied annually from December 15 through June 15.<br>**Standards:**<br>▪ Site specific ground-disturbing activity between December 15 and June 15 may be allowed if BLM determines, following Section 7 consultation with USFWS, that the requested activity would not impair values associated with maintenance or recovery of the species or behaviors associated with winter roosting, nesting, fledging, or fledging habitat. In making this determination, BLM will consider the following resource factors: meteorological or ecological conditions during the period requested; the status of the nest (active or inactive); the type, intensity, and duration of disturbance; and measures required by USFWS; potential for the activity to cause the roost or nest not to be used; potential for nest failure; abandonment of the roost or nest; mortality of fledglings; behavioral and ecological requirements of the species; the type, amount, intensity, and duration of the surface disturbance; the relative extent of available nesting and fledgling habitat; relationship to topography and vegetation screening; current baseline data; the type, location, intensity, and duration of potential adverse effects; mitigation measures proposed to avoid, minimize, or offset the adverse effects; and other factors that may affect roosting or nesting success. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent |

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| | of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Bald eagle nest or winter roost sites – 474 acres |
| TL<br>Peregrine falcon cliff nesting complex | **Goal:** Protect peregrine falcon cliff nesting sites.<br>**Objective:** Protect nesting and fledging habitat of this State-listed threatened species.<br>**Management Actions:**<br>Within a 0.5-mile radius of the cliff-nesting complex on the Roan Cliffs, no activities or other sources of disturbance that could cause abandonment of a nest or established territory will be allowed.<br>Stipulations will be applied annually, March 15 through July 31.<br>**Standards:**<br>▪ Site specific ground-disturbing activity between May 15 and July 31 may be allowed if BLM determines, following consultation with CDOW, that the requested activity would not impair values, behaviors, or habitat associated with nesting and fledging. In making this determination, BLM will consider the following resource factors: meteorological or ecological conditions during the period requested; the status of the nest (active or inactive); potential to cause the nest not to be used or lead to nest failure; abandonment of the nest; mortality of fledglings; behavioral and ecological requirements of the species; the type, amount, intensity, and duration of the surface disturbance; the relative extent of available nesting and fledgling habitat; relationship to topography and vegetation screening; current baseline data; the type, location, intensity, and duration of potential adverse effects; mitigation measures proposed to avoid, minimize, or offset the adverse effects; and other factors that may affect the species, or cause habitat to become unusable. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted |

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| **Stipulation** | |
| | scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities.<br>▪ Peregrine falcon cliff nesting complex – 917 acres |
| TL<br>Waterfowl and shorebird nesting areas | **Goal:** Protect waterfowl and shorebird nesting areas.<br>**Objective:** Protect nesting and brood-rearing habitats at the Fravert Reservoir Watchable Wildlife Area.<br>**Management Actions:**<br>Allow no ground-disturbing activities, or other sources of disturbance, from April 15 through July 15, or until all young have hatched and dispersed from the production area, or that could cause waterfowl and shorebirds not to nest or lead to nest failure or abandonment within 0.25-mile of the nesting and production area of Fravert Reservoir.<br>**Standards:**<br>▪ Site specific ground-disturbing activity between April 15 and July 15 may be allowed if BLM determines, following consultation with CDOW, that the requested activity would not impair values, behaviors, or habitat associated with nesting and fledging. In making this determination, BLM will consider the following resource factors: meteorological or ecological conditions during the period requested; the status of the nest (active or inactive); hatching and dispersal of young from the production or nesting area; potential to cause the nest not to be used or lead to nest failure; abandonment of the nest; mortality of fledglings; behavioral and ecological requirements of the species; the type, amount, intensity, and duration of the surface disturbance; the relative extent of available nesting and fledgling habitat; relationship to topography and vegetation screening; current baseline data; the type, location, intensity, and duration of potential adverse effects; mitigation measures proposed to avoid, minimize, or offset the adverse effects; and other factors that may affect the species, or cause habitat to become unusable. Approval of ground-disturbing activities granted in any given year may not constitute approval for subsequent years; approval for such activities must be granted (or extended) annually by BLM. The proponent of any ground-disturbing activity will provide an assessment with their proposal that documents (a) anticipated compliance or non-impairment of resource values protected by this stipulation, and (b) which considers the above mentioned resource factors.<br>▪ During and following the project activities covered by this provision, ongoing monitoring data will be collected using widely accepted scientific methods and reported to BLM not less often than annually. If unanticipated types or levels of adverse effects are noted during monitoring, BLM will be promptly notified; and corrective measures, as approved by BLM, will be identified and implemented by the proponent. This information will be used through an adaptive management process to refine the project components and associated mitigation measures to be applied to future proposed activities. |

[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 Under the Proposed Plan [1] | |
|---|---|
| **Stipulation** | |
| | ▪ Waterfowl and shorebird nesting areas – 1,010 acres |
| Lease Notice<br><br>Additional required Conditions of Approval (COAs) | **Goal:** Meet overall resource and multiple use objectives of the Proposed Plan.<br><br>**Objective:** To alert lessee of all potential COAs applied to permitted activities in addition to lease level stipulations by the Proposed Plan. These take the form of management prescriptions specific to defined areas, Best Management Practices (BMPs) specific to resource values, required reclamation standards and monitoring.<br><br>**Management Actions:**<br><br>Lessees and potential lessees are hereby advised of COAs, or standards that will be achieved through the use of COAs, and the location of land use management prescriptions in the Proposed Plan.<br><br>**Standards:**<br><br>▪ The Proposed RMPA/Final EIS contains: general management goals, objectives, and actions for this Planning Area in Table 2-1; management prescriptions for ACECs in Table 2-2; management goals, objectives, and actions for the Parachute Creek Watershed Management Area (WMA) in Table 2-3.<br><br>▪ Descriptions of applicable Best Management Practices and Standard Reclamation Practices are located in Appendix I of the Proposed Plan/Final EIS.<br><br>▪ Disturbed Site Reclamation Monitoring and Success Criteria are located in Appendix J of the Proposed Plan/Final EIS. |

[1] *NSO, CSU, and TL stipulations may overlap within and among categories. Acres of stipulations cannot be summed to calculate total area affected.*

Figure C-1. NSO for Steep Slopes (>50%)
Roan Plateau Proposed Plan
August 2006

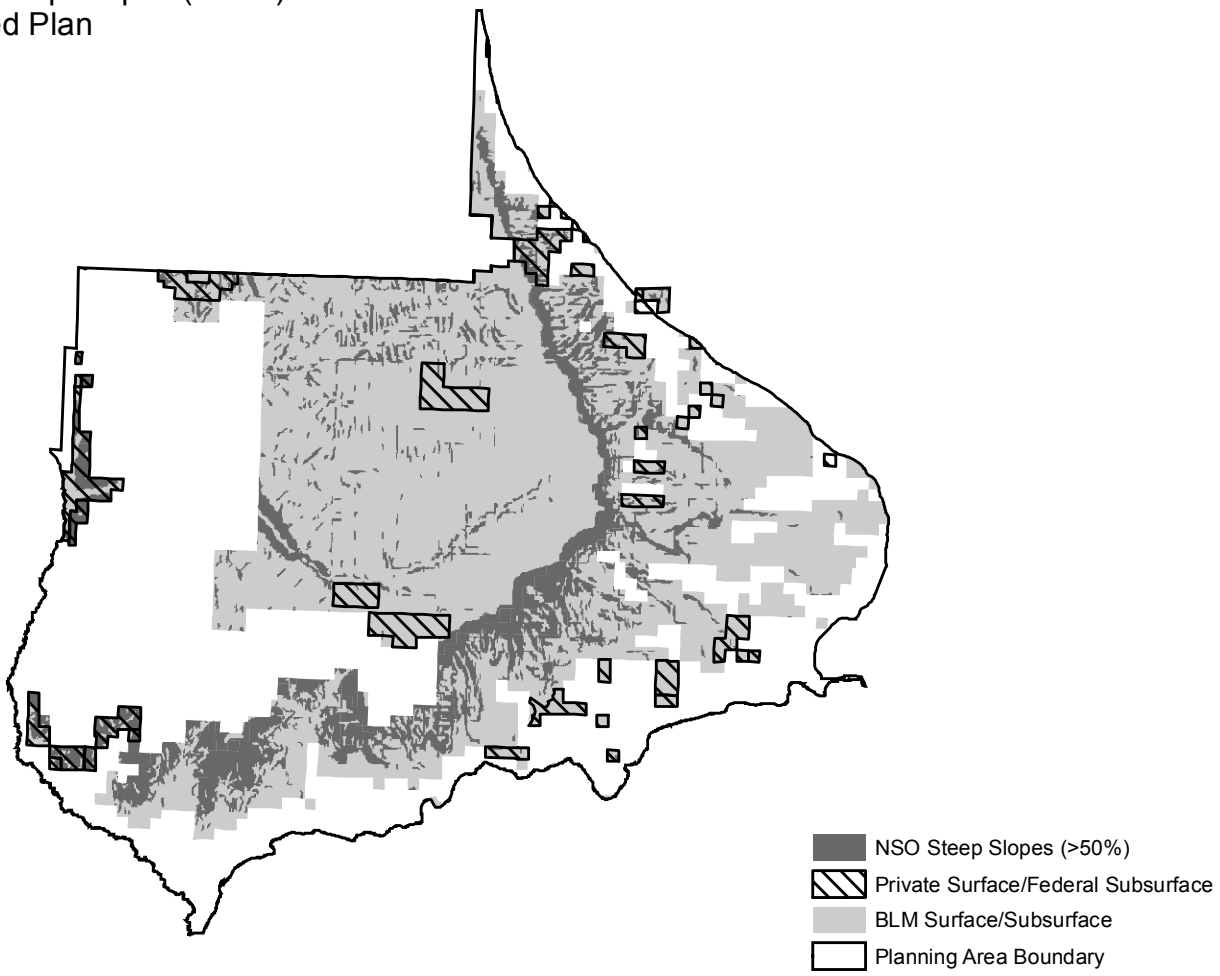



Figure C-2. NSO for Threatened, Endangered, or Candidate Species Habitat
Roan Plateau Proposed Plan
August 2006

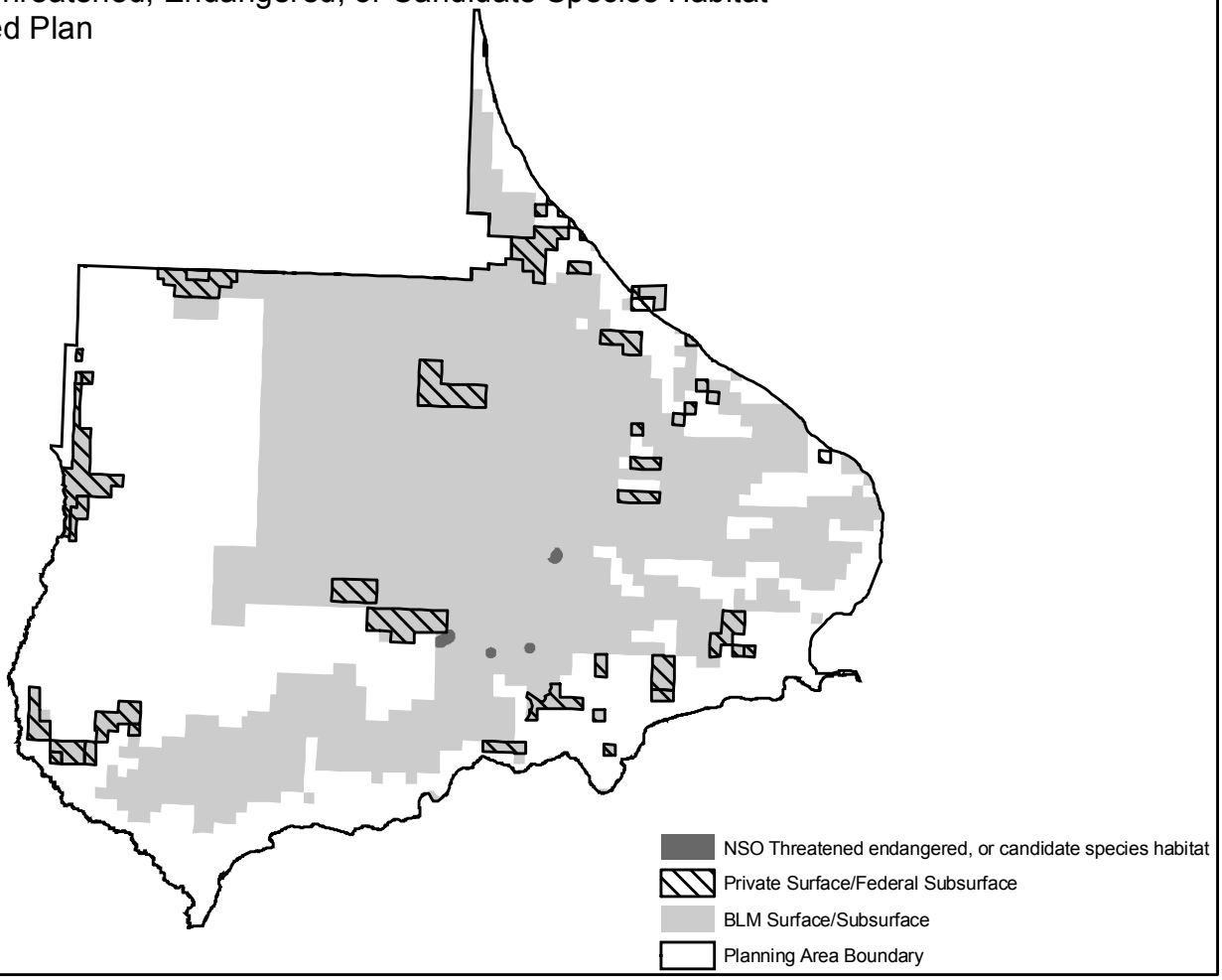


Figure C-3. NSO for Raptor Nest Sites
Roan Plateau Proposed Plan
August 2006

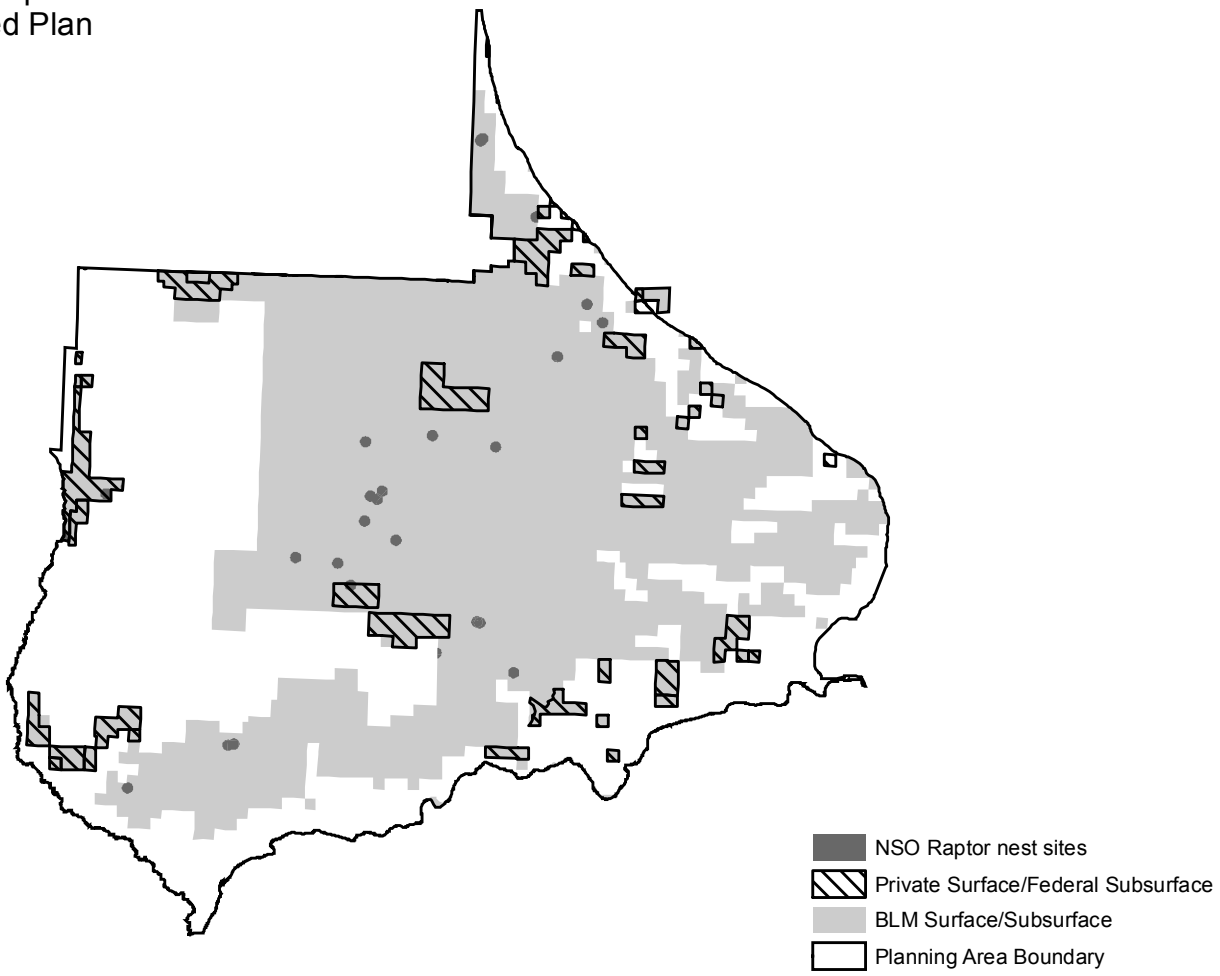



Figure C-4. NSO for Bald Eagle Nest or Winter Roost Sites
Roan Plateau Proposed Plan
August 2006

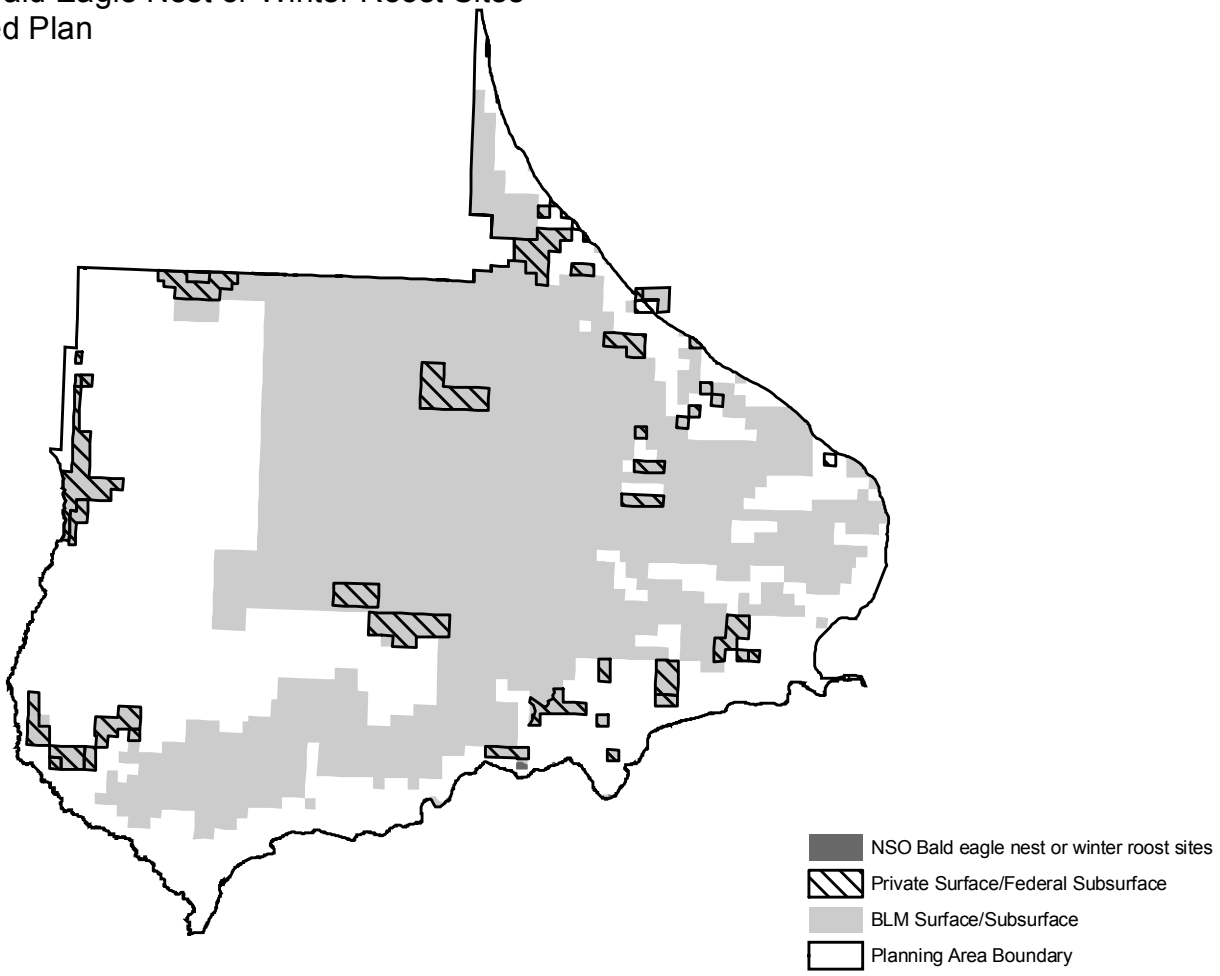


Figure C-5. NSO for Wildlife Seclusion Areas Below the Rim
Roan Plateau Proposed Plan
August 2006

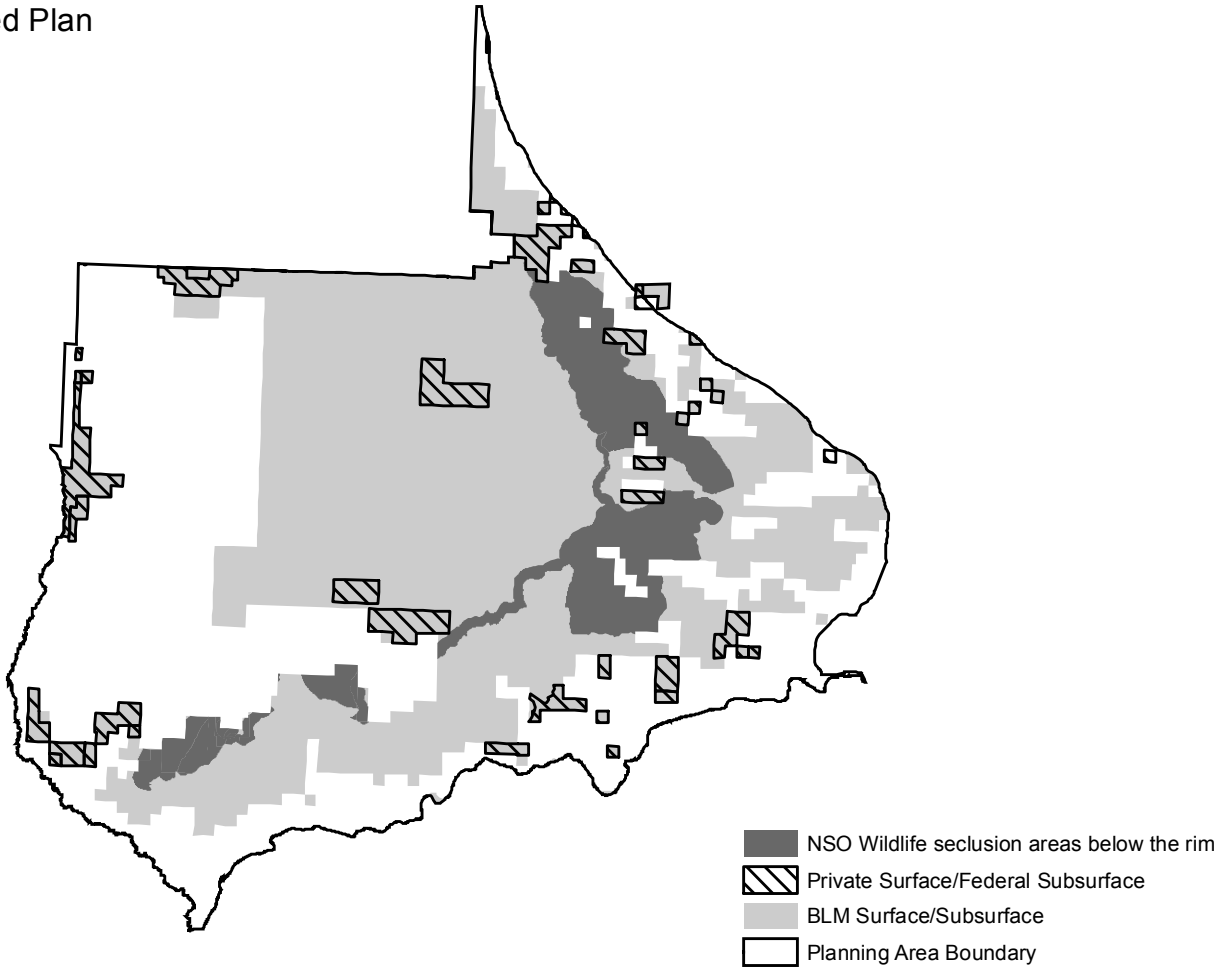



Figure C-6. NSO for High Value Special Status Fish Species Habitat
Roan Plateau Proposed Plan
August 2006

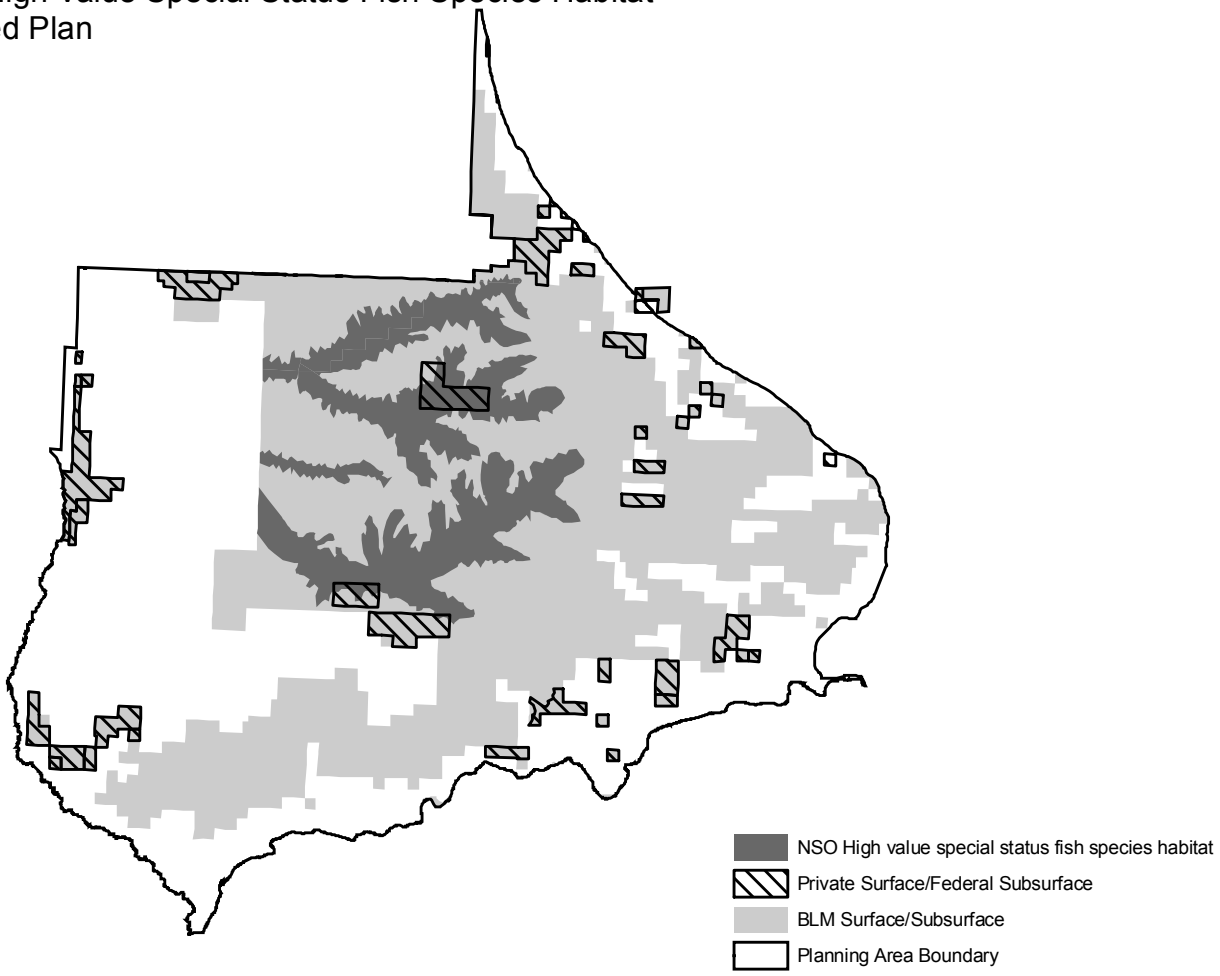


Figure C-7. NSO for Riparian and Wetland Habitat
Roan Plateau Proposed Plan
August 2006

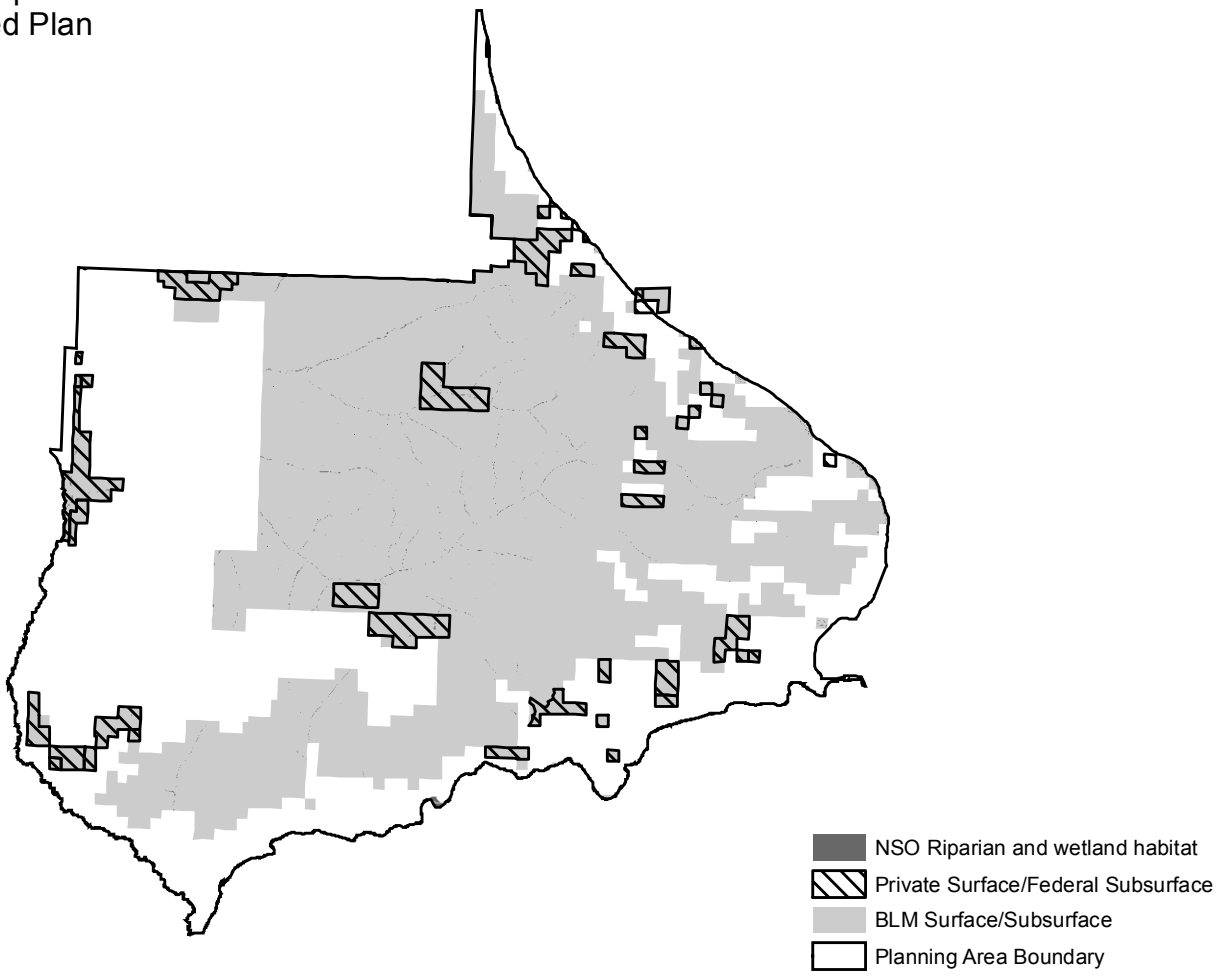



Figure C-8. NSO for I-70 Viewshed (VRM Class II)
Roan Plateau Proposed Plan
August 2006

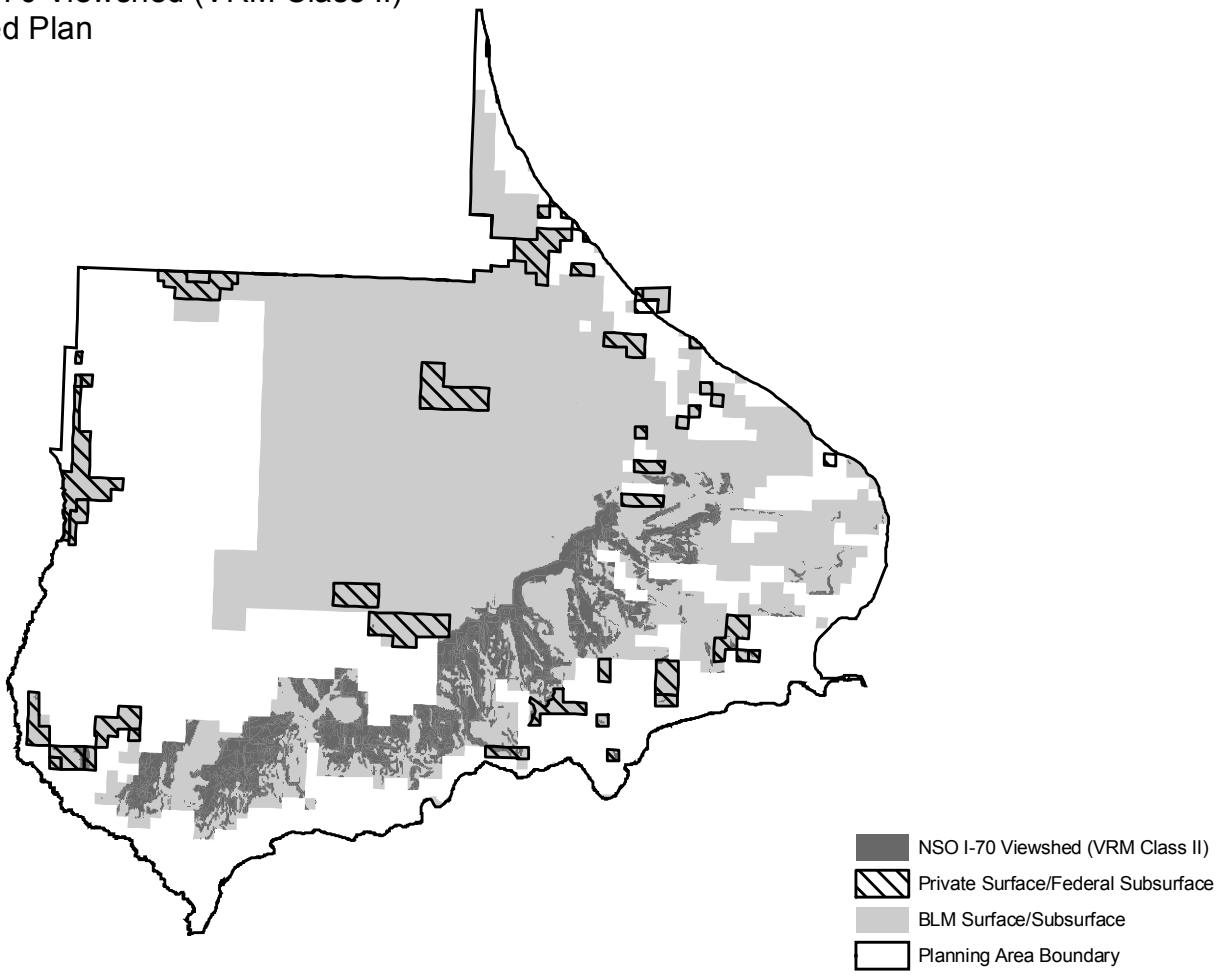


Figure C-9. NSO for East Fork Falls Viewshed (VRM Class I)
Roan Plateau Proposed Plan
August 2006

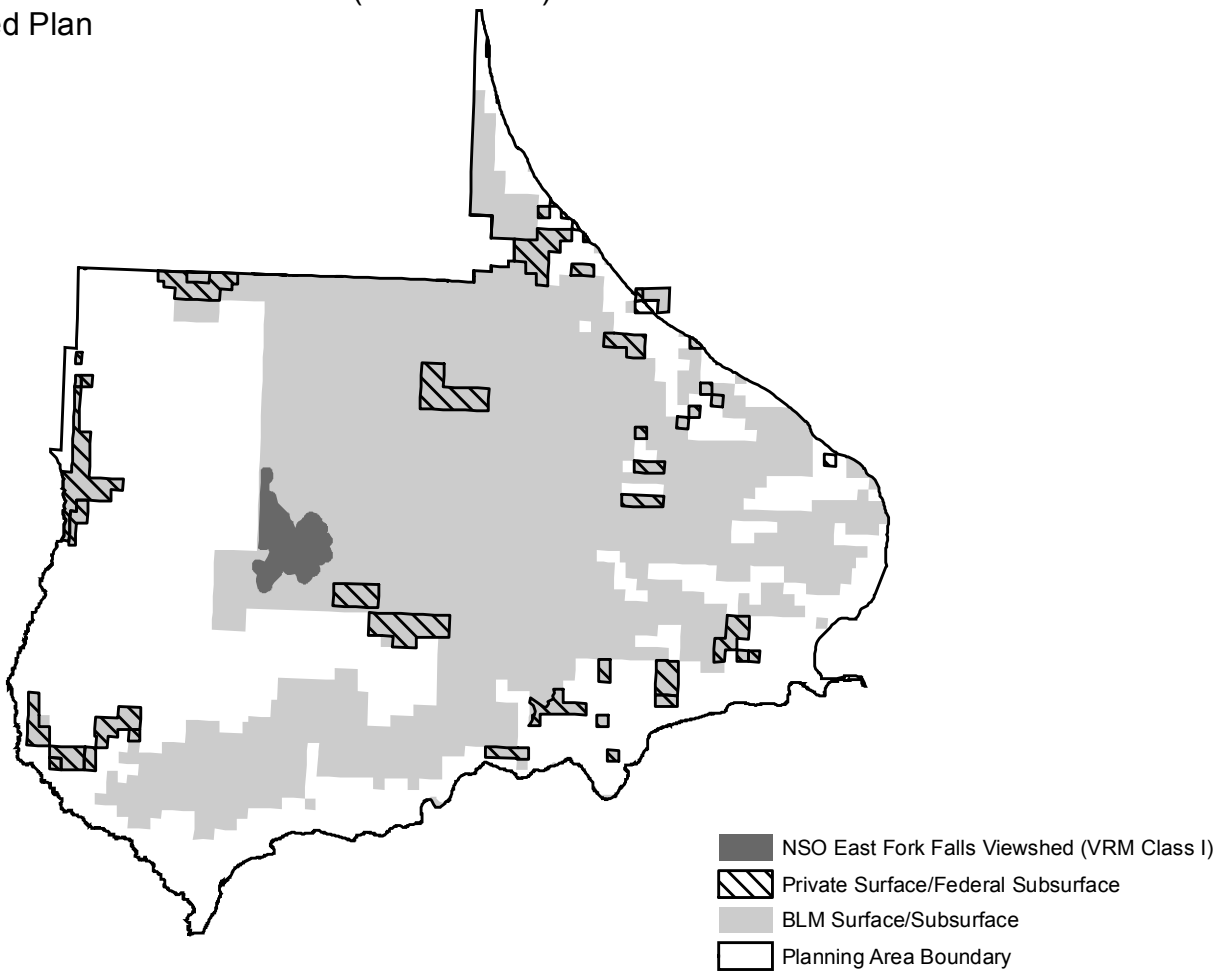



Figure C-10. NSO for Anvil Points Claystone Cave
Roan Plateau Proposed Plan
August 2006

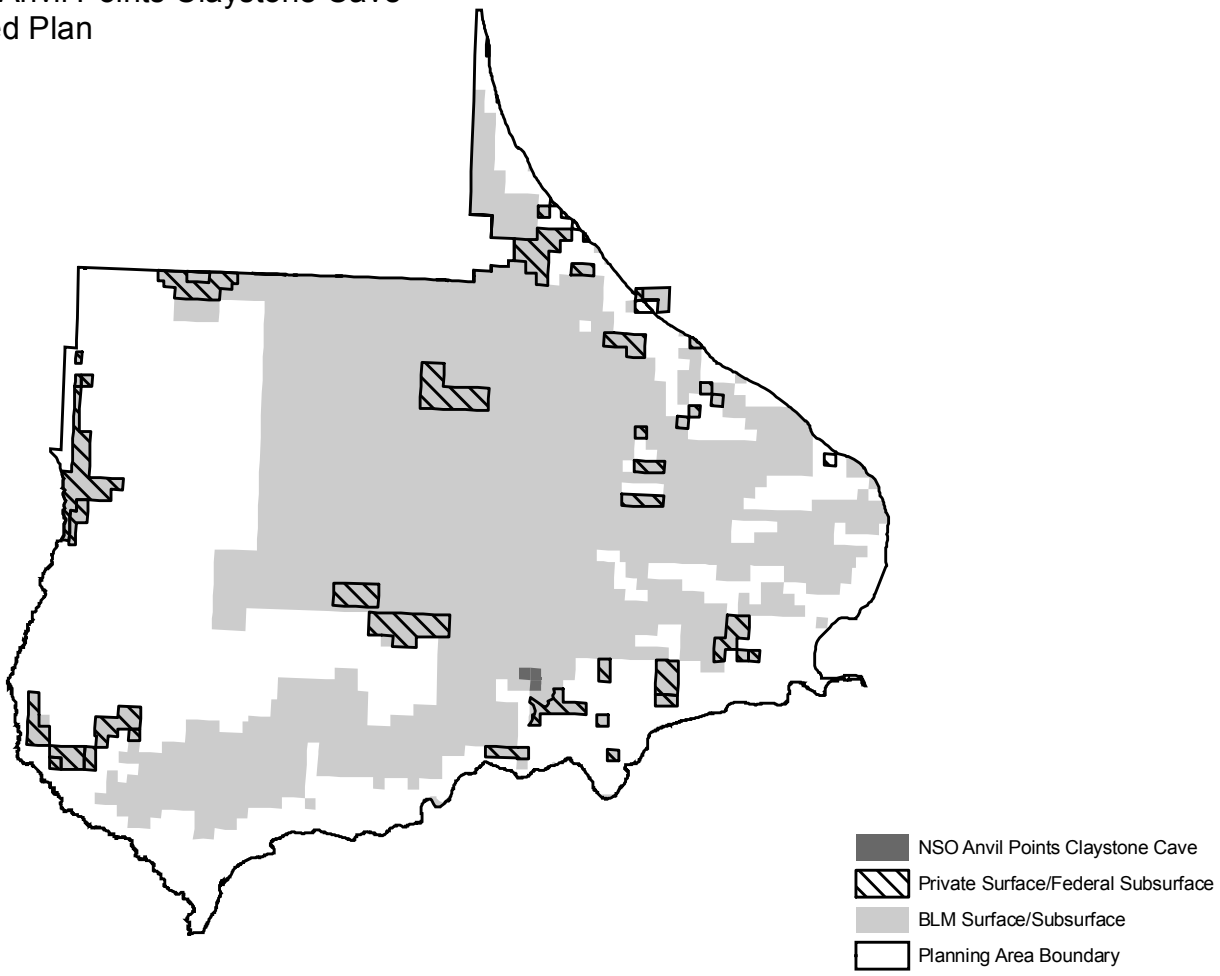


Figure C-11. NSO for Colorado River Corridor
Roan Plateau Proposed Plan
August 2006

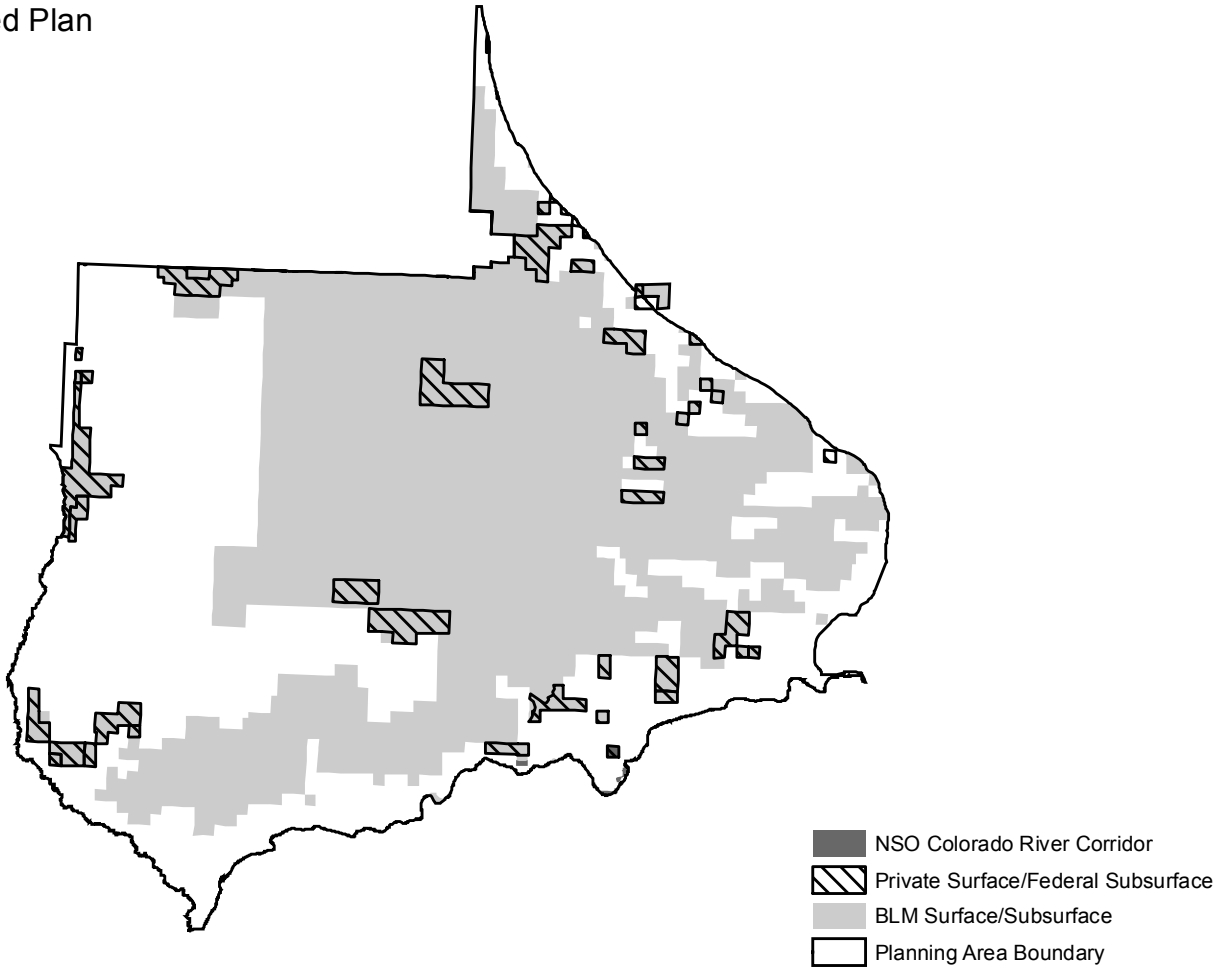



Figure C-12. CSU for Habititat for Special Status Plant Species
Populations and Significant Plant Communities
Roan Plateau Proposed Plan
August 2006

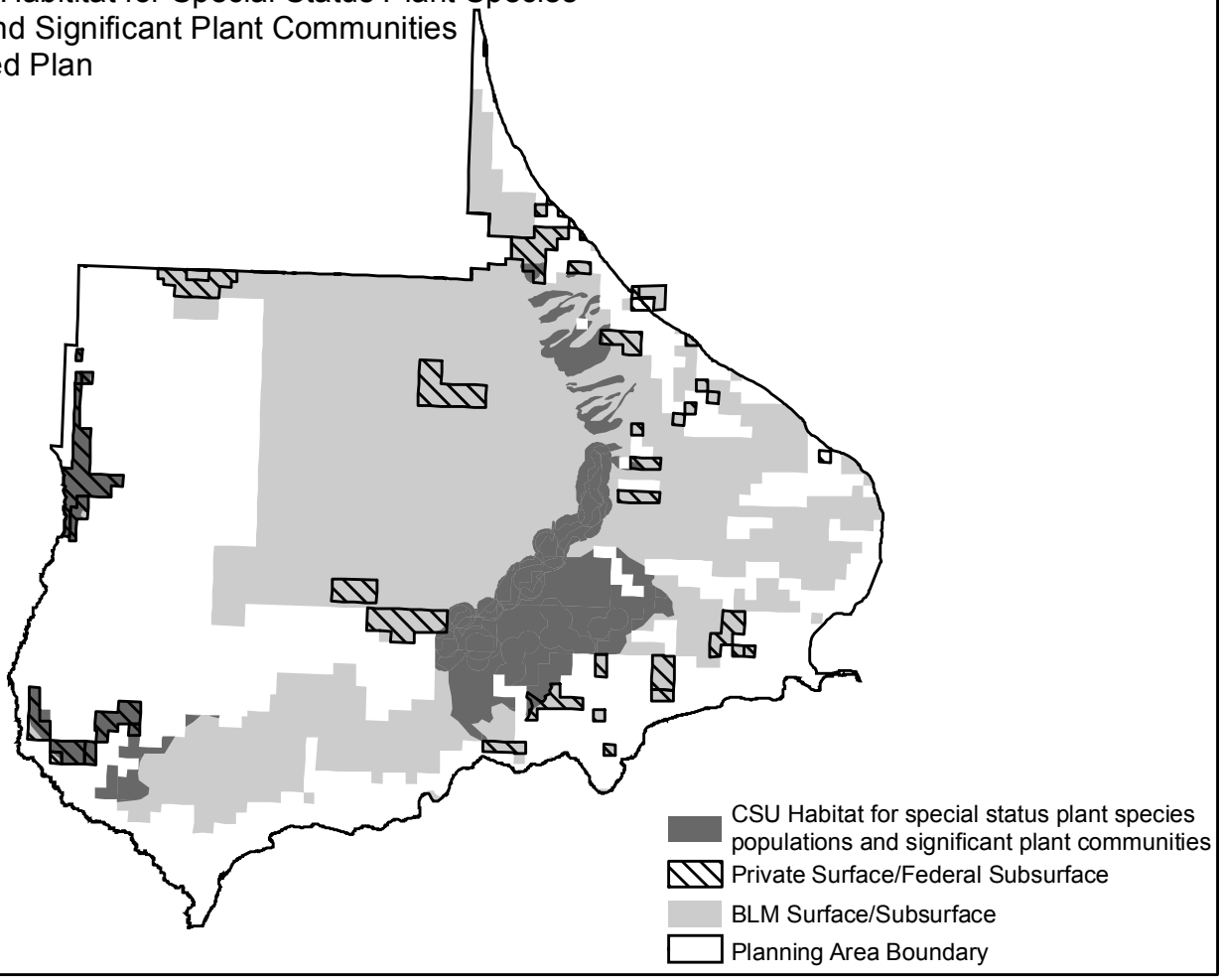


Figure C-13. CSU for Riparian and Wetland Habitat
Roan Plateau Proposed Plan
August 2006

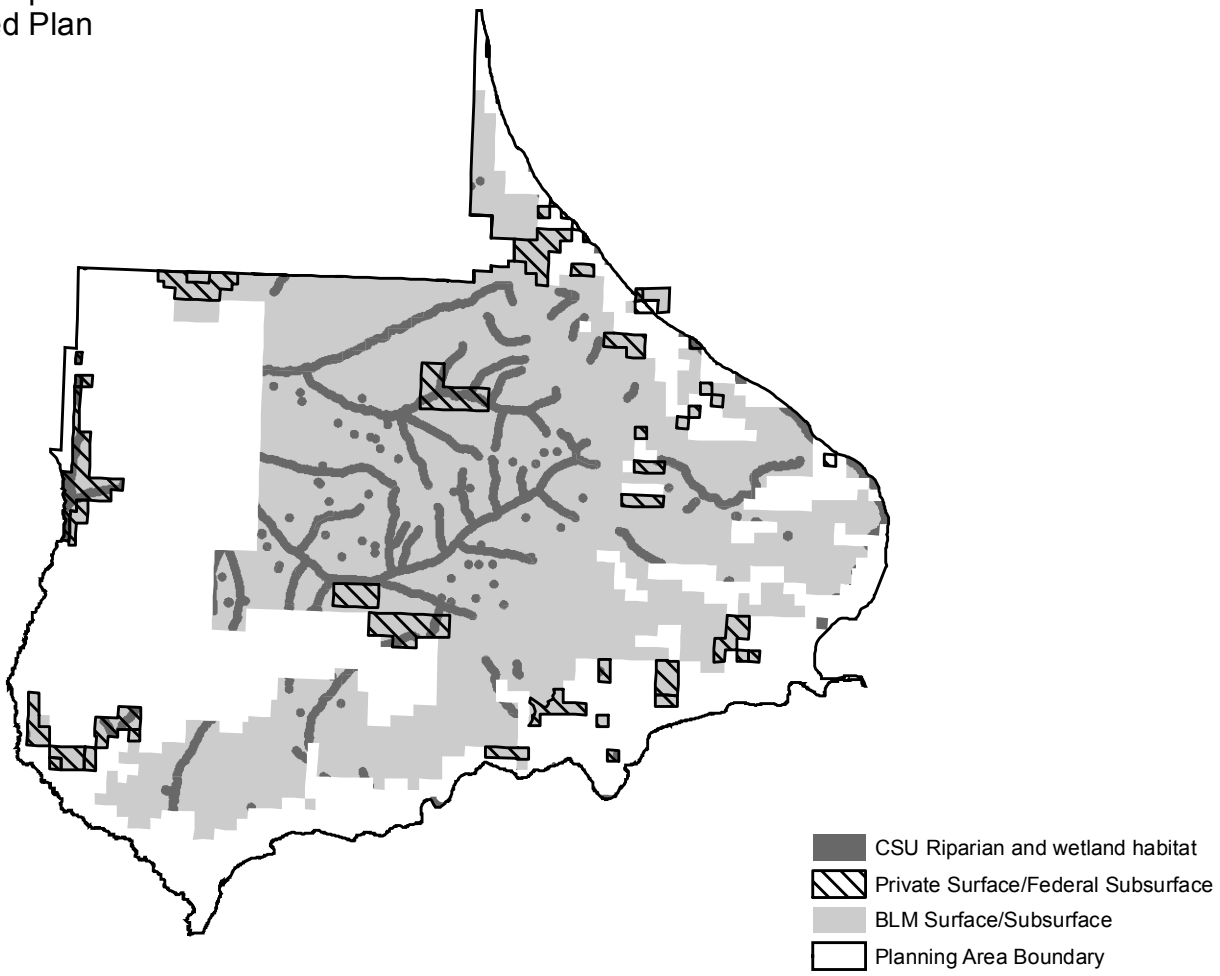



Figure C-14. CSU for Peregrine Falcon Nesting Complex
Roan Plateau Proposed Plan
August 2006

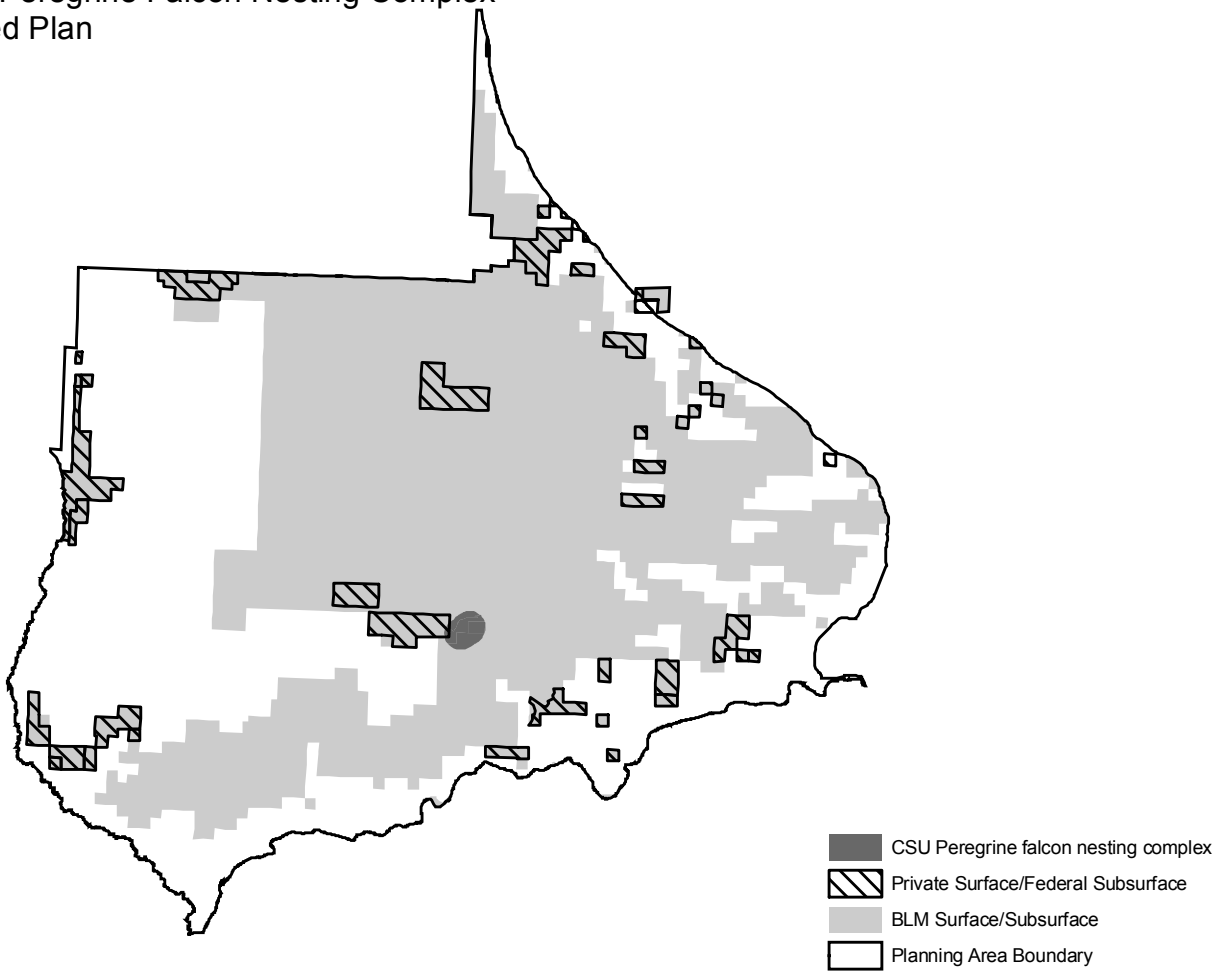


Figure C-15. CSU for Wildlife Security Areas Above the Rim
Roan Plateau Proposed Plan
August 2006

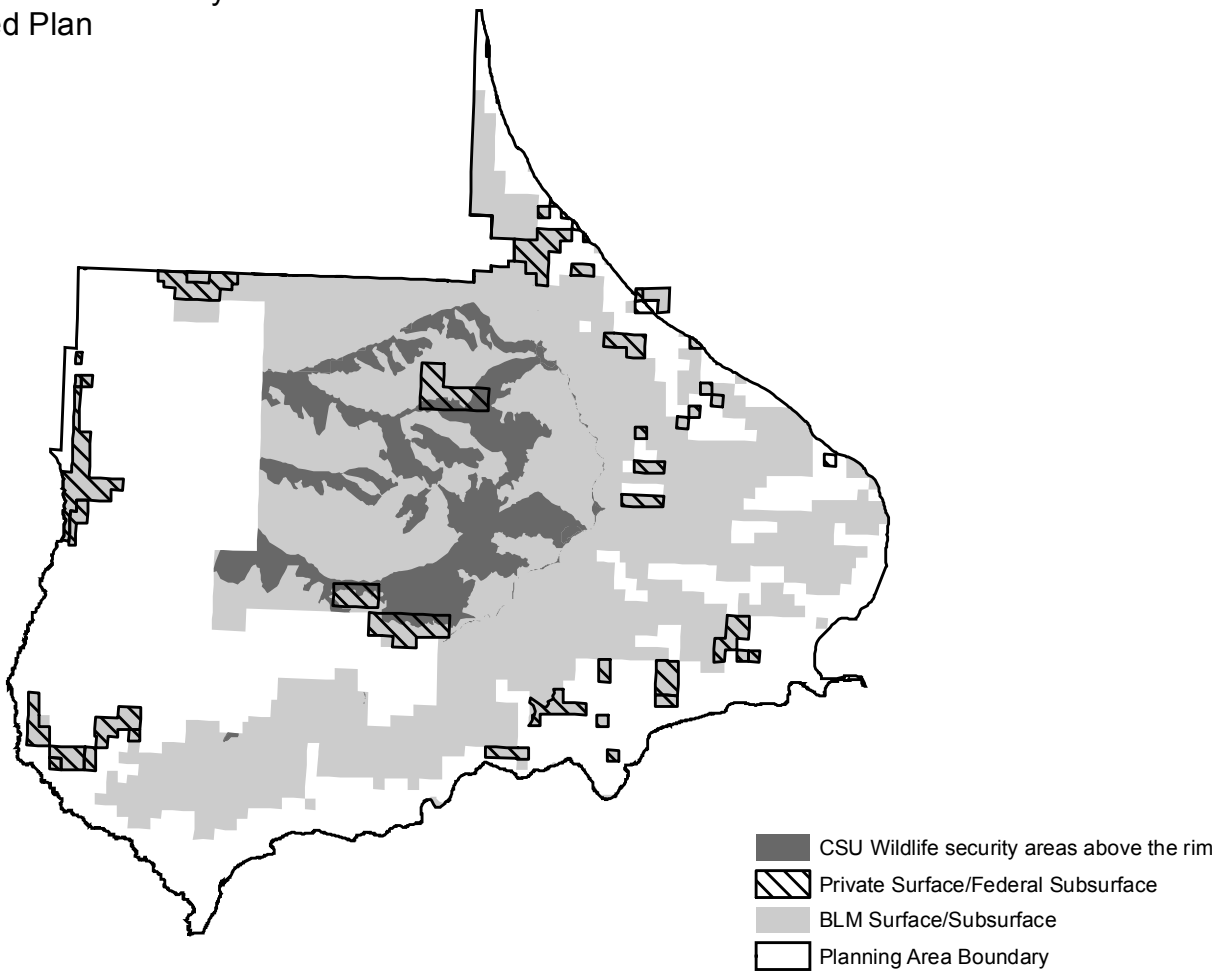



Figure C-16. CSU for Big Game Migration Corridors
Roan Plateau Proposed Plan
August 2006

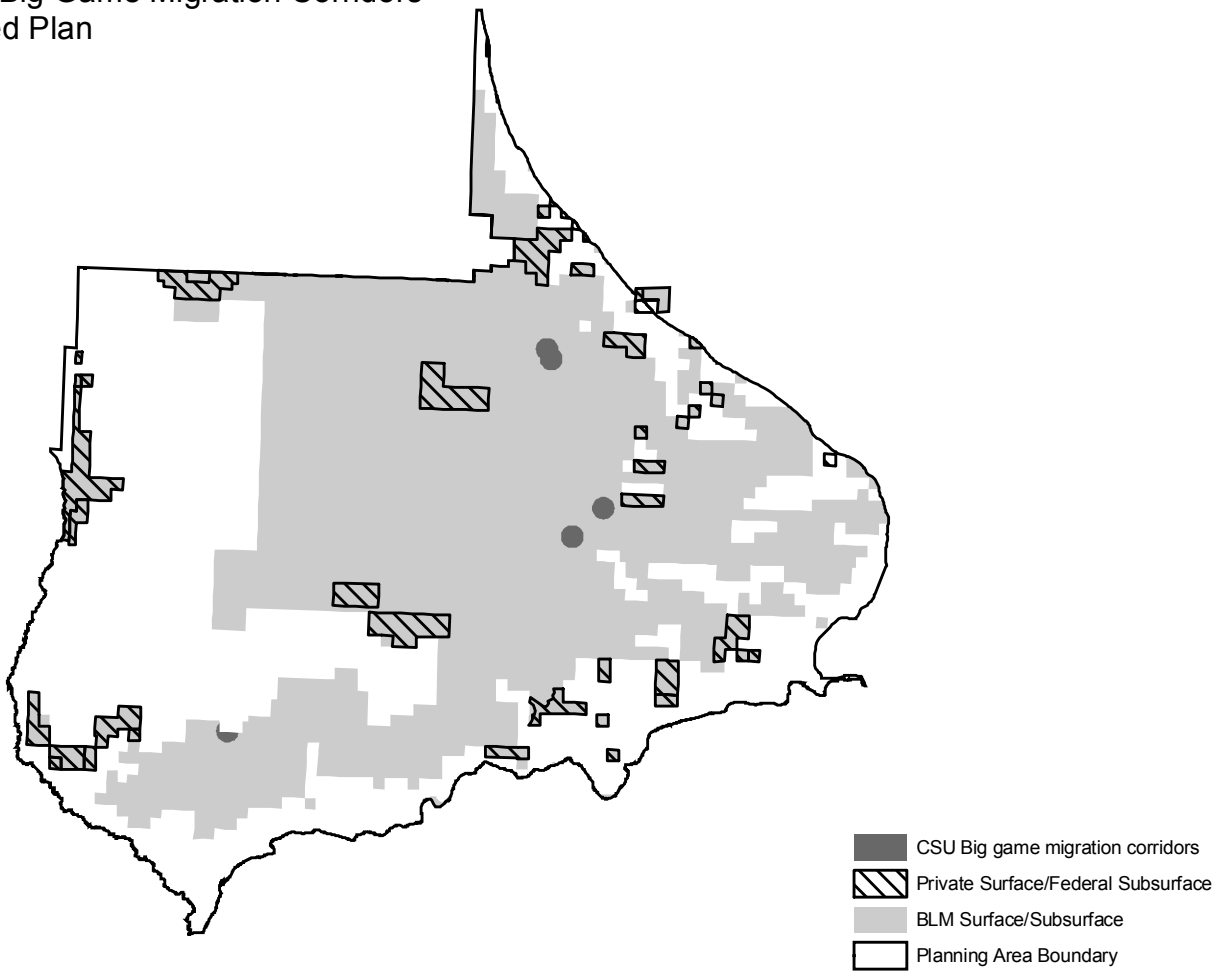


Figure C-17. CSU for Sensitive Bat Species Habitat
Roan Plateau Proposed Plan
August 2006

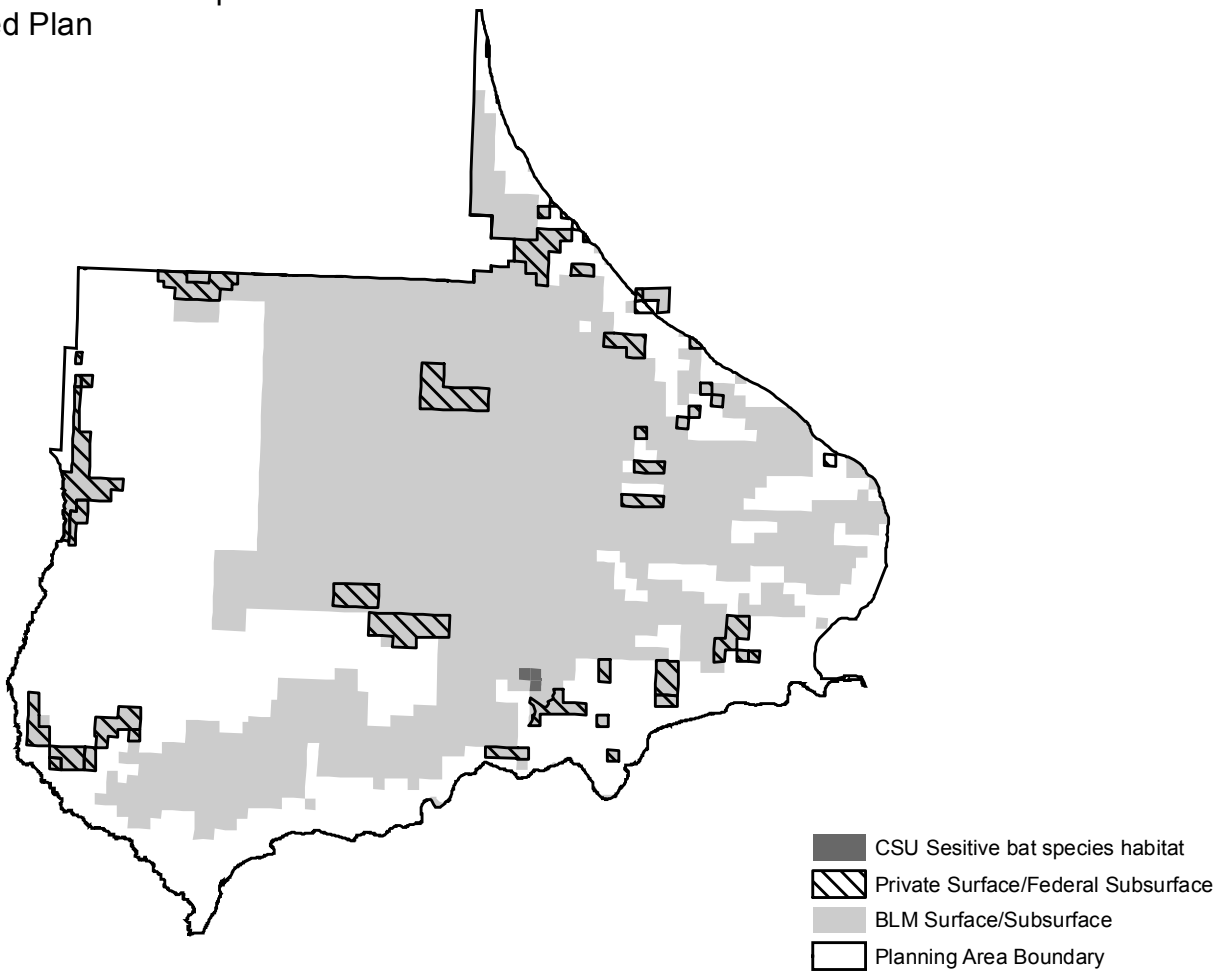



Figure C-18. CSU for Wild and Scenic River Eligibility
Roan Plateau Proposed Plan
August 2006

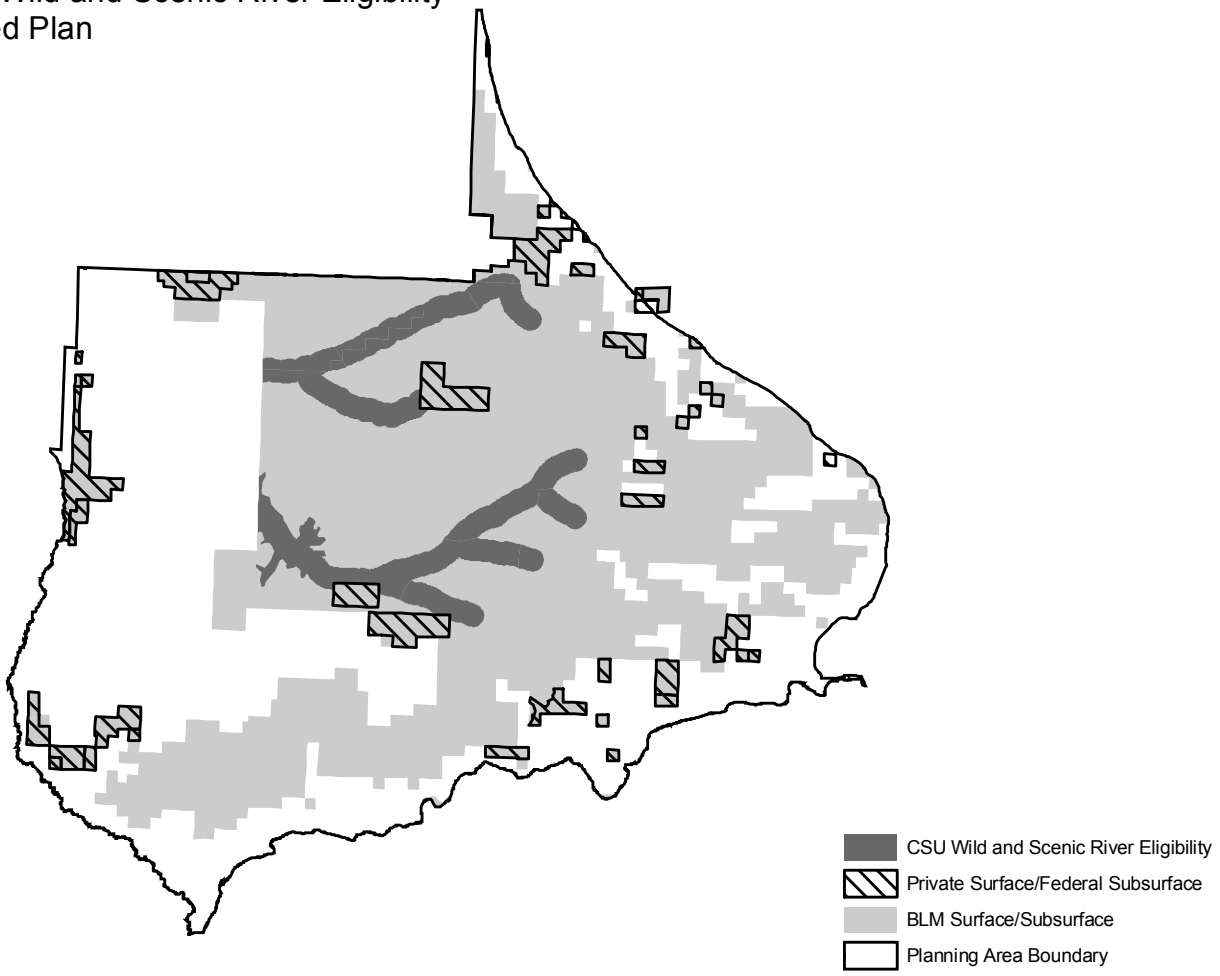


Figure C-19. CSU for Erosive Soils and Slopes (>30%)
Roan Plateau Proposed Plan
August 2006

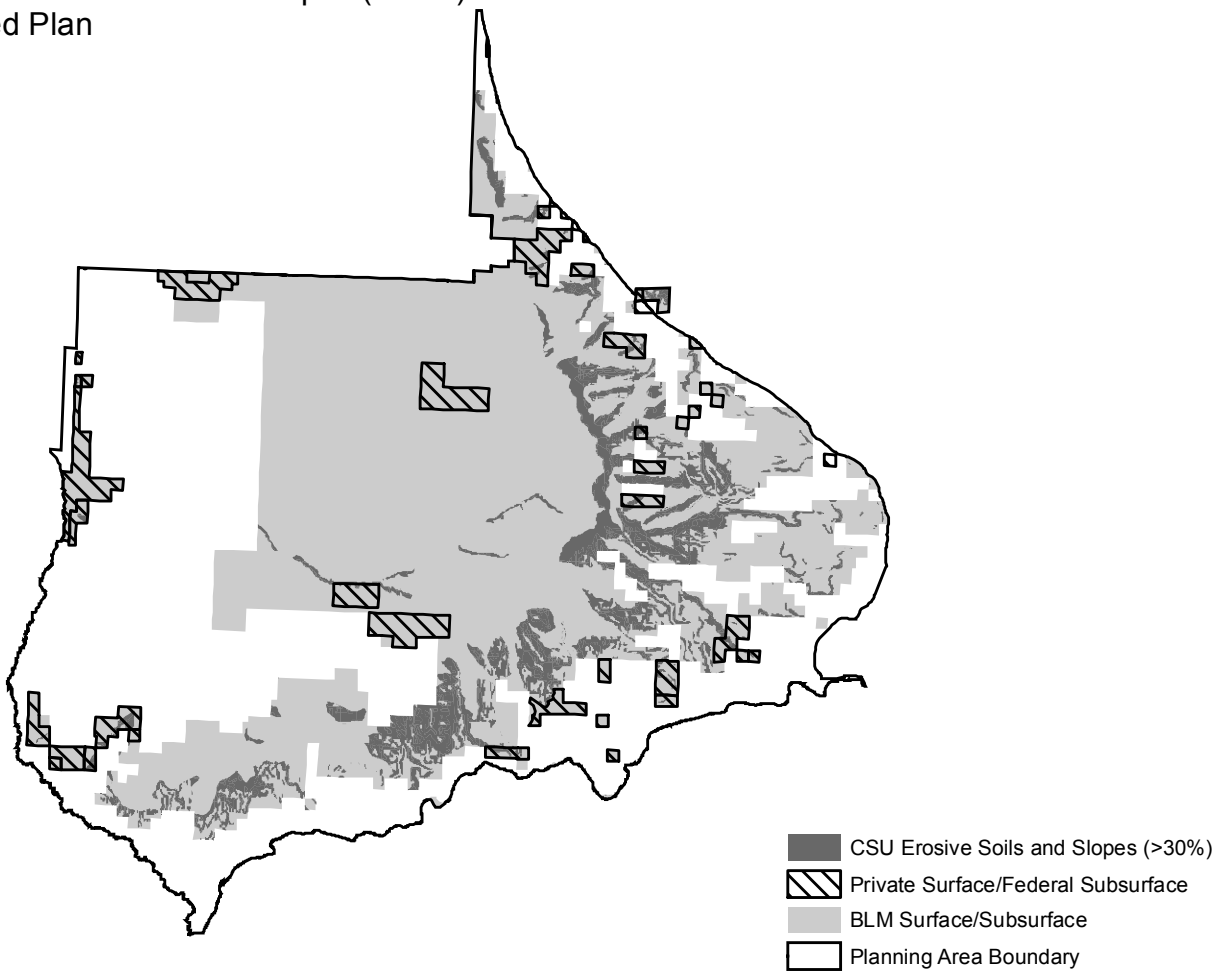



Figure C-20. CSU for VRM Class II Areas Below the Rim
Roan Plateau Proposed Plan
August 2006

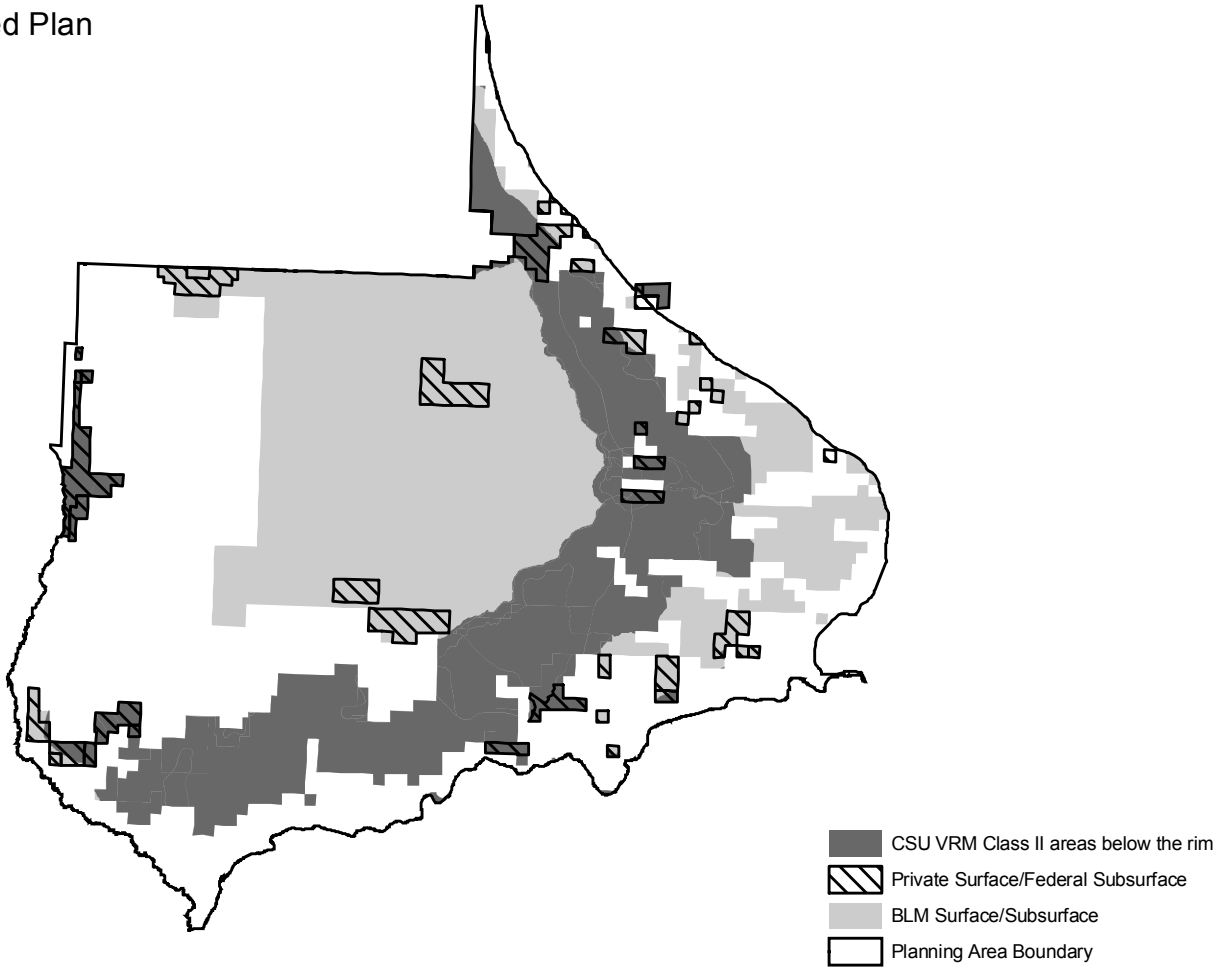


Figure C-21. CSU for VRM Class III Areas Above the Rim
Roan Plateau Proposed Plan
August 2006

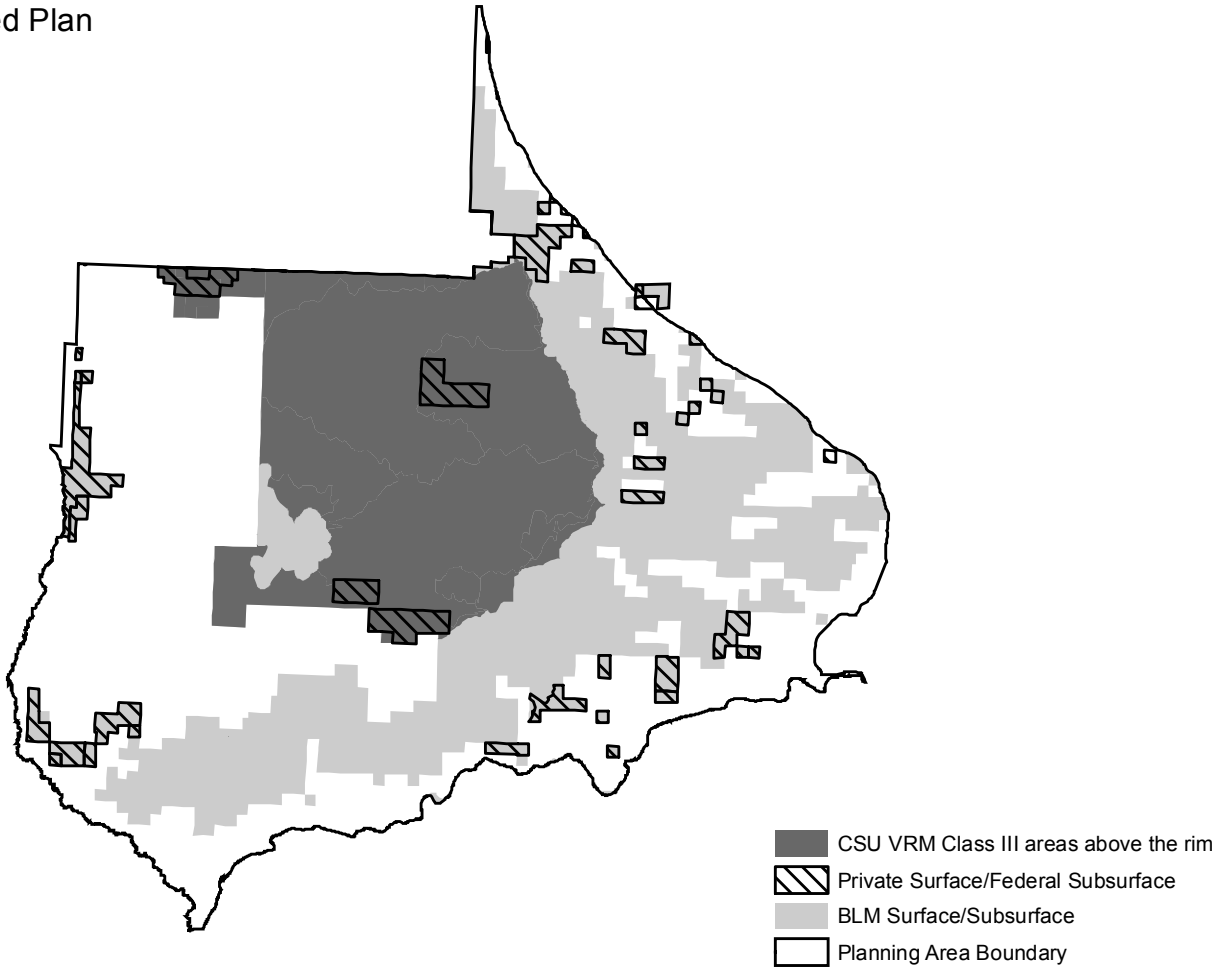



Figure C-22. CSU for Sharrard Park Paleontological Resources
Roan Plateau Proposed Plan
August 2006

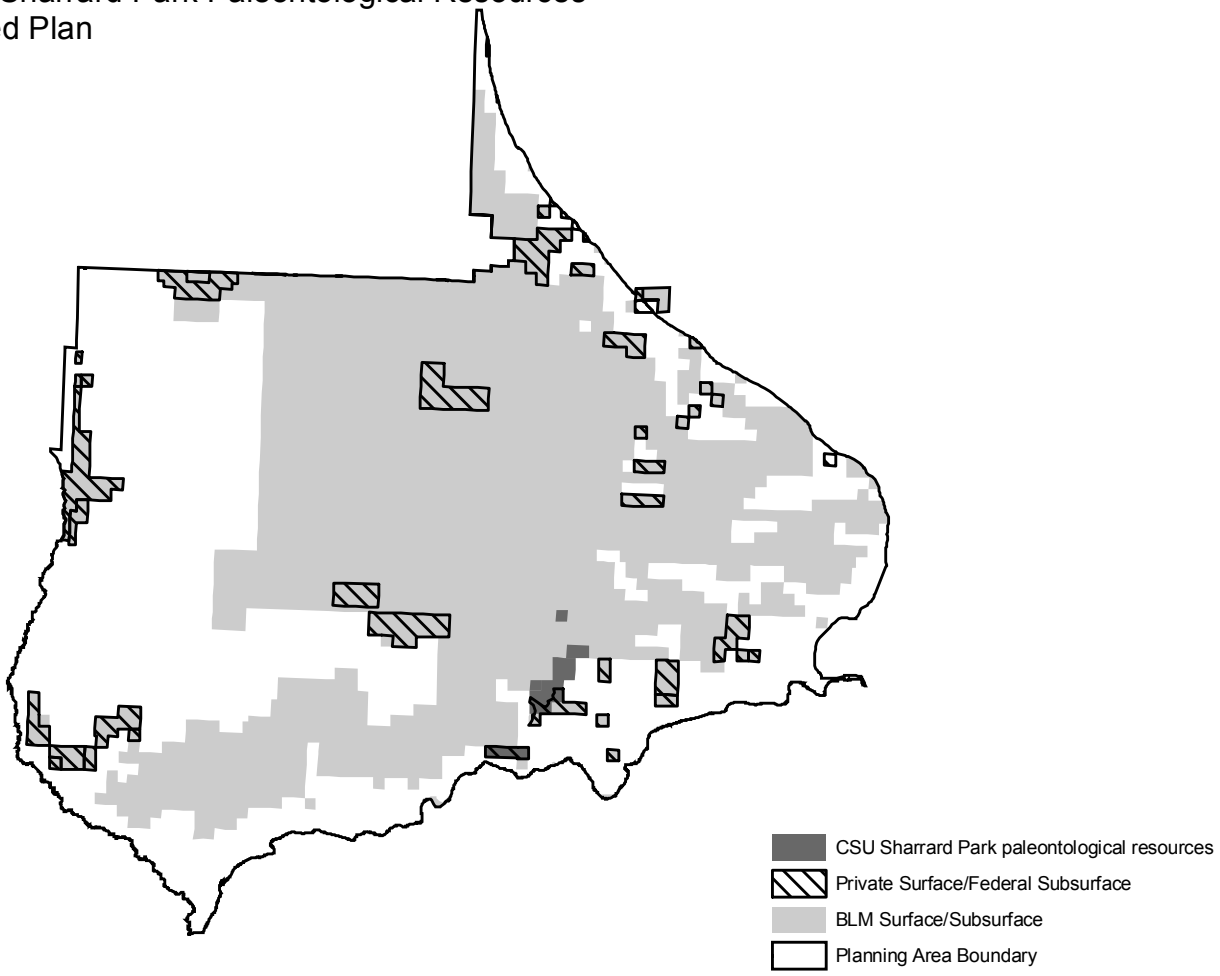


Figure C-23. CSU for Parachute Creek High Value Watershed and Watershed Management Area (WMA)
Roan Plateau Proposed Plan
August 2006

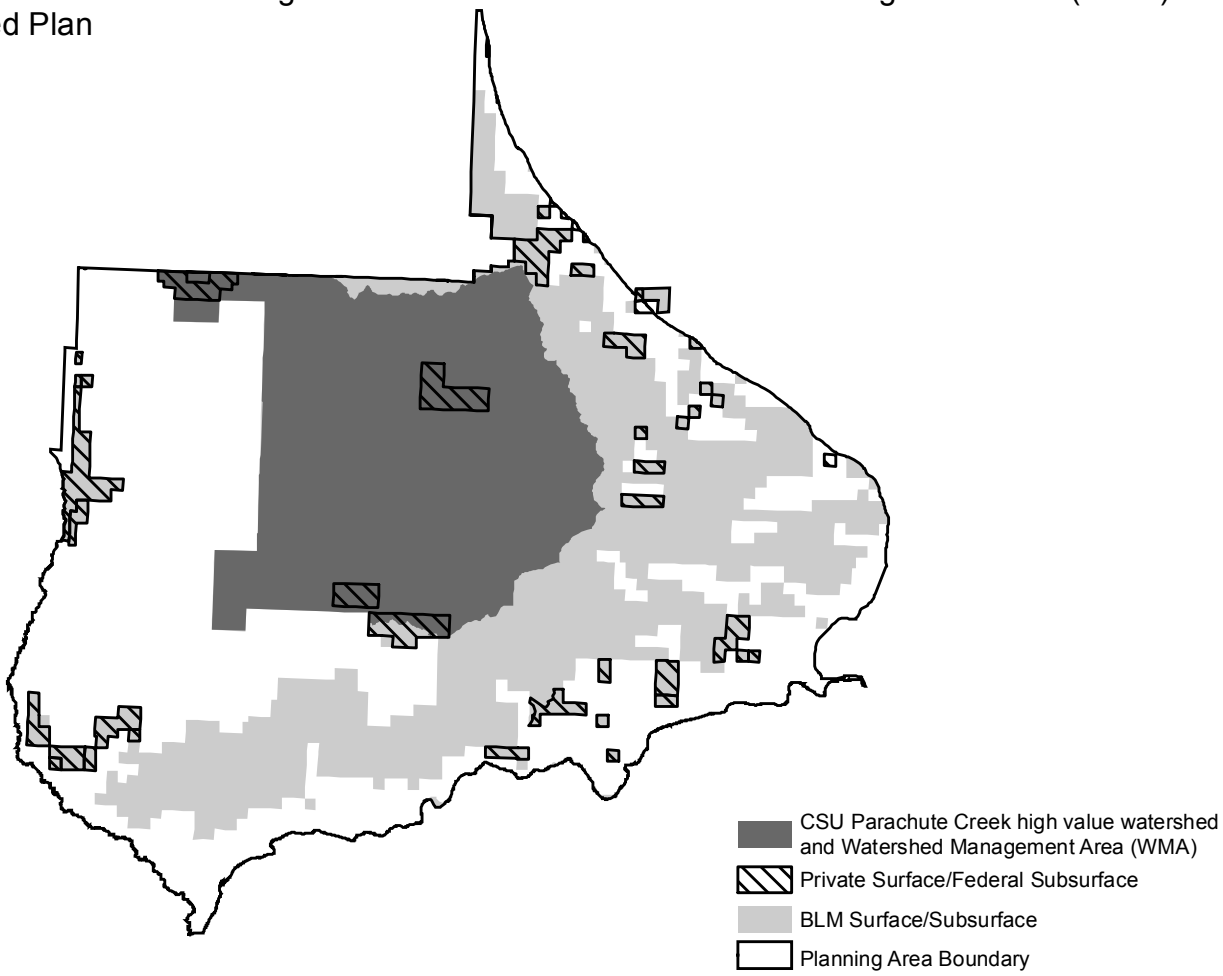



Figure C-24. CSU for Hubbard Mesa Open OHV Riding Area
Roan Plateau Proposed Plan
August 2006

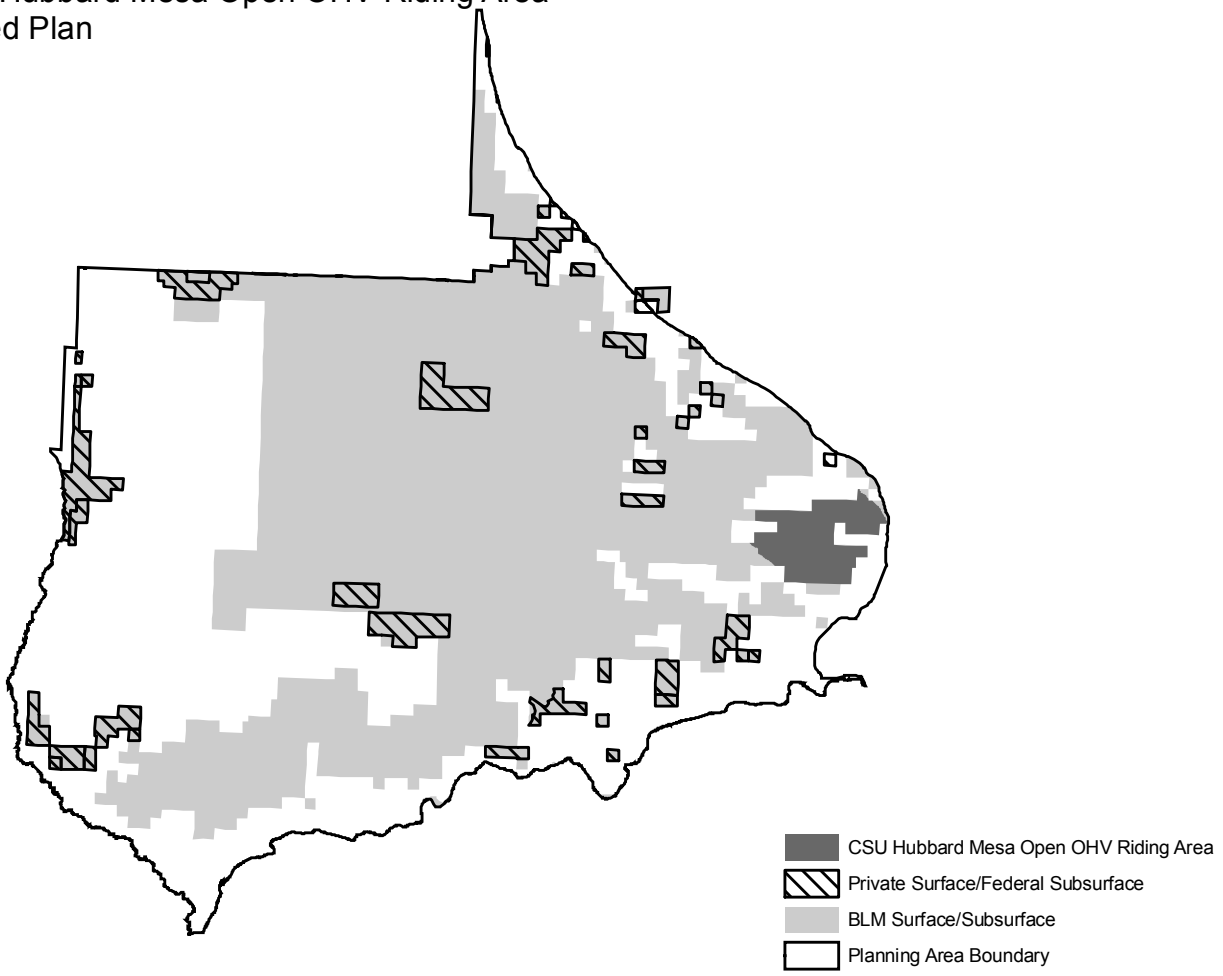


Figure C-25. TL for Big Game Winter Range
Roan Plateau Proposed Plan
August 2006

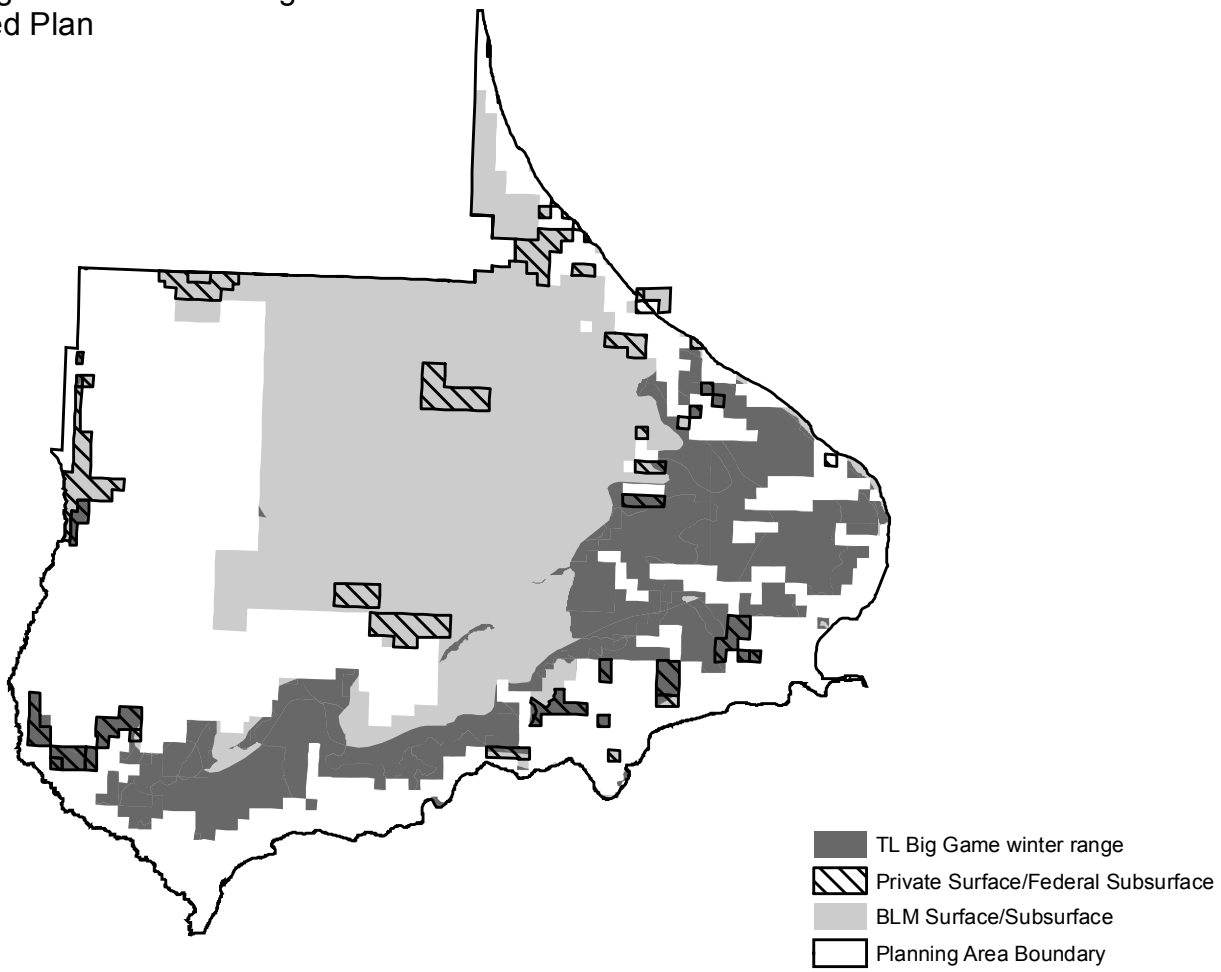



Figure C-26. TL for Active Raptor Nest Sites
Roan Plateau Proposed Plan
August 2006

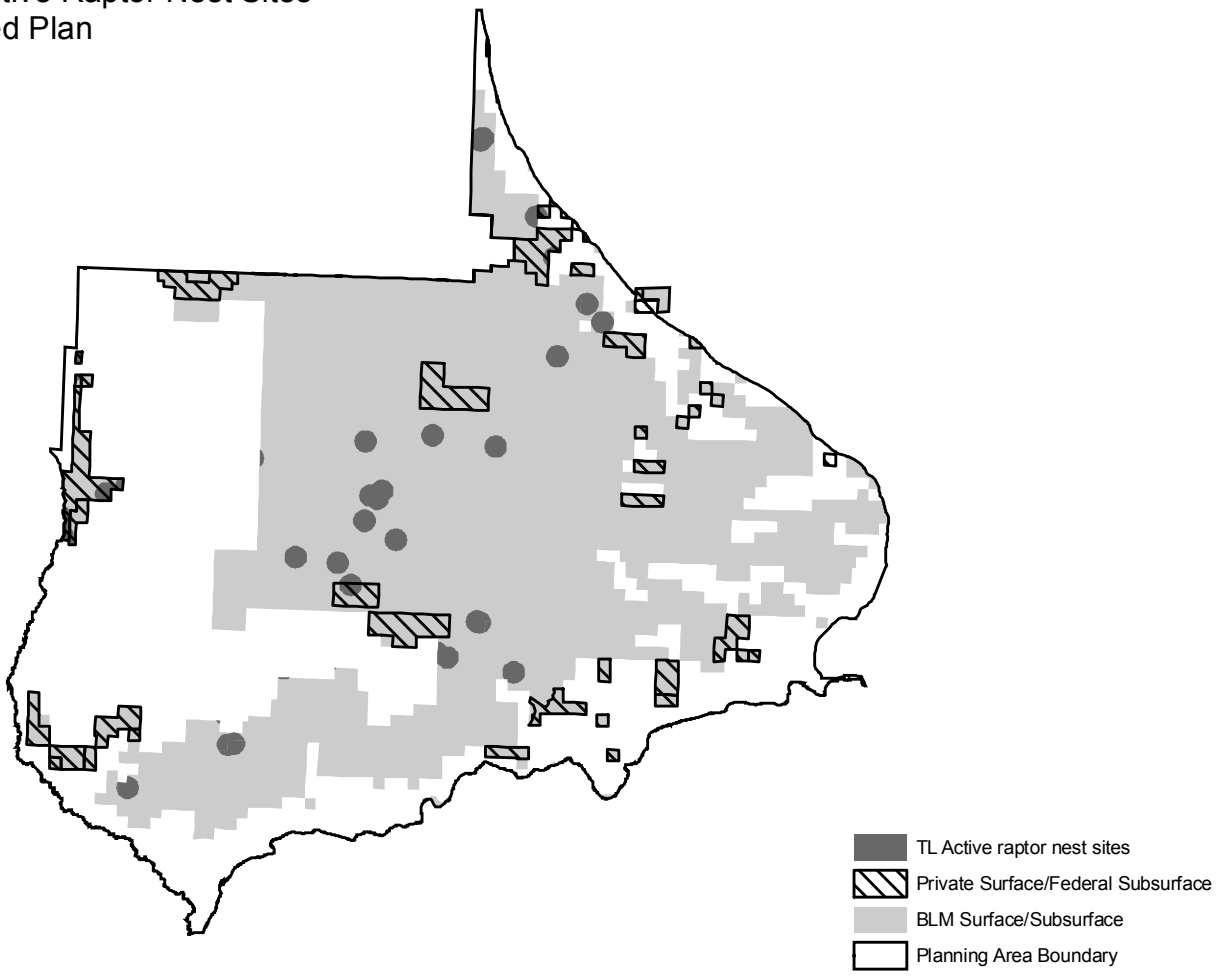


Figure C-27. TL for Bald Eagle Nest or Winter Roost Sites
Roan Plateau Proposed Plan
August 2006

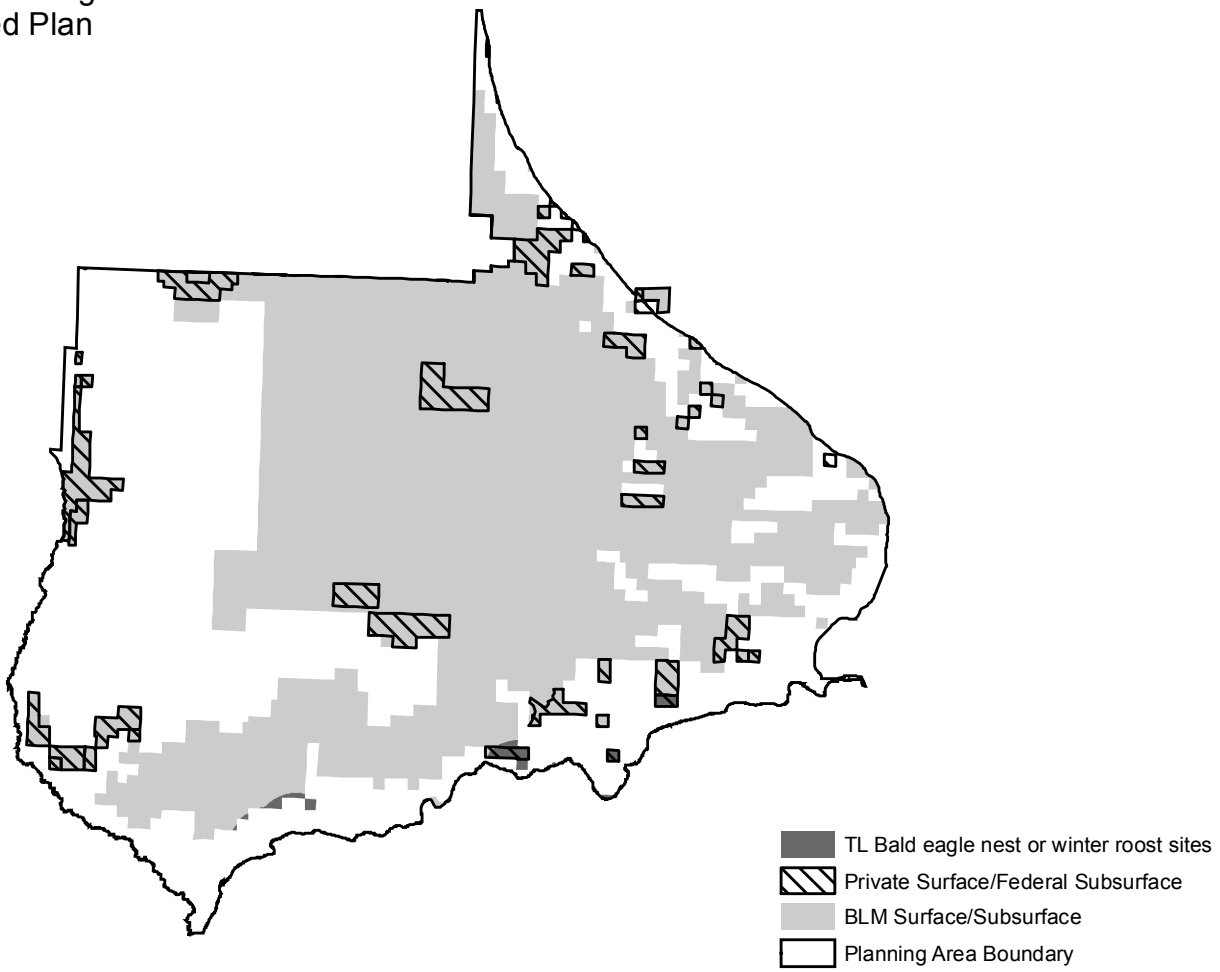



Figure C-28. TL for Peregine Falcon Cliff Nesting
Roan Plateau Proposed Plan
August 2006

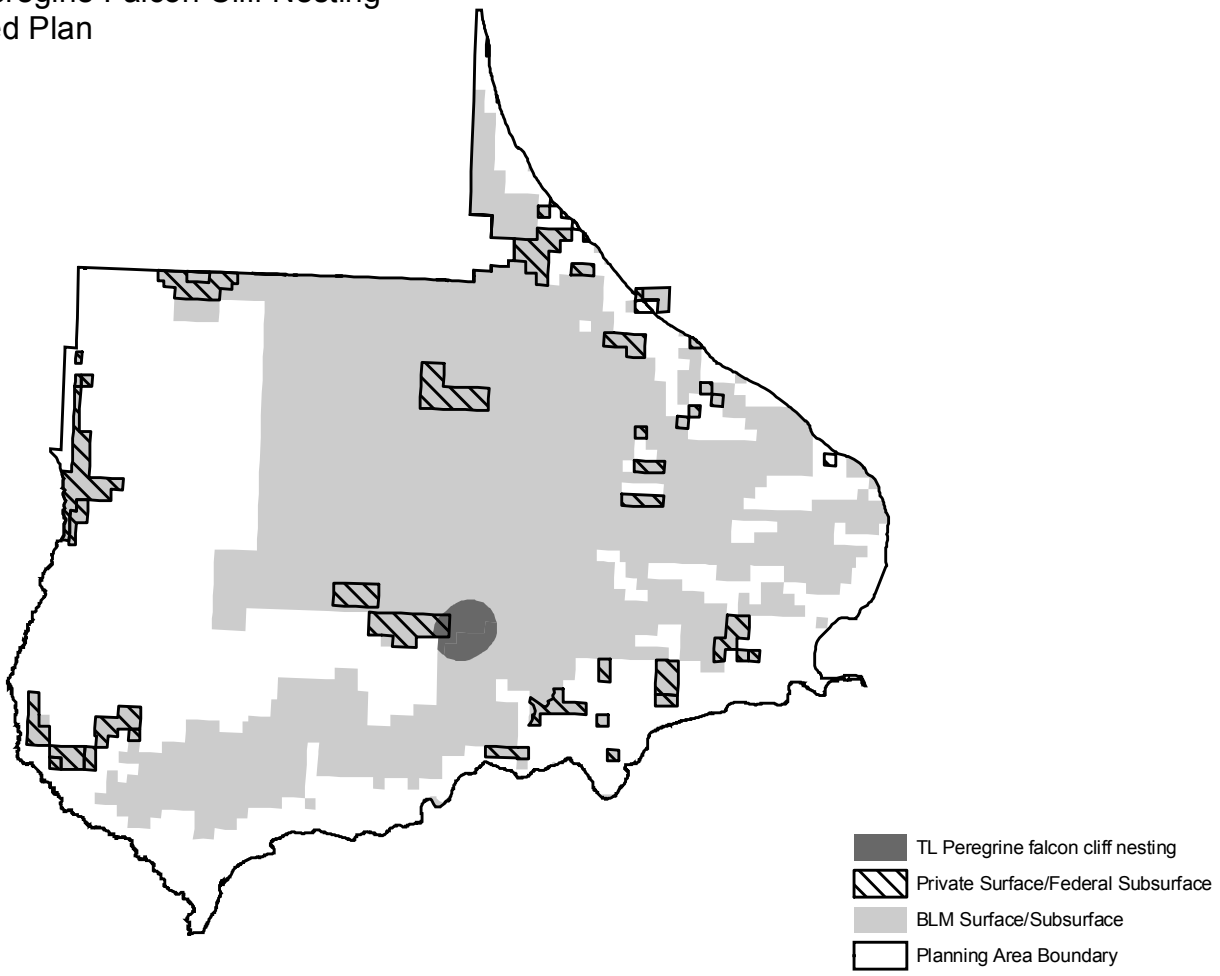
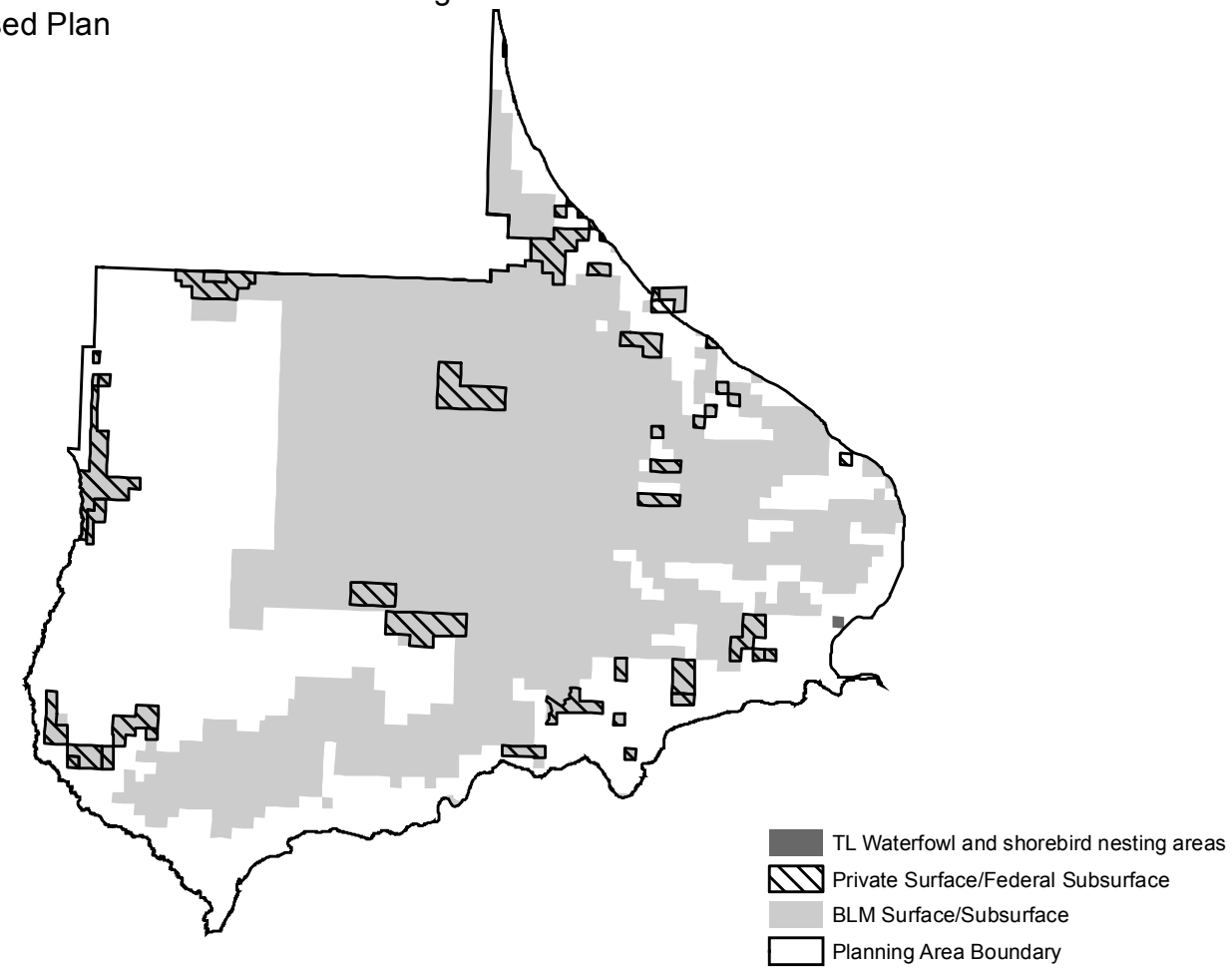


Figure C-29. TL for Waterfowl and Shorebird Nesting Areas
Roan Plateau Proposed Plan
August 2006



# Appendix D

Visual Resource Management (VRM) Classes and Objectives

# Appendix D

## 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 portrays the relative value of the visual resources, and (2) a management tool that portrays 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 (VRM) 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 that the project may have on those values. Management decisions in the RMP must reflect the value of visual resources. In fact, the value of the visual resource 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 (ACECs) 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 seen 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. These 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**

Many proposed actions will require visual simulations to be done by the proponent or private contractors. Visual simulations will be done 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 depicting any and all parts of the proposed action. This includes all structures and supporting infrastructure (roads, utilities, etc.) and the resulting disturbances to the surrounding landscape.

All requested simulations will be evaluated by the BLM staff to determine their accuracy and will become an official part of the documentation files (SEIS, EA, CX, etc.) for the proposed actions. Analysis and mitigation measures will be based on these simulations, and the proponent's end product will be held to the final visual simulation documents. If the end result is not what was represented within the visual simulations, the proponent will be out of compliance with the project proposal and the Environmental Assessment.

# Appendix E

BLM Recreation Guidelines to Meet Public Land Health Standards in Colorado

Recreation Opportunity Spectrum (ROS) Classes

| 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.<br>2. Minimize disturbances and manage recreation use in riparian areas to protect vegetation, fragile soils, springs, and wetlands.<br>3. Plan and locate routes, trails, and developments away from riparian and wetland areas and highly erodible soils.<br>4. Reduce stream crossings to the minimal number dictated by the topography. Reduce sedimentation and compaction associated with stream crossings.<br>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.<br>2. Protect against the establishment or spread of noxious weeds.<br>3. Protect wildlife habitat by preserving connectivity and avoiding fragmentation.<br>4. Minimize wildlife disturbances and artificial attractions such as feeding wild animals or improper disposal of garbage.<br>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.<br>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. | Onsite management controls and regulations are numerous and cannot go unnoticed. Intensively managed. Multiple activities may occur. Regular highway vehicles are present |
| **Rural**<br><br>**(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 of contact with others. Culturally modified landscape. People are almost continually in view. | Onsite management controls and regulations are numerous and easy to see. Land uses obvious. |
| **Front Country**<br><br>**(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**<br><br>**(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**<br><br>**(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. |

# Appendix F

Standards for Public Land Health in Colorado

BLM Guidelines for Livestock Grazing Management in Colorado

# Appendix F

## 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 the 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 are 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 that have root systems capable of withstanding high streamflow events.
- Plant species present indicate maintenance of riparian moisture characteristics.
- Stream is in balance with the 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 with 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 composed of several plant communities that may be in a variety of successional stages and patterns.

**Standard 4:** *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.

**Standard 5:** *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 the 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

*This Appendix has been removed from the Proposed Plan/Final EIS*

# Appendix H

Roan Plateau Planning Area
Oil and Gas Reasonable Foreseeable Development
Prepared by
BLM Colorado State Office

**Appendix H**
**11/30/05**
**Roan Plateau Planning Area**
**Oil and Gas Reasonable Foreseeable Development**

## Summary

The Roan Plateau Planning Area (RPPA) can be divided into two areas: upper plateau and lower plateau (See Figure 1b). The Oil and Gas Reasonable Foreseeable Development (RFD) for the RPPA is that 3,176 Mesaverde and Wasatch federal mineral estate wells are forecasted to be drilled within the RPPA over the 20 year life of the plan. From these federal mineral estate wells, 3,632 BCF[1] of gas and 8,066BO will be recovered over the next 20 years - predominantly from the Mesaverde. Of the 3,176 wells projected to be drilled, 480 wells are projected for the upper plateau and 2,696 wells are projected for the lower plateau within the RPPA. While Coal Bed Methane exists in the Cameo Coal zone of the Mesaverde in the RPPA, it is found at much deeper depths and does not have the well-developed natural fracture permeability exhibited elsewhere in the rocky mountain region. As such, the Cameo Coal zone in the RPPA 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 RPPA is calculated as 15,416 BCF[2], with federal lands comprising 8,933 BCF[3] of this amount. For federal lands, the upper and lower plateau comprise 4,219 BCF and 4,713 BCF respectively[4]. 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 proved reserves. The estimated technically recoverable gas resource within the RPPA represents 53% of this amount. According to Dwights energy data, only 14 wells were dry and abandoned out of 802 wells drilled within the RPPA. This represents a 98% success ratio. A historical area summary as well as RFD projections on private minerals as well as federal minerals are summarized in Tables 1 and 2. Road, pipeline and well pad disturbance projections will be discussed in the RPPA Environmental Impact Statement and are therefore not part of this RFD.

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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; B – Barrels; CF – Cubic Feet;

[2] 15,416 BCF = 127,009 RPPA acres * (1.17 BCF/10 acre Mesaverde well + 0.7 BCF/160 acre Wasatch well); See Table 2

[3] 8,933 BCF = 15,416 BCF * 73,597 Federal acres/127,009 RPPA acres; See Table 2

[4] 4,219 BCF = 15,416 BCF * (34,758 upper acres/127,009 RPPA acres)
4,713 BCF = 15,416 BCF * (38,833 lower acres/127,009 RPPA acres); See Table 2

## Appendix H

## Introduction

The RPPA consist of 127,009 acres. Of which 73,597 acres contain federal minerals available for oil and gas development. Of the 73,597 federal acres, about 18,744 acres are presently leased. Contained entirely within the RPPA are NOSRs 1 and 3 which were transferred to the BLM from the Department of Energy (DOE) under the Defense Authorization Act of 1997 (DAA). About 36,363 and 18,993 acres comprise NOSRs 1 and 3, respectively. 53,800 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 1 provides an area summary of the RPPA.

The RPPA contain parts of three active gas fields including the Grand Valley, Parachute and Rulison (See Figure 1a). 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. Development started in the 1940s. According to Dwights Energy June 28, 2005, data as of May 1, 2005, and as summarized in Table 1, 958 wells have been spud (787 drilled and completed) within the RPPA. Of those drilled, 14 have been drilled and abandoned (D&A). 674 wells (608 Mesaverde, 64 Wasatch and 2 other) remain as productive wells as of May 1, 2005, in the RPPA. Of the 958 wells, 219 were spud (197 drilled and completed) on federal oil and gas minerals. Drilling started on federal land on the NOSR in 1980, by the DOE. Figures 1a and 1d depict mineral ownership, petroleum field boundaries, and existing leases and agreements. Figure 1b depicts the wells in the area. Production is mainly gas with a little associated condensate mainly from the Mesaverde.

## Oil and Gas Resource Potential

## Previous Work

The DOE prepared two reports which discussed 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. Geologic studies were also conducted in 1988 and 1990 as part of the Department of Energy's Multi Well Experiment (MWX), which characterized the Mesaverde low permeability reservoirs and developed technology for their production. In addition, Ron Gunnufson, BLM Colorado State Office Geologist, prepared a report on the geologic potential of the area on October 14, 1999 and Brian Macke (Director of the Colorado Oil and Gas Conservation Commission) prepared a related report on August 26, 2005. The USGS prepared an oil and gas assessment report in 2003 for the Piceance Basin. The following discussion incorporates information from those reports, except where otherwise noted. See Figure 7 for stratigraphic column.

## Geology

## Appendix H

### Williams Fork Formation

The principal drilling objective in the RPPA is the gas-bearing fluvial sand section present in the Williams Fork Formation of the Mesaverde Group. This includes the Cameo Member found directly above the prominent Rollins Sandstone at the base of the Williams Fork. The Williams Fork is approximately 3,600 feet thick (Rulison Field), of which the lower 2,400 feet is gas saturated in the Rulison Field, and lower 1,500 feet in the Grand Valley Field. In the lower plateau, depth to the base of the Williams Fork (Rollins Sandstone) is about 7,000-8,000 feet. On the upper plateau, depths are about 3,000 feet greater.

The fluvial section in the Williams Fork Formation consists almost totally of lenticular channel sandstones and fine grained flood plain deposits which were deposited on a coastal plain behind the retreating Late Cretaceous coastline. Lorenz (1985) best described this section as consisting of meander belt river-channel sandstones inter-bedded with muddy flood plain, levee and swamp deposits. Lorenz stated that the average meander-belt width for the fluvial section of the Williams Fork Formation is 1,500 feet but within that meander-belt width are numerous point bar deposits, with each sandstone body generally not exceeding 700-800 feet in width. The point bar sand bodies are stacked vertically throughout the thickness of the formation. Studies show that the point-bar reservoirs are layered, do not communicate vertically, are naturally isolated from each other, have an asymmetric drainage pattern based on natural fracture distribution, and that drainage from a well is limited to the aerial extent of the point bar sand bodies. This explains why wells that penetrate the fluvial section encounter 10 to 25 + different, individual sandstone reservoirs that are tight and lenticular with very limited extent. These discontinuous and compartmentalized sand bodies have a very limited aerial extent which requires that wells be drilled closer together in order to adequately recover the gas and associated hydrocarbons and prevent resource waste.

The lenticular nature of the fluvial sandstone reservoirs form the major trapping mechanism at Rulison, Parachute and Grand Valley Fields with regional extension fractures enhancing this production. The source rocks for the fluvial section are the Cameo Coals and associated carbonaceous shales.

Production rates from the sands are highly variable and are a function of depth, porosity and permeability, continuity of individual sands, degree of natural fracturing, number of sands penetrated and other geologic factors which vary from well to well. The Williams Fork gas wells produce some associated condensate but little water. Initial well production for Williams Fork wells averages 1,360 MCF/D. During an April 2001, spacing hearing before the Colorado Oil and Gas Conservation Commission, Williams estimated Mesaverde reserves to be 1.25 -1.86 BCF /Well.

Geologically, there is little risk in extending the existing Grand Valley, Parachute and Rulison Fields into NOSR 1. It is expected that the Williams Fork gas saturated zone will probably underlie most of the plateau. Very few dry holes have been drilled in the Grand Valley, Parachute and Rulison Fields due to the nature of the play. Risks are minimized because the wells are drilled into

a pre-dominantly gas saturated section encompassing an enormous area. Gas sand reservoirs may lack continuity and may not be correlative between closely spaced wells, but each well will penetrate numerous productive reservoirs, unique to that well. There are smaller risks related to the geologic and engineering heterogeneities (such as permeability, porosity, faults, fracture systems, structural irregularities, etc.) that are unique to each well, which is evidenced by the large range in production rates.

**Wasatch Formation**

The DOE report considered the Wasatch reserves as second only to Mesaverde potential. The Wasatch Formation is Eocene to Paleocene in age and consists of multiple, lenticular sandstone lenses interbedded with bentonitic varicolored shales and siltstones. The sands of the Wasatch were deposited as channels cut into the shales and siltstones. The sands which usually contain high clay content are considered "tight" with low permeability.

Most of the Wasatch production in the RPPA is expected to be derived from the G Sand of the Molina Member. Production has been established in the G Sand in the Rulison, Parachute and Grand Valley Fields. Due to the heterogeneous make-up of this formation trapping mechanisms are normally stratigraphic in nature. Economic gas production rates and recoveries are highly dependent on natural and induced fracture systems within the reservoirs. Below the rim, the Wasatch Formation is found from the surface down to a depth of about 3500 feet. Most production from this formation has been derived from depths between 2,000-3,000 feet. Wasatch reserves are estimated to be about 0.7 BCF/Well and initial well production averages 270 MCF/D.

One factor affecting potential Wasatch development could be the relatively deep drilling depths required to reach the "G Sand" and the other reservoirs of the Wasatch on top of the plateau since the top is about 3,000 feet higher than the majority of the producing wells situated to the south. In December of 1990 Barrett Resources Corporation completed a Wasatch G Sand well only 1179 feet from the southern boundary of NOSR-1. The Allen Point #1-8-95 was completed between the depths of 5887-5933 feet and had an initial well production of 230 MCFGPD with no oil and no water. The ground surface elevation of this well was 8,516 feet. If the Wasatch G Sand approaches a depth of nearly 6,000 feet near the southern boundary of NOSR-1 (and structurally the regional dip underlying much of this area is to the northeast) then depths to the G Sand could be in excess of 7,000 feet. Traditionally in many areas of northwestern Colorado the Wasatch has been developed at depths between 2,000-3,000 feet with typical initial well productions of 200-300 MCFGPD.

**Coal Bed Natural Gas (CBNG)**

The Cameo Coal Zone is the basal member of the Williams Fork Formation, and the coal beds represent a potential reservoir component within the Mesaverde Group. This section reflects a paludal (swamp) depositional environment landward of the prograding Rollins paleoshoreline. In the Grand Valley Field, the Cameo coal zone is about 470 feet thick and contains 50 to 70 feet of

net coal with the thicker coals occurring near the base of the zone. The zone thickens regionally from the Grand Valley Field to the Parachute Field.

While CBNG exists in the Cameo coals, they lack 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. Well test data from the Parachute Field indicate that in situ coal permeability ranges from 0.02 to 0.2 md. In the Grand Valley Field the absence of well developed cleat systems and the lack of abundant open fractures is probably related to the depth of rock overlying the coals and to the lack of faulting in the area. With the exception of any structurally impacted areas on top of the plateau, coal beds could be subjected to even less fracturing, with greater thicknesses of overburden, resulting in less developed cleat and fracture systems which would equate to less gas production.

The CBNG potential was also evaluated in several studies which concluded that permeability in coals is significantly reduced with depth. At a depth of about 7,000 the permeability would be so low that coalbed methane could not flow in economic quantities (SPE 26196, 1993). The USGS geologic assessment of oil and gas (2003) delineated a coalbed natural gas area in the Grand Valley and Parachute fields to a depth of 7,000 based on Barrett Resources completing 51 wells in the coal beds to near that depth between 1989 and 1992. However, USGS noted that most of the wells were dual coal bed and sandstone completions, and that the coal beds were contributing only small amounts of gas to the overall production. The DOE's Coalbed Methane Primer (2004) noted that due to the depth of Piceance Basin coals, permeability is reduced, thereby hindering extraction.

It should be noted that the Cameo coals in the White River Dome area in the northeastern part of the Piceance Basin are productive at deeper depths. CBNG production has occurred down to a depth of 8,140' (Olson, 2003). The coals have low permeability, but higher than the sandstones. Coal permeability is derived from the cleats and natural fractures.

Although there are current problems associated with commercial development of CBNG within the RPPA, the future potential is unknown.

### Iles Formation

The Iles Formation underlies the Williams Fork Formation and comprises the lowest part of the Mesaverde Group. The Rollins, Cozzette, and Corcoran Sandstone Members reflect distributary channel, and beach (shoreline and offshore bar sands) depositional environments. Significant gas production from the Cozzette and Corcoran Sandstones occurs in other fields to the south and west, but is very minimal within the RPPA. Therefore, the future potential of this resource is unknown.

### Mancos Shale, Dakota Sandstone

The DOE report states that hydrocarbons could exist in the Upper Cretaceous Mancos Shale in fractured reservoirs, in the Lower Cretaceous Dakota Sandstone and Cedar Mountain-Burro Canyon

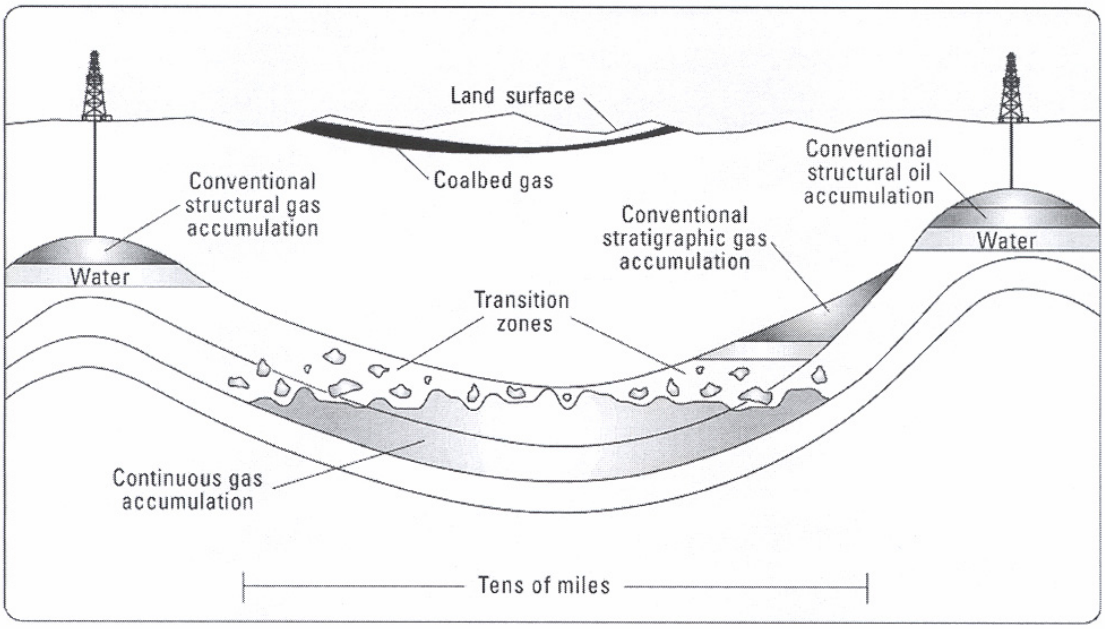
Formations, Jurassic Morrison Formation and in Paleozoic strata. With the possible exception of the Mancos Shale all of the above formations would probably occur at depths in excess of 15,000 feet which significantly reduces their importance as viable objectives in this area. In addition the Cedar Mountain-Burro Canyon Formations are actually stratigraphic lateral equivalents, and the Cedar Mountain component present in portions of northwestern Colorado may actually be absent in the NOSR-1 area.

## USGS Oil and Gas Assessment Units

The USGS oil and gas assessment project (2003) for the Piceance and Uinta Basins developed geologically based hypotheses regarding the potential for oil and gas reserves. The focus was to determine the distribution, quantity, and availability of oil and gas resources, with an emphasis on undiscovered resources underlying federal lands. The approach was to establish the framework geology, define the major total petroleum systems (TPS), define assessment units within the TPS, and assess the potential for additions to reserves.

Each TPS is a mapable accumulation of gas which was generated by a pod of mature source rock. In addition, USGS mapped the reservoirs, traps, and seals necessary for gas accumulations to exist. Within each TPS, assessment units were developed, which encompass conventional or continuous accumulations sharing similar geologic traits. The two Piceance Basin TPS designations are the Mancos and Mesaverde. An assessment unit may contain multiple plays.

Hydrocarbons generated from coals and carbonaceous shales in the Williams Fork Formation define the limits of the Mesaverde TPS. That portion of the area underlain by the lowest coal zone in the Williams Fork is included in the Mesaverde TPS. Gas migrated into low permeability, lenticular sandstone beds, resulting in basin-centered accumulations, such as found in the Rulison and Mamm Creek Fields. The TPS includes the lowest major coal zone (Cameo zone), potential reservoirs in overlying fluvial sands of the Williams Fork fluvial sands, and sands within the Wasatch Formation. There are 4 assessment units within the Mesaverde TPS which overlap the RPPA – continuous gas, transitional gas, coal bed gas, and conventional gas.




**Schematic diagram of the types of oil and gas resources in USGS assessment**

Continuous gas units include and overlie Mesaverde source rocks where thermal maturity values are highest, and include basin-centered gas accumulations characterized by gas-saturated sandstone reservoirs. The primary reservoirs are the lenticular, fluvial channel sandstones in the Williams Fork and overlying Wasatch Formation. In a continuous-type accumulation, the deep basin gas-saturation zone cuts across formation boundaries and basically gas production that is water free can be established wherever permeability is sufficient to yield economic flows. Traps such as structural closures and updip stratigraphic pinch-outs are not necessary for trapping gas in this type of gas accumulation. Artificial fracture treatments are normally required because sandstone reservoirs in deep basin continuous accumulations are "tight" and generally characterized by low porosities (<8%) and very low permeabilities (usually less than 0.1 md). Near the basin margins and closer to outcrops (Roan Cliffs) sandstone reservoirs could be saturated with fresh water.

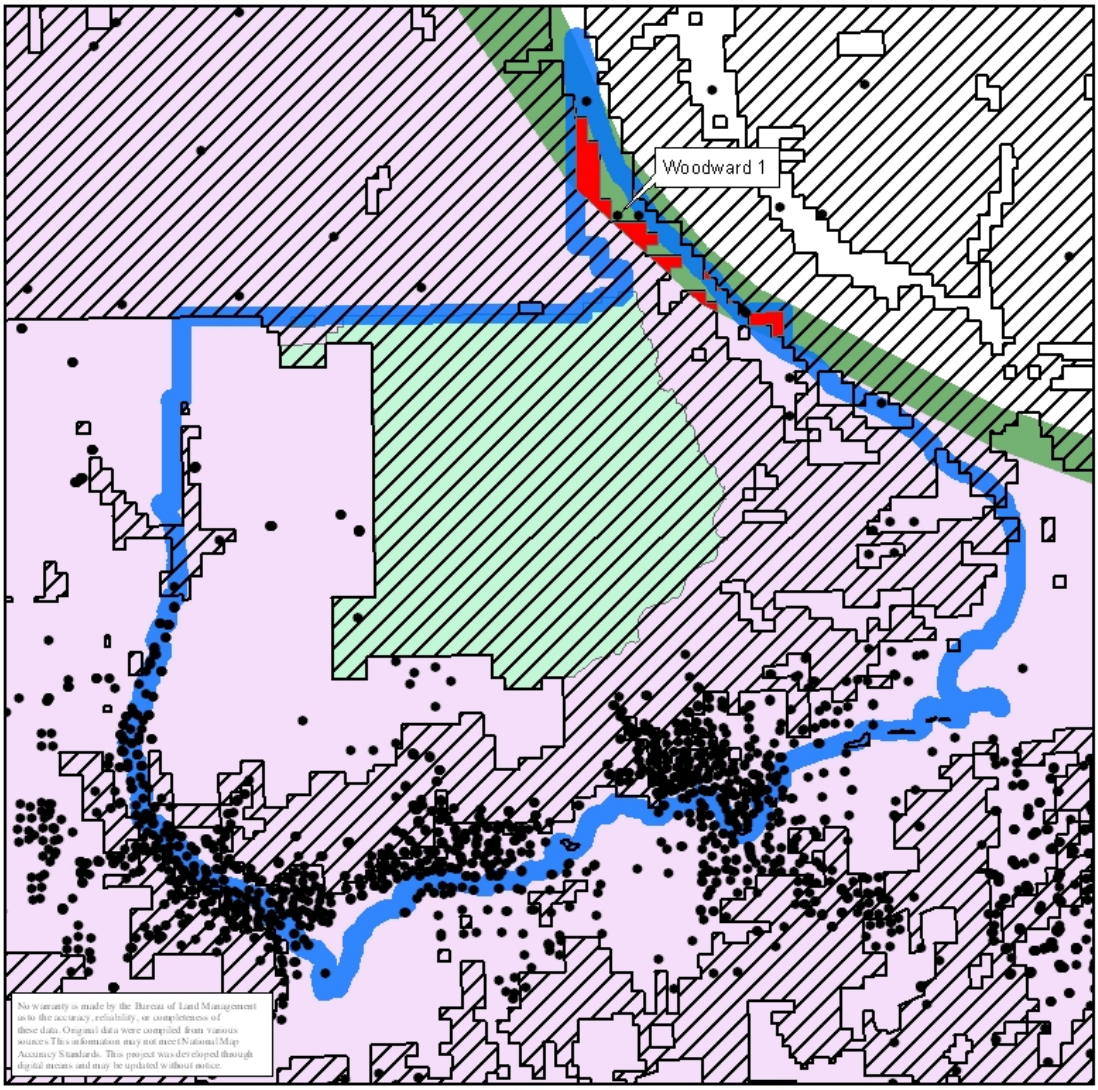
Updip from the continuously gas-saturated zone a transitional zone may exist with reservoirs containing a mixture of gas and water in more traditional stratigraphic traps with downdip gas-water contacts. Transitional units represent the transition zone surrounding the basin-centered accumulation and are characterized by a combination of gas-saturated and water-wet reservoirs, having source rocks with lower thermal maturity values.

The transitional unit has incomplete gas saturation as compared to the continuous unit, with increased chance of penetrating water-wet reservoirs (Johnson and Roberts, 2002).

Conventional gas units include reservoirs with conventional-type structural and stratigraphic traps and discrete gas-water contacts. According to USGS, there is a small potential for conventional reservoirs in the Wasatch Formation and fluvial channel sands of the Williams Fork along the basin

margins.

The oil and gas resource potential map shows that nearly the entire planning area is underlain by the Mesaverde continuous gas unit, and therefore is considered to have a similarly high gas resource potential. However, the extreme north end falls within the transitional gas unit along the steeply dipping Grand Hogback and is projected to have a lower gas resource potential. The Woodward 1 well, drilled by Williams Production in 2002, is located in section 22, T 4 S, R 94 W. in the north end of the plan area within the Mesaverde transitional gas unit. The total depth was 12,850' in the Sego Sandstone (upper Mancos). It was completed in the Mesaverde, but average production for the entire 500-day production period has only been 89 MCF/day, and the well is currently shut-in. By comparison, typical production from the Rulison Field (nearest field) averaged 821 MCF/day based on the initial 500-day production period for 15 representative wells. (Note: The above data on the Woodward 1 well and production data was obtained and compiled from the COGCC public website.) About 1100 acres of federal mineral estate and 1700 acres of fee lands within the planning area lie within the transitional gas unit (2800 acres total). Because the federal acreage having lower resource potential is a tiny fraction of the planning area total, any changes to the overall RFD well projections would be minimal.




**Oil and Gas Resource Potential within the Roan Plateau Planning Area**

- Gas Wells (producing, shut in, plugged/dry and abandoned, proposed locations)
- Federal minerals within the Roan Plateau Planning Area within the Mesaverde Transitional Gas Unit. 1100 acres
- Mesaverde Transitional Gas Unit
- Mesaverde Continuous Gas Unit
- Federal Minerals
- Roan Plateau Planning Area Boundary
- Upper Plateau

Map based on USGS Petroleum Systems and Geologic Assessment of Oil and Gas in the Uinta-Piceance Province, Utah and Colorado, 2003.

N

0 2 4 6 8 10 Miles

This map was produced by the BLM Grand Junction field Office, June 2005 t:\gisuser\bfowler\cg\roan_USGS.mxd

## Appendix H

## Oil and Gas Activity

### Past Development

In the early 1980's, 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 25-30 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".

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 seven wells per year, a total of 184 wells by May 1, 2005. In the last 7 years, drilling has been increasing at a rate of about 27 wells per year on private and federal. The average number of wells drilled per year for the last seven years is about 115 wells per year with an expected 250 wells drilled in 2005. As of May 1, 1999, there were 141 Mesaverde and 45 Wasatch wells. As of May 1, 2005, there were 608 Mesaverde and 64 Wasatch wells. In the NOSR, there were 27 wells as of May 1, 1999, and 123 wells as of May 1, 2005. The number of wells drilled annually on federal and private mineral estate is depicted on Figures 2 and 2a

### Present Development

During January, 1999, a Supplemental Environmental Impact Statement (SEIS) covering impacts from oil and gas 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 May 1, 2005, Dwights Energy Data reveals that there are 124 spudded and completed wells in the NOSR. These completions are located on the 4 NOSR leases. As of May 1, 2005, there are 123 wells producing.

Directional drilling in the RPPA has increased substantially in recent years. Prior to January 1, 2001, a total of 17 wells were completed as directional wells in the RPPA. During 2001, 2002, 2003 and 2004, 18, 48, 50 and 132 wells respectively were completed directionally. As of May 1, 2005, a total 328 wells were completed as directional wells. 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.

The operator of the NOSR leases (Williams) proposed 160 federal wells for this area drilled from 39 new locations and 21 existing locations. The environmental assessment for this proposal is the Wheeler to Webster Geographic Area Proposal (WWGAP) and is dated July 2002. In this proposal,

there were two to three wells per location with as many as seven wells on a single location. In 2004, the WWGAP was amended to add an additional 55 wells. All wells proposed in this action were to be drilled from existing gas well locations. Then in 2005, Williams proposed to drill up to 213 additional natural gas wells within the Wheeler to Webster project area during a two-to-three year program. The plan proposed to drill these 213 new wells from up to 12 previously analyzed new surface locations plus 47 existing well pads for a total of 59 well pads. The wells will all be directionally drilled. All of the 59 well pads would have multiple well bores. Of the 213 proposed wells, 19 would be based on 40-acre bottom hole spacing, 38 would be based on 20-acre bottom hole spacing, and 156 would be based on 10-acre bottom hole spacing patterns. All of the 213 proposed wells would be drilled on existing Williams's leases. Combinations of the following development scenarios are proposed:

- Forty-seven existing well pads to obtain 180 bottom hole locations;
- Twelve new well pads to obtain 33 bottom hole locations; and
- Multi-well locations where up to ten additional wells would be drilled from a single well pad.

If fully developed, this proposal would result in an additional 213 new bottom hole locations. Williams expects to drill up to 30 of the proposed wells in 2005 and an equal or greater number per year in subsequent years. As one can see, future plans from the operator call for a stronger emphasis on directional drilling multiple wells from common pads.

The COGCC requires that all applications for increased oil and gas well density are supported by evidence and testimony that shows that the additional wells are necessary to recover the resource. Prior to 1994, much of the area was approved by the COGCC for one Mesaverde group well per 640, 320 or 160 acre drilling spacing unit. Beginning in 1994, it was determined that the existing wells were not adequately recovering the natural gas resources from the Williams Fork Formation primarily because of the geological characteristics of the Williams Fork Formation. Increased downhole well density to 80 acres for the Williams Fork was approved by the COGCC in 1994. Forty-acre down-hole spacing was approved in 1995. 20-acre down-hole spacing was approved in 1996 in a limited area as a pilot. Then, in 1998, 20 acre well density for the Grand Valley, Rulison and Parachute fields was approved with most of the lands limited to 40 acre surface well density and a small portion approved for 20 acre surface well density. The COGCC then approved a limited 10 acre subsurface well density pilot in 2001. During a COGCC administrative hearing held prior to an April 21, 2003, hearing, and further supported by July 2, 2003, industry testimony before the COGCC and a Williams May 20, 2003, report, it was determined that 20 acre well spacing would recover only about 40% of the gas in place. Wells drilled on 10 acre spacing would recover approximately 80% of the gas in place. Industry further testified that based on measurements of the Williams Fork Formation of the Mesaverde group where it outcrops near Cameo, Colorado, that the average lateral extent of the point-bar sand bodies that make up the Williams Fork Formation is 682 feet and is consistent with 10-acre spacing of 660 feet. Also, log cross sections were presented that further supported discontinuous sand bodies that are probably not connected. Additional data support laterally stacked meander belt complexes and point bar sandstone deposits of the Williams Fork Formation. The meander belts have an average thickness of 1500 feet with the average sand body width being approximately 750 feet. It was also shown that

little or no production interference was exhibited between wells drilled at 10 acre spacing. Ten acre down-hole well spacing for the Williams Fork was approved by the COGCC on April 21, 2003, for fee lands and August 18, 2003, for federal lands. As of August 2005, the COGCC has approved 127,094 acres of lands for 10 acre subsurface well density Williams Fork Formation natural gas and associated hydrocarbon development with most of the lands in and adjacent to the Roan Planning Area. As of August 2005, Williams has approximately 39,429 acres of land approved by the COGCC for 10-acre down-hole Williams Fork spacing on private and federal land in the area. Approximately 21,000 acres of these 10-acre lands are in the planning area. Over 90% of the existing federal leases and communitization agreements (CAs) in the planning area are currently approved for 10-acre down-hole spacing for the Mesaverde (See figure 1c).

While it is anticipated that the reservoir characteristics of the upper plateau are similar to the lower plateau, drilling will not be similar. On the upper plateau, an additional 2,000 to 3,000 feet of Uintah and Green River formations must be penetrated as compared to the lower plateau. The mineral make-up of these two formations results in drilling problems including water flows, lost circulation and swelling and sloughing clays. Also, the operator reports that lost circulation was encountered in the Wasatch due to the additional 2,000 to 3,000 feet of overburden present in the upper plateau. These hole problems result in drilling difficulties including differential drill pipe sticking and lost circulation which have not been overcome as of yet. 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 six months of the year as reported by industry and an average Mesaverde well drilling and completion would be extended to 30 days.

## RPPA Production

Between May 1, 1999, and May 1, 2005, Cumulative gas and oil production from the RPPA has increased from 126 BCF and 195 MBO to 390 BCF and 553 MBO. Monthly gas production from the RPPA between the same periods increased from 1,531 MMCF to 6,367 MMCF. Monthly oil production increased from 2,678 BO to 11,994 BO. Between the same periods, federal oil and gas minerals cumulative production has increased from 26 BCF and 50 MBO to 89 BCF and 161 MBO. Monthly federal gas and oil has increased from 270 MMCF and 782 BO to 2,320 MMCF and 6,282 BO. These figures support a gas production rate increase of about 316% on federal and private land and 190% on just federal land between the periods. As of May 1, 2005, cumulative federal gas production from the Mesaverde is 78 BCF and 11 BCF from the Wasatch. From these figures, one can conclude that Mesaverde is about 88% of the total production. Cumulative total and federal water production is 4,052 BW and 1,207 BW, respectively as of May 1, 2005. Between May 1, 1999, and May 1, 2005, cumulative gas and oil production from the NOSR has increased from 14 BCF and 19 MBO to 50 BCF and 61 MBO respectively. Monthly gas production increased from 95 MMCF and 183 BO to 1,472 MMCF and 3,840 BO respectively. Production figures are from the June 28, 2005, Dwights Energy Data load and are summarized in Table 1.

Over the period from 1994 to 2004, production from the Piceance Basin has inclined at about 10%

per year (Figure 3) and production from the Grand Valley, Rulison and Parachute fields has inclined at about 20% per year (Figure 4). From this data, one can conclude that production incline in the area of the Roan Plateau exceeds the production incline in the Piceance Basin as a whole.

## Reasonable Foreseeable Development

The Reasonable Foreseeable Development (RFD) is the level of oil and gas development activity, constrained only by technical and legal constraints, 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 high oil and gas potential areas, known as Region 4. The projections were subsequently increased to 90 wells total and 72 in Region 4. By 1997, or six years after implementation of the FEIS, 72 wells had been authorized in Region 4.

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, emphasis is being placed on recent oil and gas activity, operator plans and the geology of the productive horizons.

The geology and reservoir characteristics require that the Williams Fork Formation be developed on 10 acre subsurface well density to adequately recover the natural gas and associated hydrocarbon resources within the Roan Planning Area. Lesser development interest will exist for the Wasatch and it will be developed at 160 acre spacing.

Exploration activity on the upper plateau will be limited due to one suitable access road, a weather drilling window of six 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 improbable at this time but it is anticipated that drilling technology will improve so that by year four, directional drilling will be utilized. Also, wells drilled on the upper plateau - federal minerals would be limited to drilling 6 months with 1 rig running for the first 3 years, 3 rigs running for the next 4 years , then 5 rigs running for the next 13 years. Wells drilled on the upper plateau – private minerals would follow a similar schedule but have more rigs running because of better access, existing surface use agreements and less government involvement on private land. Two rigs will be running during the first 3 years, then 5 rigs running for the next 4 years and 5 rigs running for the remaining 13 years. An average upper

plateau well would take 30 days average time to drill. Using this staged development, a total of 1,026 wells will be drilled over 20 years on the upper plateau as presented on line 10 of Table 2. This is about 15% of the number of wells (6,725 wells, as seen on line 6' of Table 2) that will eventually be drilled on the upper plateau. Currently, 90% of the wells are Mesaverde and 10% of the wells are Wasatch. In the future, it is assumed that Wasatch will be developed at 160 acre downhole spacing and Mesaverde at 10 acre downhole spacing (i.e., 1 Wasatch well for every 16 Mesaverde wells). After subtracting existing wells, the 1,026 wells will result in 967 Mesaverde and 59 Wasatch wells forecasted to be drilled as presented on lines 11 and 12 of Table 2.

To determine the number of well pads for the upper plateau, it is assumed that wells will be vertically drilled through year three. In year 4, drilling technology will be developed that will facilitate wells being directionally drilled. As such, vertical wells will be drilled one per pad for the first 3 years. Starting in year 4, three additional wells, drilled directionally, will be drilled on each existing pad for a total of 4 Mesaverde wells per pad. As an example, using the upper plateau-private minerals drilling scenario from above, the first 3 years will yield 36 wells, the next 4 years (years 4 through 7) will yield 120 wells and the next 13 years will yield 390 wells for a total of 546 wells, or 515 Mesaverde wells and 31 Wasatch wells. In the first 3 years, 36 single-well pads will result. In years 4 through 7, 36 wells times 3 wells per existing pad leaves 108 wells that will be placed on the existing 36 single-well pads leaving 120-108, or 12 wells to be drilled at 4 wells per pad or 3 pads for a total of 3 + 36 or 39 pads through year 7. In year 8, all but 31 Wasatch of the remaining 390 wells, or 359 wells will be drilled 4 to a pad or an additional 90 pads for a total of 3 + 36 + 90 or 129 pads as presented on line 17 of Table 2. The 31 Wasatch wells will be drilled at 160 acre spacing and will be the 5$^{th}$ well on every 4$^{th}$ pad, collocated with the Mesaverde wells.

For the lower plateau, it is assumed that areas within the Rulison, Grand Valley and Parachute fields will be developed fully at 10 acre spacing within 5 years. After these fields are fully developed, then the areas outside the fields will be developed with the area closest to the existing fields being developed first and then progress away from the existing fields. It is estimated that the area outside the existing fields will be developed at a rate similar to the development that occurred from 1999 to the present in the RPPA (Figure 2a). Figure 2a is a graph of the number of spuds in the PRRA versus years. Using least squares and the spud data from 1999 on the graph, a trend line, Y=26.936X can be obtained where "Y" is the number of wells and "X" is years. Integration of this linear equation for 15 years starting in 1999 will yield the total number of wells that will be developed over 15 years. Integration provides Y=26.93X**2/2. Using this equation, 3,029 wells would be spud in 15 years which represents the number of spuds from year 6 to the end of the plan (year 20). Subtracting the existing 50 wells leaves 2,979 wells as represented in line 8 of Table 2. Adding the wells for the area inside the field boundaries of 1,875 wells provides 4,854 total wells for the lower plateau. This number is then checked against development of the lower plateau based upon rig availability and drilling times. For example, at 20 days/well, over 20 years with 20 rigs running, 20 years * 365 days/year/ 20 days/well * 20 rigs running, or 7,300 wells per year can be drilled as seen on line 9 of Table 2. However, only 4,854 wells can be developed based on spacing and a development schedule as seen on line 8 of Table 2. As such, the RFD wells are the lesser of 7,300 wells and 4,854 wells, or 4,854 wells as presented in line 10 of Table 2. For the area outside the existing fields on the lower plateau, 2,979 wells will be developed over 48,692 acres, or an

average of 16 acres per well. Since full development is at 10 acre spacing, a little over half of the area outside the existing fields will be developed during the planning period.

For the purpose of 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 located on every 4$^{th}$ pad and be the 5$^{th}$ well on a pad. For example, line 10 of Table 2 reveals that there are 2,546 lower plateau federal Mesaverde wells. At 4 wells per pad, the number of pads on federal lower plateau would be 2,546 wells/4 wells per pad or 636 pads as revealed in line 17 of Table 2. These pads would have 4 MV wells each and every fifth pad would have 4 MV and 1 Wasatch wells.

## RFD Assumptions

Based on the above information, the following assumptions are made in determining the RFD. The results are presented in Table 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 2,500' * offsets will be utilized to obtain reserves otherwise precluded by steep slopes. GIS reveals that there are no steep slopes that will likely preclude the development of the minerals after directional drilling with 2,500’ offsets.

3. Wasatch reserves will be .7BCF/Well and development will occur at the rate of 1 Wasatch well for every 16 MV wells (160 acre downhole spacing) and will be collocated on pads constructed for Mesaverde wells throughout the lower 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.

5. On the lower plateau, the Mesaverde will be fully developed at 10 acre spacing inside the existing Rulison, Grand Valley and Parachute field boundaries. It is estimated that this area will be developed in approximately 5 years based upon 20 rigs running, 20 days/well and drilling 365 days per year. The development tendency in this area is to develop the known areas prior to exploring less-known areas. As such, it is assumed that the area outside the existing field boundary will be developed after the area inside the field boundary is developed (5 years) and continue for an additional 15 years of development for a total of 20 years of development. Based on the historical development trend of this area since 1999 (Figure 2a), it was calculated that 3,029 wells could be drilled in 15 years. Based on 10 acre MV spacing and 160 acre Wasatch spacing, there will be 16 MV wells for every Wasatch well. It is believed that development will progress from the field boundary outward at 10 acre spacing.

6. The upper plateau will be drilled concurrently with the lower plateau but at a different schedule rate because of access, weather, infrastructure and directional drilling limitations. The development rate will increase over time as the development and production infrastructure (roads, pipelines, compressors, etc) are improved. It is assumed that on federal land for the first 3 years, 1 rig will be running. For the next 4 years, 3 rigs will be running and for the last 13 years, 5 rigs will be running. Because of existing private surface agreements, easier access and less government involvement, private acreage will be more preferable to develop. On private acreage, it is assumed that for the first 3 years 2 rig will be running. For the remaining 17 years, 5 rigs will be running. Drilling will occur 6 months out of a given year and a typical well will take 30 days to complete.

7. The wells for the upper plateau will generally be drilled vertically for the first 3 years. For the final 17 years, the wells will be drilled directionally on existing pads up to 4 MV wells per pad and an additional Wasatch well every 4$^{th}$ pad with the remaining wells drilled on new pads at 4 MV wells per pad and an additional Wasatch well every 4$^{th}$ pad.

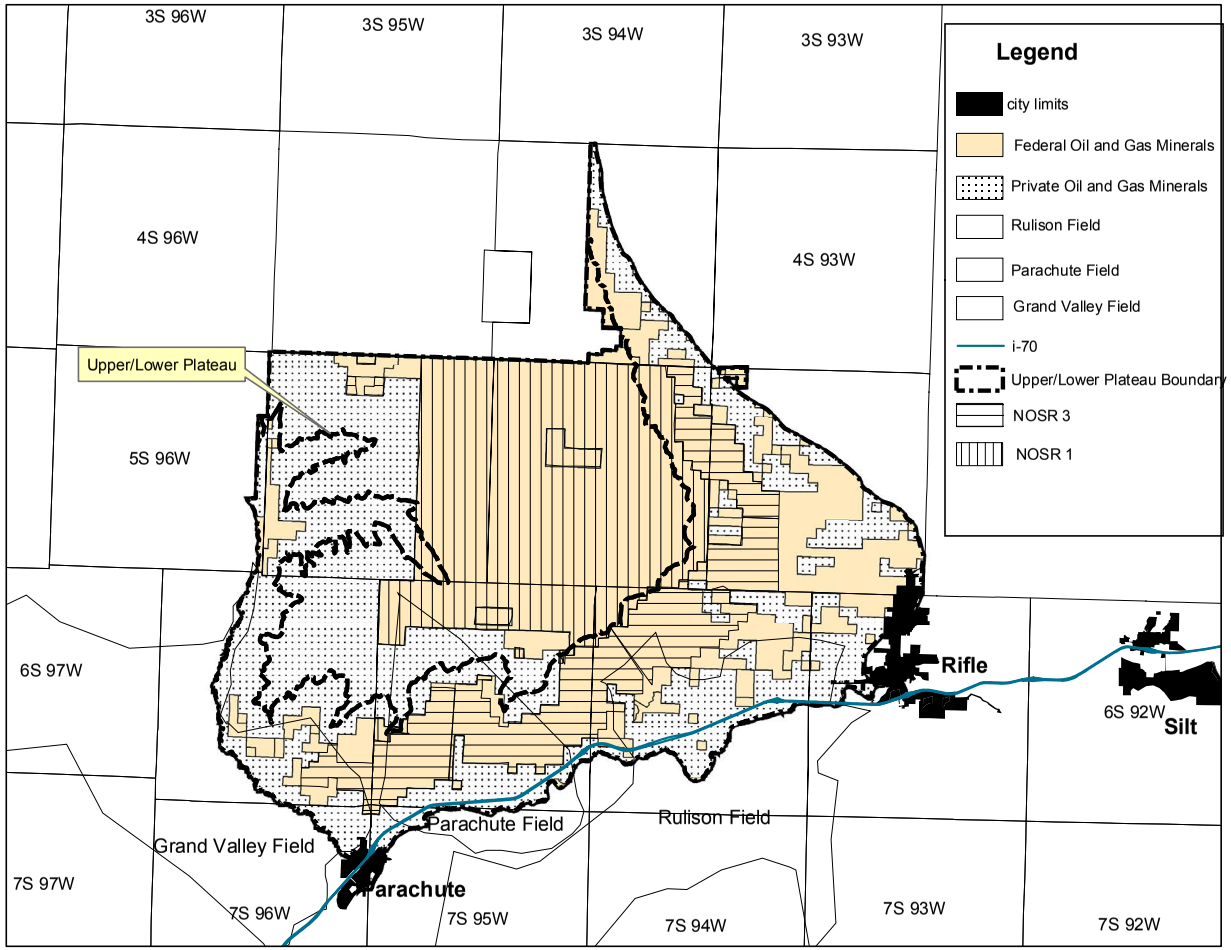
8. Generally, for upper and lower plateaus when directional drilling is employed, pads will be at 40 acre surface locations with Mesaverde wells at 10 acre downhole locations – one drilled vertically and the other three drilled directionally and Wasatch wells at 160 acre downhole locations – all drilled vertically from an existing Mesaverde pad.

9. 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).

* Typical directional wells drilled in this area have horizontal displacements of about 800 feet to 900 feet. COGCC however provided comments that a 2500 foot reach is technically feasible. As such, we also believe that directional drilling will improve and that a 2500 foot reach is reasonable now for the lower plateau and at a later time for the upper plateau. To provide for the most flexibility in pad placement, to lessen surface impacts, and still provide for well displacements that will not leave resources un-recovered, surface locations will probably be limited to 40 acre locations. Pads placed at distances greater than 40 acres could require well displacements greater than 2,500 feet resulting in un-recovered resources. If directional drilling improves and further reaches are obtained, surface locations might expand to 80 or 160 acre locations.

Figure 1a

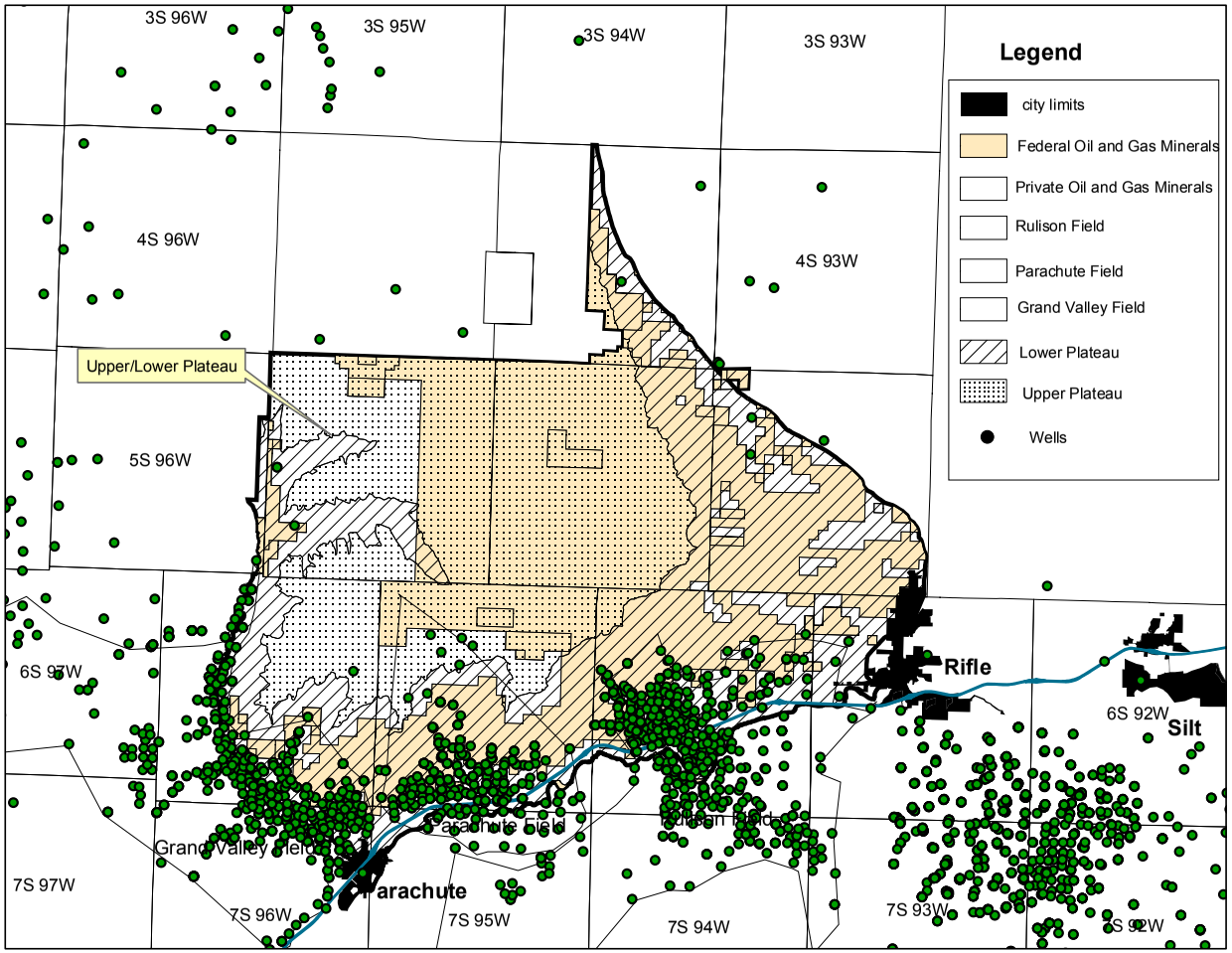
# ROAN PLATEAU PLANNING AREA




**This plat shows the boundaries of the Roan Plan Area, NOSRs 1 and 3, federal leases, mineral estates and petroleum field boundaries.**

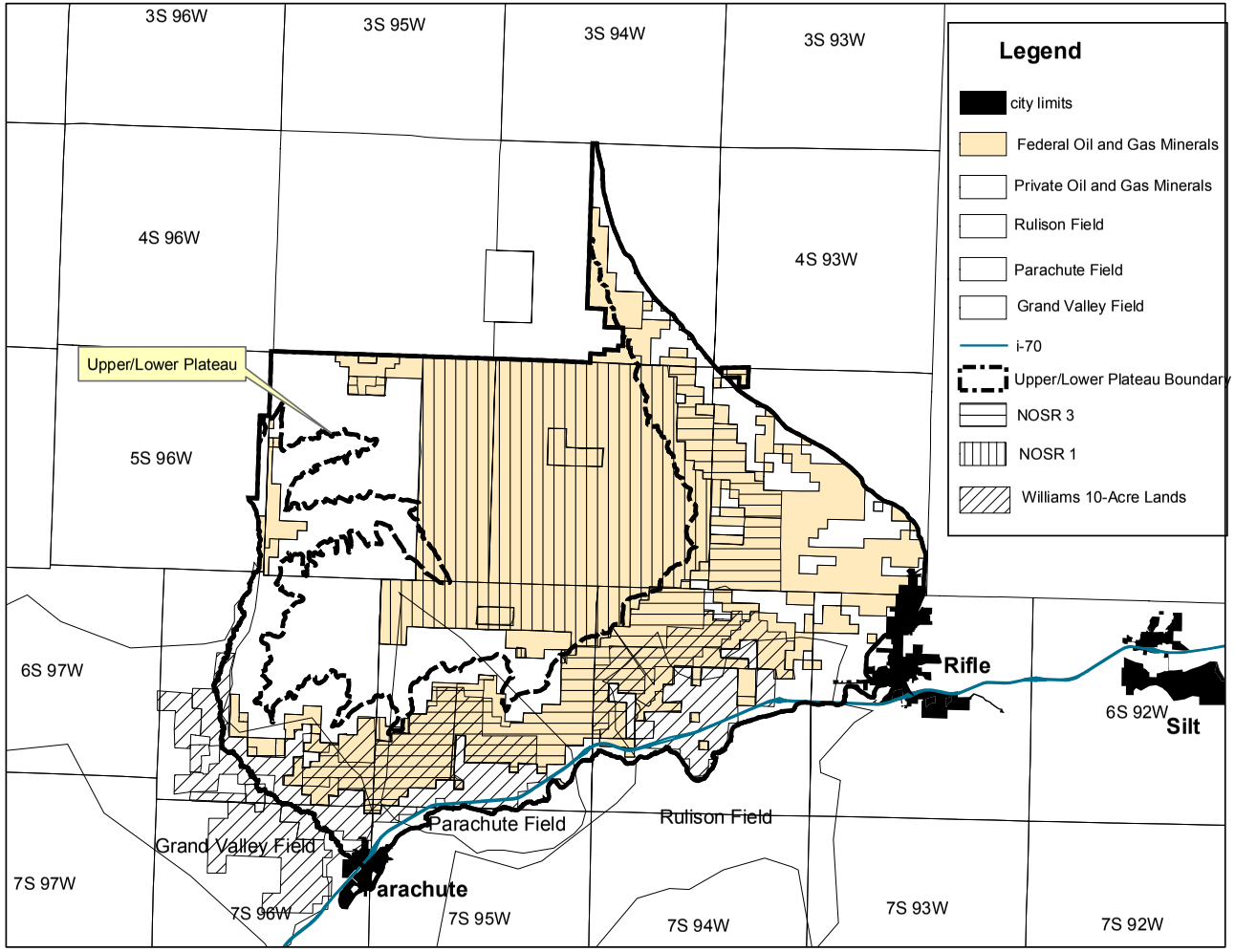
Figure 1b

# ROAN PLATEAU PLANNING AREA




**This plat shows the upper and lower plateau, private and federal oil and gas minerals, oil and gas fields and existing wells as of 8/17/04**

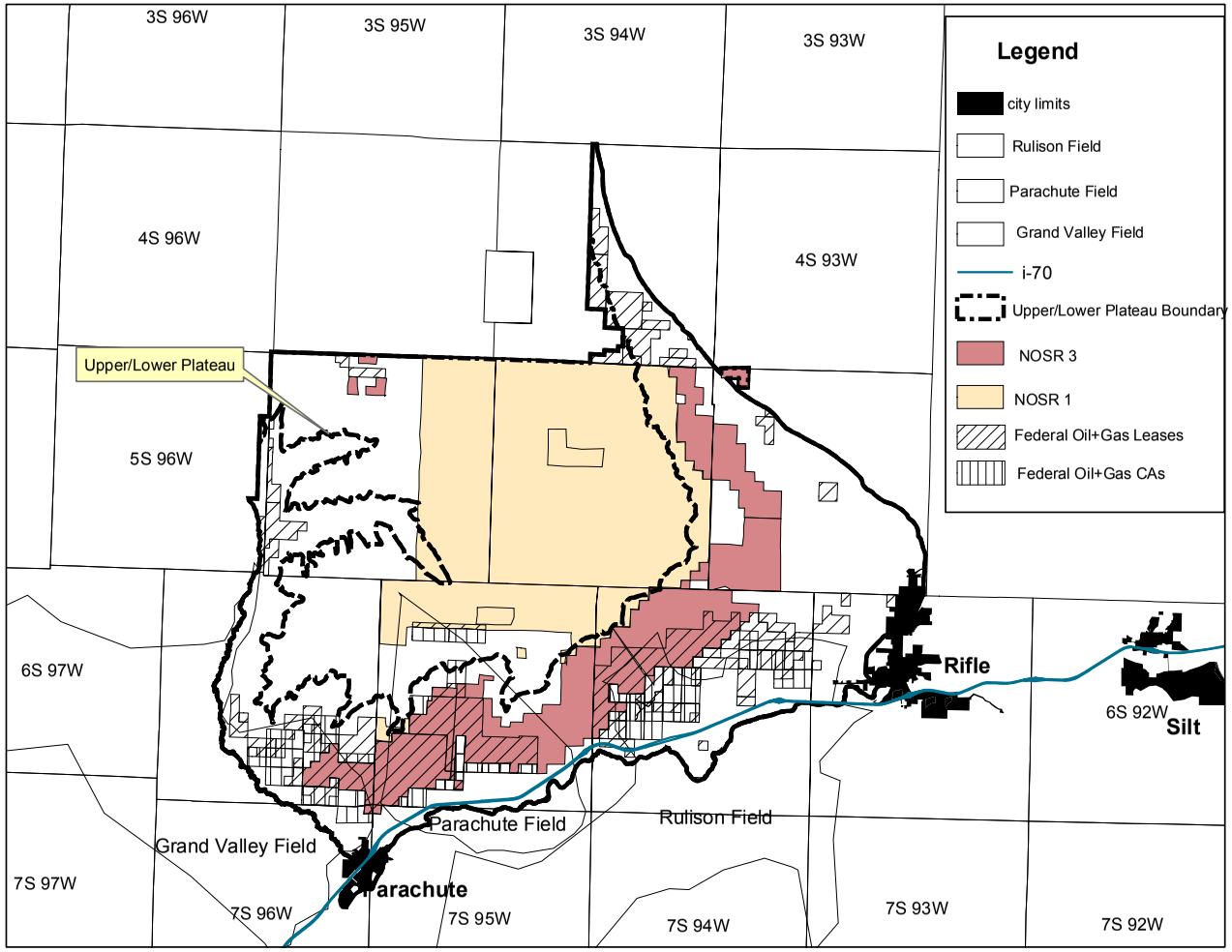
# Figure 1c
# ROAN PLATEAU PLANNING AREA




**This plat shows the upper and lower plateau, private and federal oil and gas minerals, oil and gas fields and Williams approved 10-acre down-hole spaced lands.**

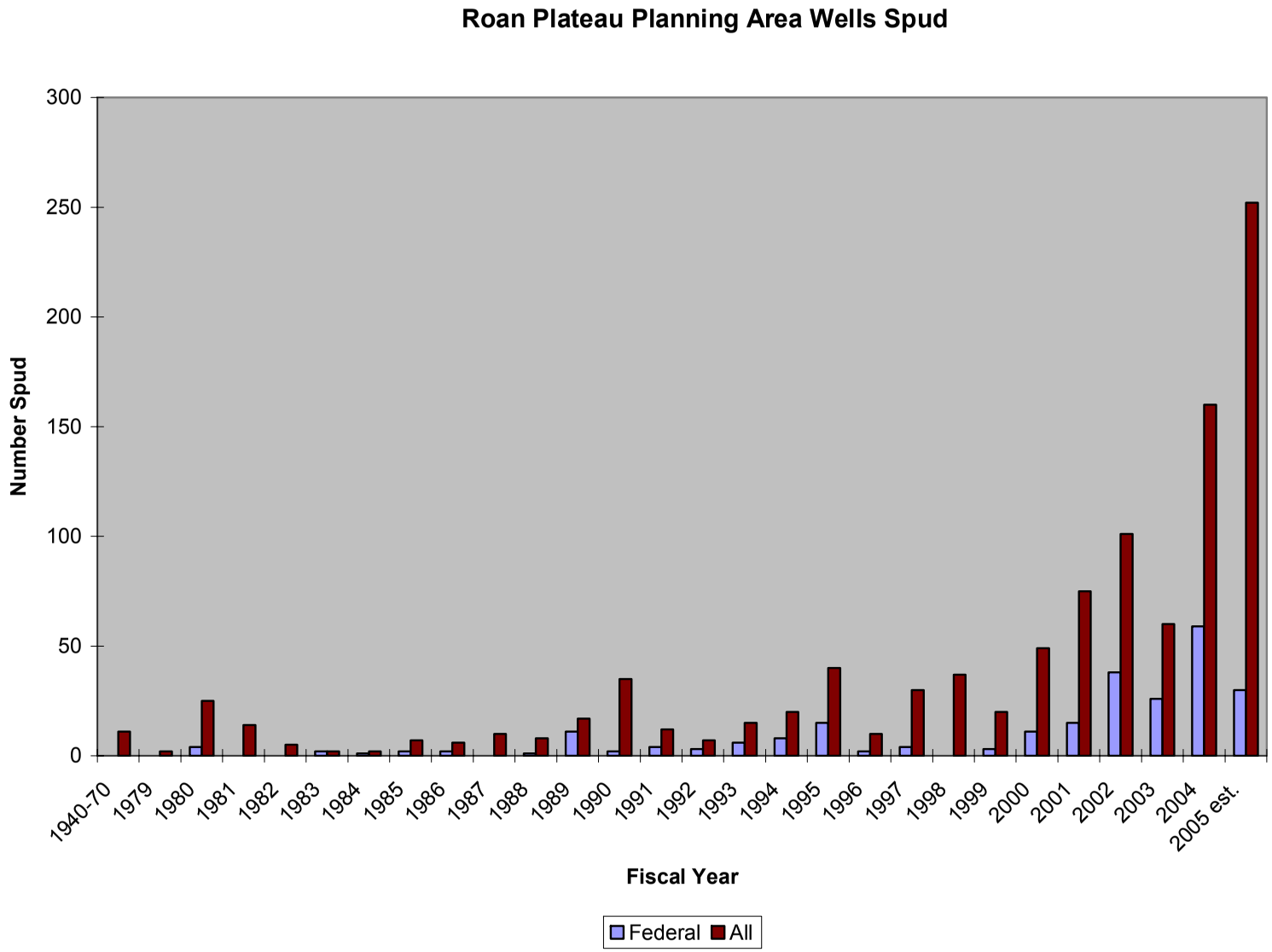
Figure 1d

# ROAN PLATEAU PLANNING AREA



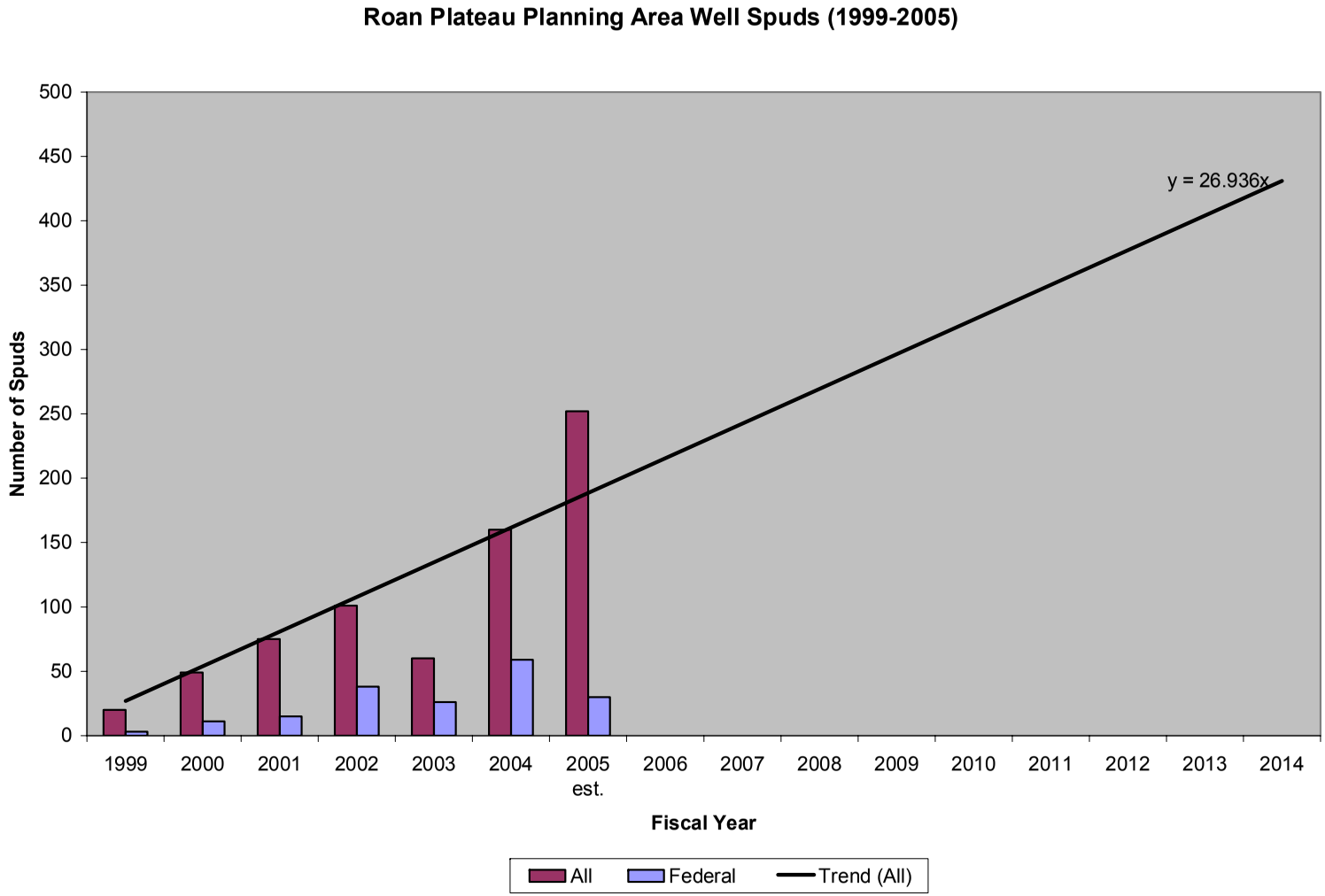

**This plat shows the boundaries of the Roan Plan Area, NOSRs 1 and 3, federal leases, federal communitization agreements (CAs), and petroleum field boundaries**

# Figure 2



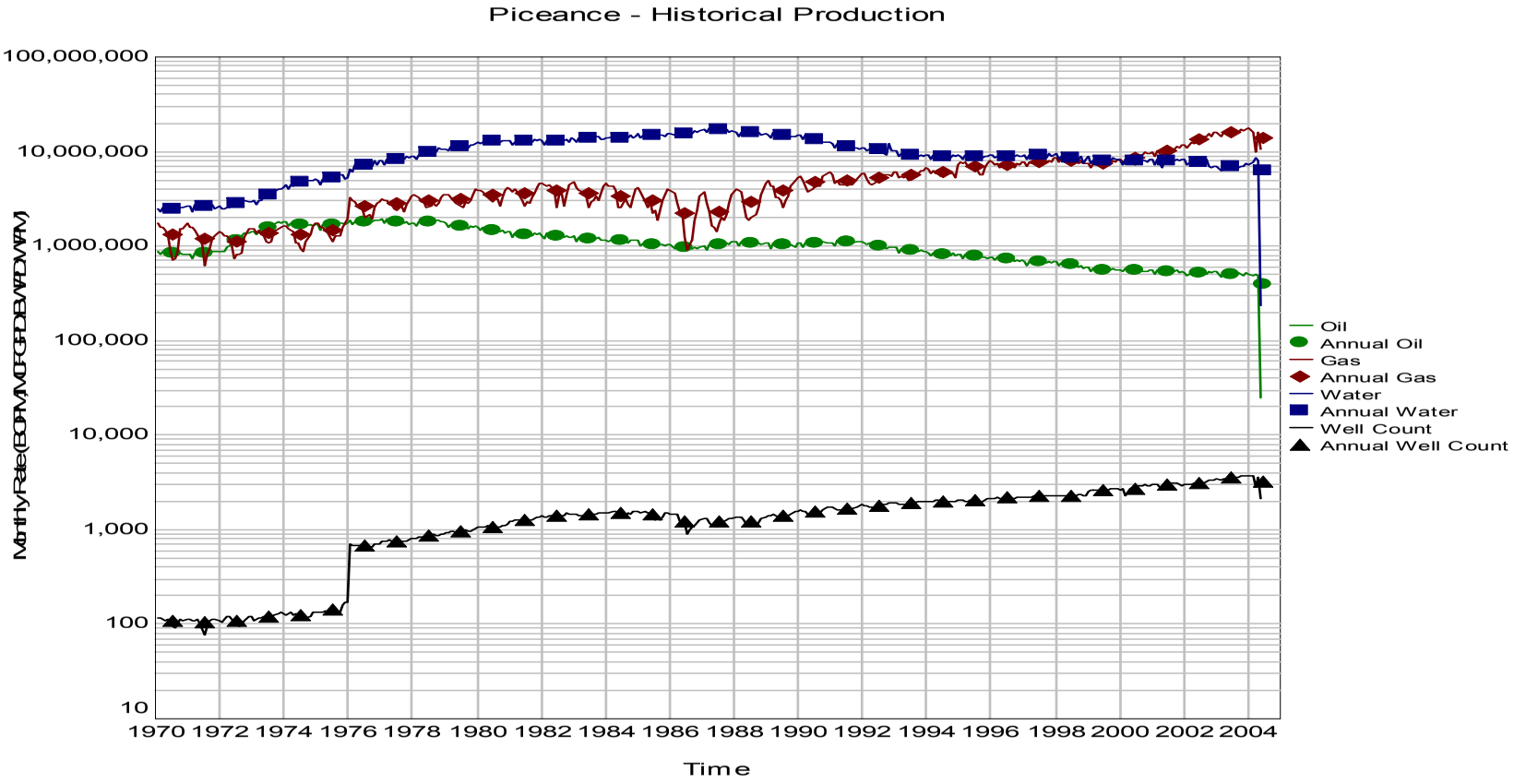

**This graph shows the number of federal and all wells that were spud (drilling starts) in the Roan Plateau Planning Area. Data is by fiscal year and was obtained from Dwights release dated May 3, 2005.**

# Figure 2a



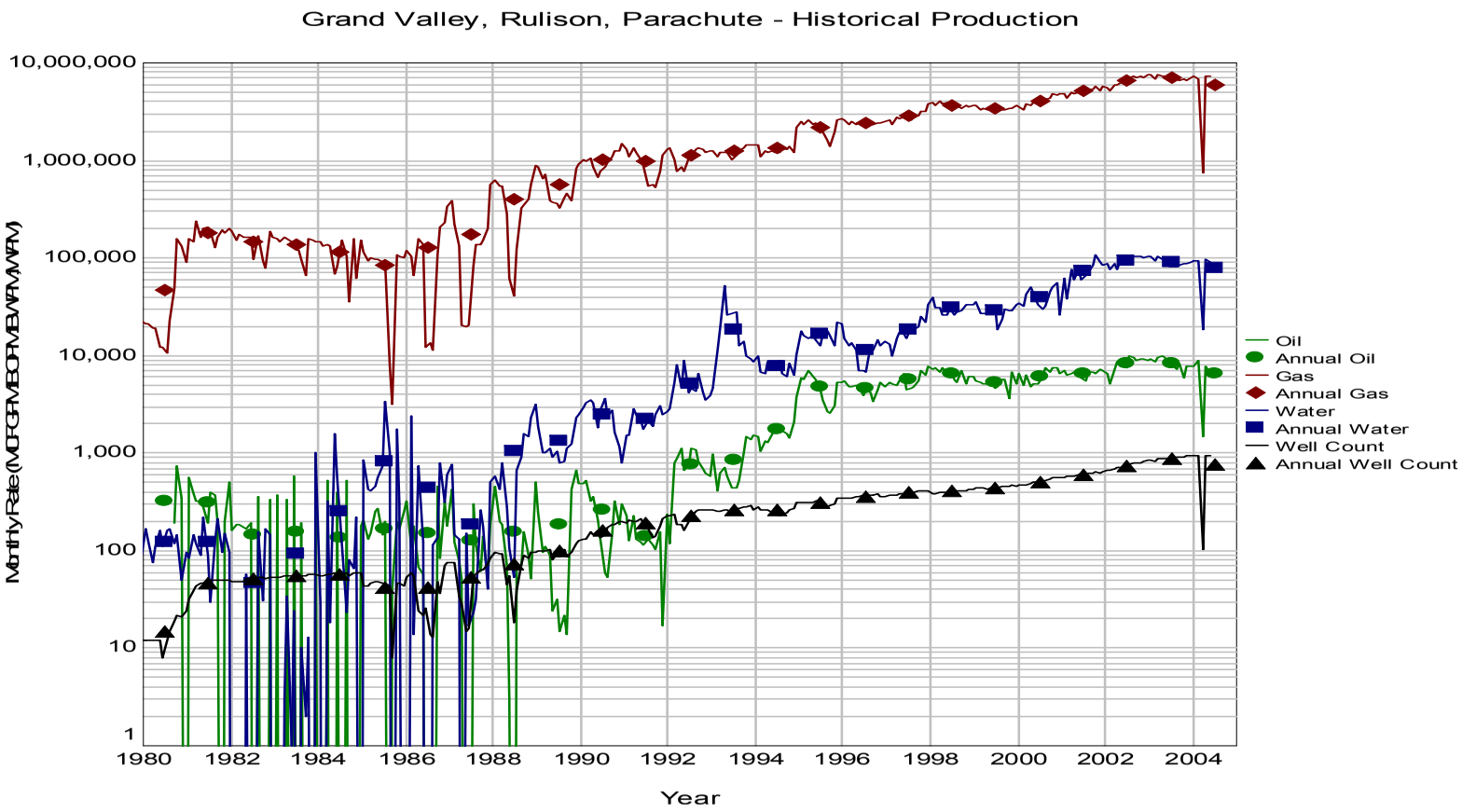

**This graph shows drilling spud trend of all wells spud in the Roan Plateau planning area. Y=26.93x is the equation of the trend line which was developed in Excel by least squares. Data is by fiscal year and was obtained from Dwights release dated May 3, 2005.**

# Figure 3



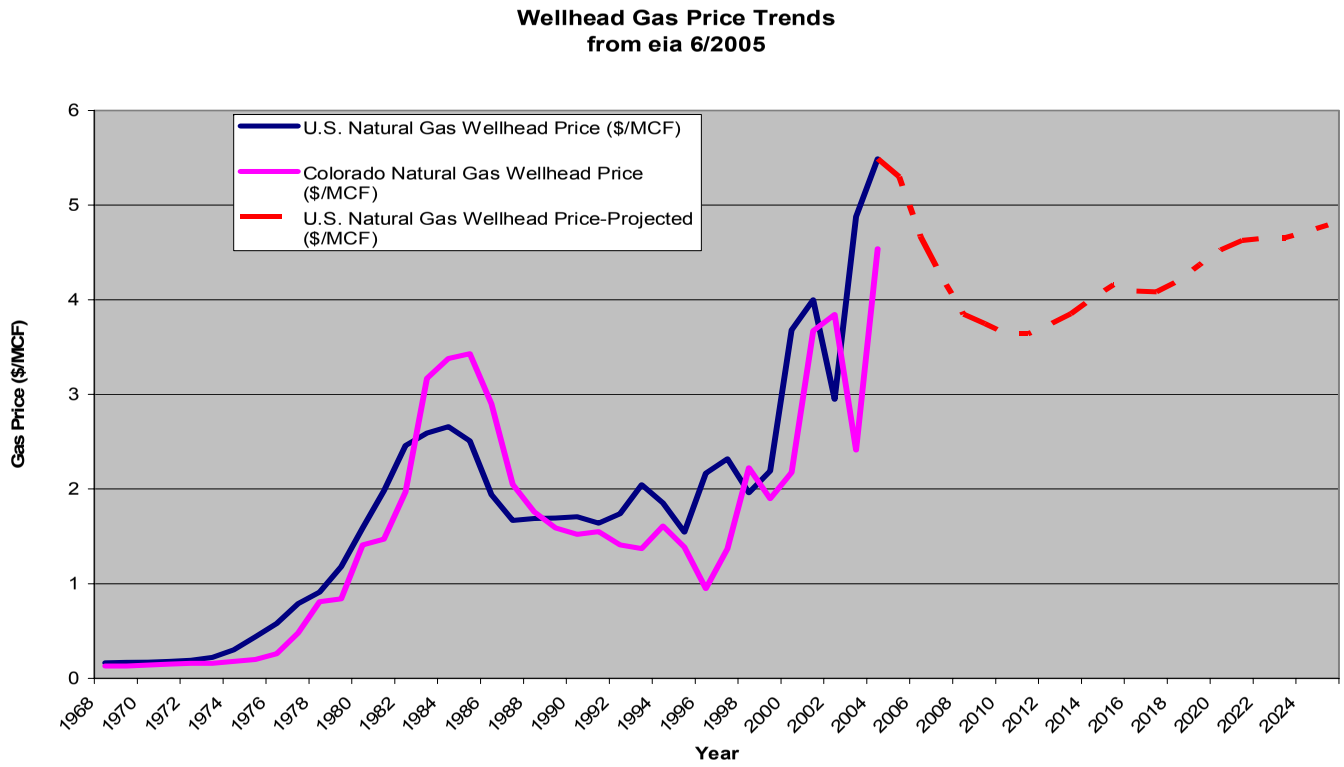

**This figure shows historical production from the Piceance basin (data from Dwights). For the last 8 years, gas production exhibits a nominal incline of about 10% per year.**

# Figure 4



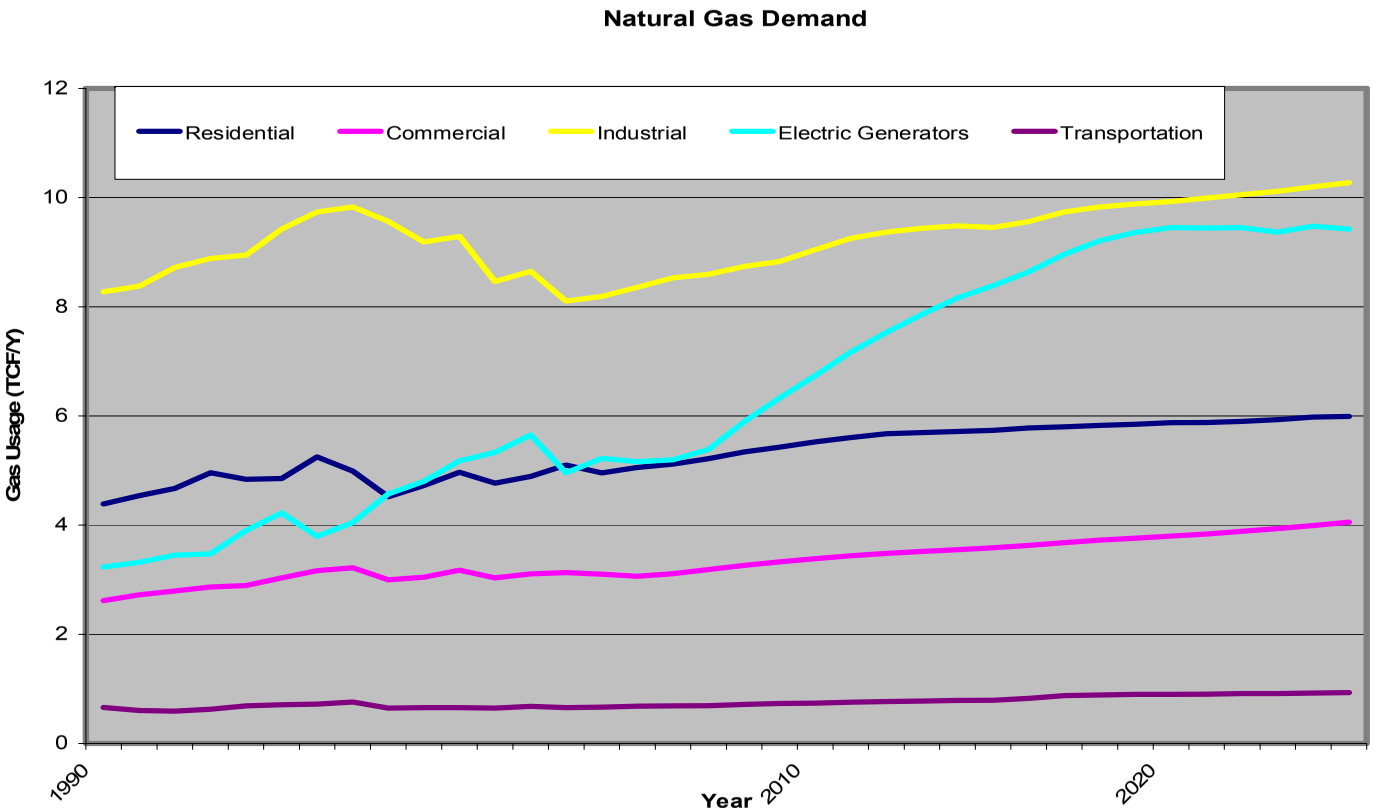

**This figure shows the historical production of the Grand Valley, Rulison and Parachute fields (Data from Dwights). The RPPA contains production from all three of these fields. For the last 8 years, gas production exhibits a nominal incline of about 20% per year.**

# Figure 5



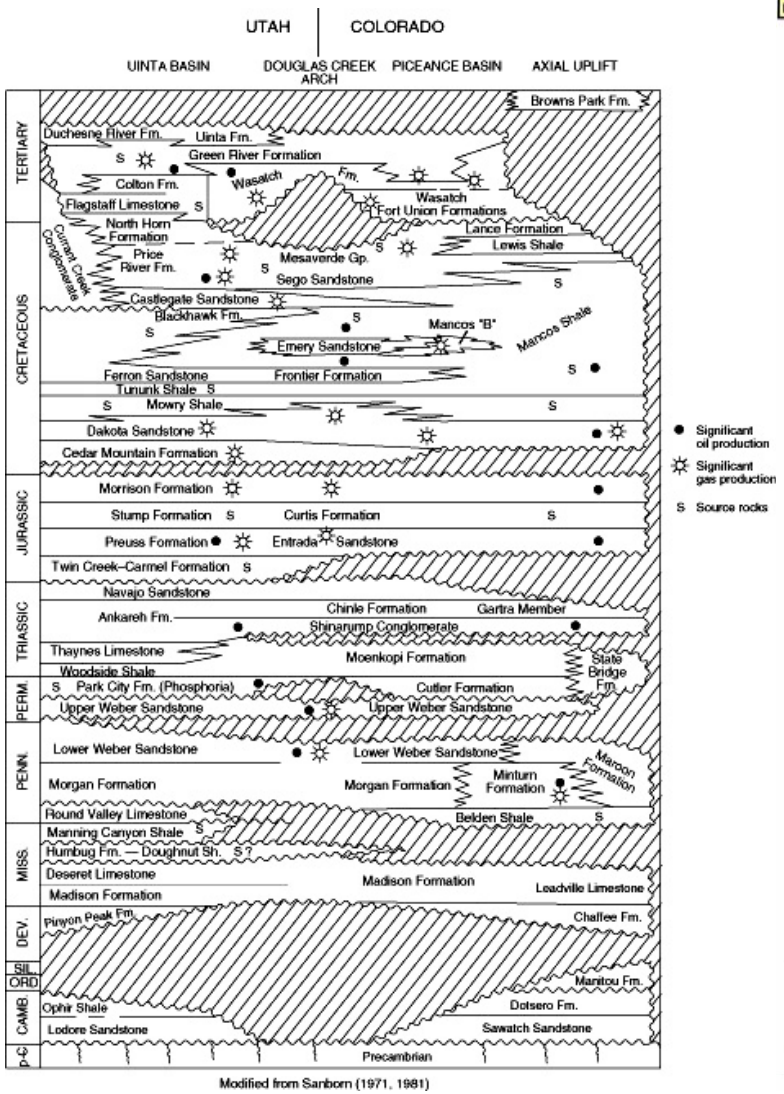

**This figure depicts historical and projected gas price from the Energy Information Agency (EIA). According to EIA, the largest increase in lower 48 onshore natural gas production is projected to come from the Rocky Mountain region. Rocky Mountain natural gas production is projected to increase from 3.7 trillion cubic feet in 2003 to 5.6 trillion cubic feet in 2025. In 2003, Rocky Mountain production was27 percent of total lower 48 onshore production. The Rocky Mountain region's share of lower 48 onshore production is projected to increase to 38percent in 2025. Currently, national wellhead gas prices are at an all-time yearly high of $5.49 per MCF. As indicated by Figure 4, national wellhead gas prices are projected to decline to $3.64 per MCF (2003 dollars) in 2010 as drilling levels increase, new production capacity comes on line, and LNG imports increase in response to current high prices. After 2011, however, wellhead prices are projected to increase to $4.79 per MCF in 2025 or about 2% per year. The higher projected price is in response to the higher exploration and development costs associated with smaller and deeper gas deposits in the remaining domestic gas resource base. Also, as lower 48 conventional natural gas resources are depleted and wellhead prices rise, an increasing proportion of U.S. natural gas supply is projected to come from Alaska, unconventional production, and LNG imports. It can be seen from the figure that Colorado's wellhead gas price trends follow closely with the national trend. The gas spike in the 1980s was due to deregulation. Other anomalies are primarily due to anomalous weather, supply and demand, use of other sources of energy, etc.**

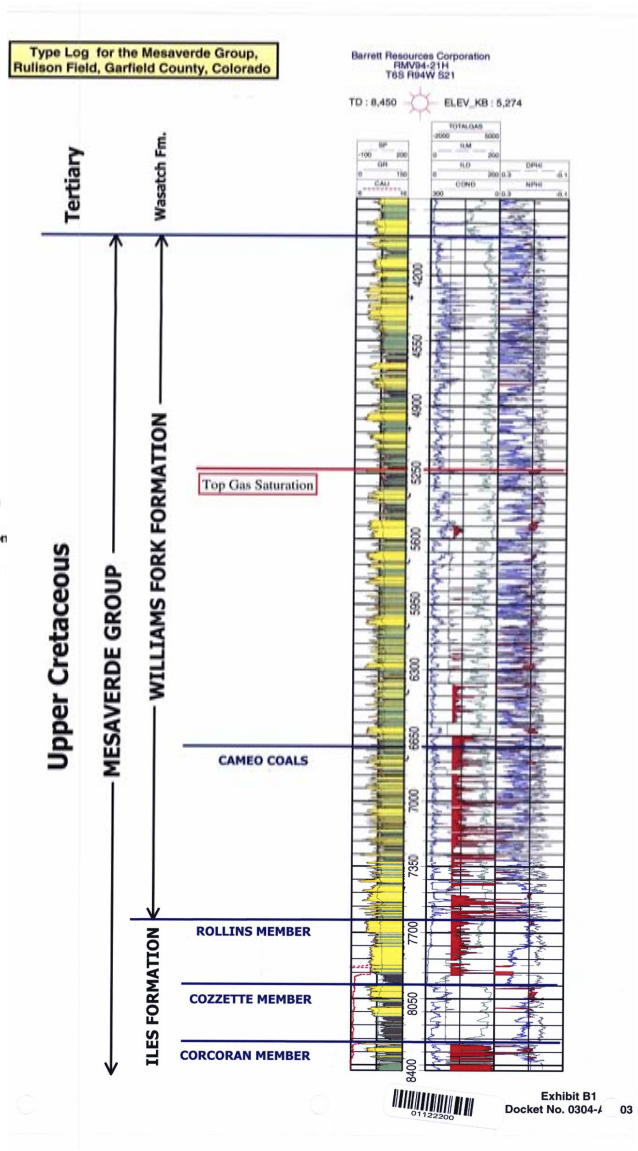
# Figure 6




**This figure depicts gas usage by various sectors. Total natural gas consumption is projected to increase from 22.0 TCF in 2003 to 30.7 TCF in 2025. Electricity generation accounts for most of the increase. For electrical generation, natural gas consumption is projected to increase from 5.0 TCF in 2003 to 9.4 trillion cubic feet in 2025 accounting for 31 percent of total demand for natural gas in 2025 as compared with 23 percent in 2003. The increase in natural gas consumption for electricity generation results from both the construction of new gas-fired generating plants and higher capacity utilization at existing plants. Most new electricity generation capacity is expected to be fueled by natural gas because natural-gas-fired generators are projected to have advantages over coal-fired generators that include lower capital costs, higher fuel efficiency, shorter construction lead times, and lower emissions.**

# Figure 7




**Stratigraphic column of the Piceance Basin (from USGS web site http://certnetra.cr.usgs.gov/1995 OGData/Region3/PR20ST.JPG). Second stratigraphic column supplied by the Colorado Oil and Gas Conservation Commission.**

**Table 1**

9/7/2005

**Roan Planning Area**

**Area Summary**

| | | Planning Area | NOSR1 | NOSR3 |
|---|---|---|---|---|
| 1 | Total Area (Acres) | 127,009 | 36,363 | 18,993 |
| 2 | Federal oil and gas minerals (Acres) | 73,597 | 36,363 | 18,993 |
| 3 | Nonfederal oil and gas minerals (Acres) | 53,412 | 0 | 0 |
| 4 | Federal leased oil and gas minerals (Acres) | 18,742 | 0 | 7,646 |
| 5 | Federal unleased oil and gas minerals (Acres) | 57,491 | 36,363 | 11,160 |
| 6 | Steep slopes greater than 50% (Acres) | 29,211 | 5,338 | 7,356 |
| 7 | Steep slopes left after 2500' buffer for directional drilling (Acres) | 0 | 0 | 0 |
| | **Wells** | **Federal** | **Total** | **NOSR** |
| 8 | Well starts (spuds) | 219 | 958 | 139 |
| 9 | Wells drilled and completed | 197 | 787 | 124 |
| 10 | Dry holes | 1 | 14 | 1 |
| 11 | Permitted not started | 83 | 153 | 67 |
| 12 | Started not finished (drilling) | 20 | 156 | 14 |
| 13 | Junked and abandoned | 1 | 1 | 1 |

| | | NOSR1 | | NOSR3 | | **********Planning Area* ********** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Federal | Total | Federal | Total | Mesaverde Federal | Mesaverde Total | Wasatch Federal | Wasatch Total | Total Federal | Total |
| | **2005 Production** | | | | | | | | | | |
| 14 | Cumulative gas produced (5/1/05 - BCF) | 0 | 0 | 50 | 50 | 78 | 343 | 11. | 47. | 89 | 390 |
| 15 | Cumulative oil produced (5/1/05 - MBO) | 0 | 0 | 61 | 61 | 161 | 553 | 0.032 | 0.032 | 161 | 553 |
| 16 | Cumulative water produced (5/1/05 - MBW) | 0 | 0 | 758 | 758 | 1,206 | 4,036 | 0.531 | 8.7 | 1,207 | 4,052 |
| 17 | Monthly gas produced (5/1/05 - MMCF) | 0 | 0 | 1,472 | 1,472 | 2,282 | 6,258 | 37. | 100. | 2,320 | 6,367 |
| 18 | Monthly oil produced (5/1/05 - BO) | 0 | 0 | 3,840 | 3,840 | 6,282 | 11,994 | 0. | 0. | 6,282 | 11,994 |
| 19 | Monthly water produced (5/1/05 - BW) | 0 | 0 | 37,453 | 37,453 | 49,786 | 103,397 | 0. | 0. | 49,786 | 103,397 |
| 20 | Monthly producing wells (5/1/05) | 0 | 0 | 123 | 123 | 165 | 608 | 19. | 64. | 184 | 674 |
| | **1999 Production** | | | | | | | | | | |
| 21 | Cumulative gas produced (5/1/99 - BCF) | 0 | 0 | 14 | 14 | 18 | 89 | 8.4 | 38. | 26 | 126 |
| 22 | Cumulative oil produced (5/1/99 - MBO) | 0 | 0 | 19 | 19 | 50 | 195 | 0.032 | 0.032 | 50 | 195 |
| 23 | Cumulative water produced (5/1/99 - MBW) | 0 | 0 | 92 | 92 | 182 | 689 | 0.076 | 4.9 | 182 | 695 |
| 24 | Monthly gas produced (5/1/99 - MMCF) | 0 | 0 | 95 | 95 | 214 | 1,342 | 55. | 157. | 270 | 1,531 |
| 25 | Monthly oil produced (5/1/99 - BO) | 0 | 0 | 183 | 183 | 782 | 2,678 | 0. | 0. | 782 | 2,678 |
| 26 | Monthly water produced (5/1/99 - BW) | 0 | 0 | 752 | 752 | 2,102 | 12,893 | 0. | 45. | 2,102 | 13,118 |
| 27 | Monthly producing wells (5/1/99) | 0 | 0 | 27 | 27 | 28 | 141 | 21. | 68. | 49 | 210 |

*"Planning Area" includes NOSR3 numbers

**Table 1 Notes:**

1 Total Area from roanplat_pby.shp and Nosr_parcel.shp (NOSR1 includes 924 acres of private surface/Federal oil and gas minerals) -- nosr1.shp, nosr3.shp. All GIS shp files are located in roan62805a.mdx project

2 Federal oil and gas minerals from roanmno.shp (Nosr_parcel.shp and gsfomno.shp, F-FM;F-OG;F-OTHER;P-FM-P-OG;P-OGC;P-OTHER;S-FM;S-OG;S-OGC;S-OTHER) -- nosr3federalminerals.shp and nosr1federalminerals.shp

3 Non oil and gas minerals = roanmno with "MNO" = P-C, and P-NM

4 Federal leased oil and gas minerals from oilgasleasesroan.shp and oilgasleasesnosr3.shp (from 9/2005 LR2000 data)

5 Federal unleased oil and gas minerals = Federal oil and gas minerals less federal leased oil and gas minerals (federalunleasedminerals.shp and nosr1.shp and nosr3unleasedfederalminerals.shp)

6 Steep Slopes greater than 50% is from Rp_slope50.shp intersected with NOSR_parcelsa.shp (slopeparcelsinter.shp) -- (nosr3rp_slope50.shp and nosr1rp_slope50.shp)

7 Steep Slopes left after 2500' buffer for directional drilling - xxx.shp

8-13 Fee and federal wellstatus from roanwells62805.shp, roanwellsfederalmineralestate62805dwights.shp and nosr3wells62805.shp - summarized in ArcMap on "Status_Final" field.

14-27 Federal cumulative and monthly- gas, oil and water and current producing wells from the following powertools files: roanwells62805.mdb, roanfederalwells62805.mdb, and nosr3wells62805.mdb

"Total" column is just for Mesaverde (Williams Fork) and Wasatch.
Data is from dwights tape of 6/28/05 but last data point is 4/2005.
Mesaverde includes the Williams Fork, Cameo Coal, Rollins and Corcoran formations. It doesn't include production from minor zones including the cozzette, iles and dakota. The Total column includes all formations.

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**Table 2**

11/30/2005

**Roan Planning Area**

**Reasonable Foreseeable Development ***

| | INTERNAL DRAFT NOT FOR PUBLIC DISCLOSURE | ****Planning Area****** | | | ****Upper Plateau**** | | | ********Lower Plateau******** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | ****Lower Plateau Total**** | | | ****inside field bounds**** | | | **outside field bounds** | | |
| | 6 month drilling window | | | | | | | | | | | | | | | |
| | 20 year RFD | private & federal | federal | private | private & federal | federal | private | private & federal | federal | private | private & federal | federal | private | private & federal | federal | private |
| | *******Area distribution****** | | | | | | | | | | | | | | | |
| 1 | Oil and gas minerals (Acres) | 127,009 | 73,597 | 53,412 | 53,800 | 34,758 | 19,042 | 73,209 | 38,839 | 34,370 | 24,517 | 10,846 | 13,671 | 48,692 | 27,993 | 20,699 |
| 2 | Steep slopes greater than 50% (Acres) | 29,211 | 16,555 | 12,656 | 6,257 | 3,260 | 2,997 | 22,956 | 13,296 | 9,660 | 5,412 | 3,907 | 1,505 | 17,543 | 9,388 | 8,155 |
| 3 | 50% Steep slopes remaining after 2500' directional drilling on all areas except NOSR and upper plateau (Acres) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | Oil and gas minerals after steep slopes are directionally drilled (Acres) | 127,009 | 73,597 | 53,412 | 53,800 | 34,758 | 19,042 | 73,209 | 38,839 | 34,370 | 24,517 | 10,846 | 13,671 | 48,692 | 27,993 | 20,699 |
| | ******Preliminary wells****** | | | | | | | | | | | | | | | |
| 5 | Existing Wells drilled and completed | 787 | 197 | 590 | 7 | 0 | 7 | 780 | 197 | 583 | 730 | 169 | 561 | 50 | 28 | 22 |
| 6' | Ultimate Mesaverde and Wasatch development wells | 13,495 | 7,820 | 5,675 | 5,716 | 3,693 | 2,023 | 7,778 | 4,127 | 3,652 | 2,605 | 1,152 | 1,453 | 5,174 | 2,974 | 2,199 |
| 6 | New Mesaverde wells (existing fields at 10 acre spacing; 2,851 MV wells outside fields - less existing MV wells-) | 9,981 | 6,021 | 3,959 | 5,380 | 3,476 | 1,904 | 4,601 | 2,546 | 2,055 | 1,795 | 933 | 862 | 2,806 | 1,613 | 1,193 |
| 7 | New Wasatch wells (existing fields at 160 acre spacing 173 W wells outside fields - less existing Wasatch wells ) | 583 | 368 | 215 | 329 | 217 | 112 | 253 | 150 | 103 | 80 | 51 | 29 | 173 | 100 | 74 |
| 8 | Preliminary new wells (lines 6 and 7, #) | 10,563 | 6,389 | 4,174 | 5,709 | 3,693 | 2,016 | 4,854 | 2,696 | 2,158 | 1,875 | 983 | 892 | 2,979 | 1,713 | 1,266 |
| | ******RFD wells, pad numbers and oil and gas resources****** | | | | | | | | | | | | | | | |
| 9 | Limit check (lower limit: 20years,365days/year,20day/well 20rigs = 7300 wells; upper limit: staged development) | 8,326 | 4,353 | 3,973 | 1,026 | 480 | 546 | 7,300 | 3,873 | 3,427 | 2,445 | 1,082 | 1,363 | 4,855 | 2,791 | 2,064 |
| 10 | RFD Wells (lesser of line 8 and line 9) | 5,880 | 3,176 | 2,704 | 1,026 | 480 | 546 | 4,854 | 2,696 | 2,158 | 1,875 | 983 | 892 | 2,979 | 1,713 | 1,266 |
| 11 | Mesaverde RFD wells | 5,568 | 2,997 | 2,571 | 967 | 452 | 516 | 4,601 | 2,546 | 2,055 | 1,795 | 933 | 862 | 2,806 | 1,613 | 1,193 |
| 12 | Wasatch RFD wells | 312 | 179 | 133 | 59 | 28 | 30 | 253 | 150 | 103 | 80 | 51 | 29 | 173 | 100 | 74 |
| 13 | Mesaverde gas RFD resources (BCF) | 6,515 | 3,507 | 3,008 | 1,132 | 529 | 603 | 5,383 | 2,978 | 2,404 | 2,100 | 1,091 | 1,009 | 3,283 | 1,887 | 1,396 |
| 14 | Wasatch gas RFD resources (BCF) | 218 | 125 | 93 | 41 | 20 | 21 | 177 | 105 | 72 | 56 | 36 | 21 | 121 | 70 | 52 |
| 15 | Total gas RFD resources (BCF) | 6,733 | 3,632 | 3,101 | 1,173 | 548 | 625 | 5,560 | 3,084 | 2,476 | 2,156 | 1,127 | 1,029 | 3,404 | 1,957 | 1,447 |
| 16 | Mesaverde and total oil RFD resources (MBO) | 14,983 | 8,066 | 6,918 | 2,603 | 1,216 | 1,388 | 12,380 | 6,850 | 5,530 | 4,830 | 2,509 | 2,320 | 7,550 | 4,341 | 3,210 |
| 17 | New RFD well pads (40 acre surface spacing) | 1,392 | 749 | 643 | 242 | 113 | 129 | 1,150 | 636 | 514 | 449 | 233 | 216 | 701 | 403 | 298 |

**Table 2 Notes:**

* 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 acres obtained from the Glenwood Springs Field Office (GSFO) and modified as appropriate for different areas (e.g., upper plateau, lower plateau, federal, etc) in ArcMap GIS under u:\...\roan62805adata.mxd project. Field boundaries were developed by drawing a polygon around the existing wells.

2 Steep slopes greater than 50% is from the GSFO.

3 Steep slopes left after 2500' buffer for directional drilling is from buffer_slope50.shp, supplied by the GSFO, for the entire planning area and estimated based on acreage for the upper and lower plateau areas. From buffer_slope50.shp, all steep slope areas can be developed with 2,500' directional drilling

4 Oil and gas minerals less steep slopes remaining after directional drilling

5 Fee and federal wells drilled and completed obtained from GIS intersection of "roanwells62805.shp" that are drilled and completed and various shape files describing the specific area (e.g., "lowerplateauinsidefieldprivate.shp"

6,7 Upper Plateau: Preliminary wells are assumed to be developed uniformally throught the entire upper area not overlain by steep slopes that cannot be directionally drilled. Wasatch will be developed at 160 acre spacing and Mesaverde at 10 acre downhole spacing with some directional drilling occuring only after year three due to anticipated drilling difficulties the extra 3000 feet of wasatch penetration will pose. It is anticipated that the companies will overcome the directional drilling difficulties starting in year four.

Lower Plateau: Preliminary wells are assumed to be developed uniformally at 10 acre spacing within the existing fields (parachute, grand valley and Rulison).

Outside existing fields: development will occur after the fields are developed by year 5 (1,875 inside field boundary wells / (365 days/year * well/20 days * 20 rigs = 5.1 years)) and will increase at a rate similar to the existing development (See Figure 2a) to a maximum of 3,029 wells (2,979 new wells +50 existing wells).

Wasatch will be developed at 160 acrea spacing and Mesaverde at 10 acre downhole spacing (i.e., 1 Wasatch well for every 16 MV wells) with dirctional drilling from 40 acre surface locations.

Existing wells were subtracted from the upper and lower totals leaving the projected new wells.

For these calculations, it is assumed that 90% of the existing wells are Mesaverde and 10% of the existing wells are Wasatch for historical drilling and 1 Wasatch well for every 16 MV wells for future development.

Outside existing fields: of the 3,029 wells, 16/17 or 2,851 wells will be MV and 1/17 or 178 wells will be Wasatch.

Subtracting the existing Mesaverde and Wasatch wells leaves the following: 2,851 Mesaverde - 50(.90), or 2,806 Mesaverde wells and 178 Wasatch -50(.10), or 173 Wasatch wells. Total wells is 2,806 and 173 or 2,979 wells. All wells will be drilled from 40 acre surface locations.

8 Total new wells (not including existing wells) is the sum of new Mesaverde and Wasatch wells (lines 6 and 7).

9 Projected activity limit check -

Lower plateau - It is assumed that activity will be limited in that wells will be drilled at 20 days per well, 20 rigs will be running 365 days per year developed over the RFD time of 20 years. This amounts to 365 wells per year or 7,300 wells in 20 years

Upper plateau - private minerals: Because of weather and initial access limitations, activity will be limited to a 6 month drilling year with 2 rigs running for the first 3 years, then 5 rigs running for 4 years, then 5 rigs running for 13 years. Because of the additional drilling depth and access, it is assumed that wells will be drilled at 30 days per well.

(example, 1st 3 years: 2 rigx6 months*3years=36 wells, next 4 years: 5 rigs x 6 months x 4 years= 120 wells,
next 13 years: 5 rigs x 6 months x 13 years = 390 wells, total is 36 + 120 + 390 or 546 wells
Upper plateau - federal minerals: Because of weather and initial access limitations, activity will be limited
to a 6 month drilling year with 1 rig running for the first 3 years,
then 3 rigs running for the next 4 years, then 5 rigs running for the next 13 years for a total of 480 federal wells and 1,026 private and federal wells.
The difference in the schedule between the federal and private upper plateau development schedules is based
on more favorable private development because of better access, surface use agreements in place and less government involvement.

10 The RFD wells will be the lesser of development based on spacing and historical production (line 8) and development limited
by projected activity over a 20 year development cycle (line 9)

11 Comparing lines 6 and 7, (line 6/(line 6 + line 7))*100, the number of Mesaverde RFD wells is about 95% of the RFD wells (line 10)

12 Comparing lines 6 and 7, (line 7/(line 7 + line 6))*100, the number of Wasatch RFD wells is about 5% of the RFD wells (line 10)

| | | | |
|---|---|---|---|
| 13 | Mesaverde gas resource (2/16/2003 article published in the GSPI) | 1.17 | BCF/Well |
| 14 | Wasatch gas resource (1998 DOE NOSR3 Commercial Development study) | 0.7 | BCF/Well |
| 15 | Total gas resource is the sum of lines 13 and 14. | | |
| 16 | Mesaverde oil resource (1998 DOE NOSRs1+3 Oil and Gas Reserves Evaluation) | 0.002 | BO/MCF |

17 Total new RFD well pads -
Lower plateau - existing and expanded field development - to determine the total number of pads through RFD development, it is assumed that Mesaverde RFD wells (line 11) will be drilled 4 to a pad with Wasatch wells collocated with the Mesaverde wells (i.e., no additional pads for Wasatch wells - fifth well on a pad) (line 11/4).
It is anticipated that development will be concentrated within the boundaries of the field and expand outward. Since development is at 10 acres per well,
and the lower plateau outside field boundaries is 48,692 acres and will be developed with 3,029 wells, or an average of 16 acres per well,
that more than half of the lower plateau outside field boundaries will be developed within the 20 year plan lifespan
Upper plateau - It is assumed that since directional drilling won't start for 3 years because of developing drilling technology.
vertical RFD wells will be drilled one per pad on 40 acre spacing for the first 3 years.
Starting in year 4, three additional wells, drilled directionally, will be drilled on each existing pad for a total of 4 Mesaverde wells per pad.
(example, from private minerals #9 above, 1st 3 years, 36 wells, next 4 years 120 wells, next 13 years 390 wells for a total of 546 wells, or 515 MV wells and 31 Wasatch wells,
36 wells *3 = 108 wells will be placed on the existing 36 pads leaving (120-108) or 12 wells to be drilled 4 wells/pad or 3 pads for a total of 3 + 36 or 39 pads through year 7.
In year 8, all but 31 Wasatch of the 390, or 359 wells will be drilled 4 to a pad or an additional 90 pads for a total of 3 + 36 + 90 or 129 pads
The 31 Wasatch wells will be collocated with the Mesaverde wells (i.e., no additional pads for Wasatch wells - fifth well on a pad)

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# Appendix I

Best Management Practices (BMPs)
and Standard Reclamation Practices

# Appendix I

## BEST MANAGEMENT PRACTICES

Best Management Practices (BMPs) are innovative, dynamic, and economically feasible mitigation practices that are applied on a site-by-site basis to reduce, prevent, or avoid adverse environmental or social impacts of development activities (BLM 2004). A number of BLM BMPs for oil and gas development are incorporated into the general oil and gas development requirements in the Proposed Plan. These include minimizing the number of pads by utilizing multiple well designs and directional drilling, minimizing road footprints, centralized support facilities such as tank batteries, collocating utilities and pipelines in common corridors and aligning them along roadways, and implementing interim reclamation practices. The BMPs identified in this Appendix represent the kinds of activities which may be required; actual BMPs required during the permitting process to mitigate impacts may vary. BMPs and specific methodologies associated with them are expected to change over time to reflect the results of monitoring and ongoing adaptive management efforts. Additional practices may be required, practices may be withdrawn, or practices may be modified during activity, implementation, or project level planning; this may be done without future land use plan (RMP) decisions or amendments, but would likely be analyzed as part of the NEPA analysis associated the permitting process. Monitoring and adaptive management practices will be used to refine and clarify needed practices consistent with the goals and objectives of this plan.

The following or similar BMPs will be applied to all long-term ground-disturbing activities, as appropriate to each site and activity. This list is not all inclusive, but is presented to aid the reader in understanding BMPs.

**Physical Site Protection/Water Quality Controls**

- Employ dust suppression to minimize impacts to air, water, vegetation, and wildlife
- Install silt-fence installation to protect riparian areas, wetlands, open water
- Use closed compressor buildings or mufflers to minimize noise
- Install catalytic converters to minimize emissions

**Topsoil Salvage and Storage**

- Strip topsoil to a minimum depth of six inches and salvage from potential disturbance sites. Exception to this practice will be in disturbance areas infested with noxious weeds or other undesirable plants species, or with seleniferous or erosive soils. When possible, salvaged topsoil will be direct-hauled to disturbed areas with similar soil characteristics undergoing concurrent revegetation.
- BLM may require stripping be conducted in stages to avoid topsoil compaction, beginning with a leading edge and moving in one consistent direction for subsequent loads.
- Topsoil will be stockpiled where no vehicle traffic will cross topsoil mounds. Stockpiles will be protected from wind and water erosion through the use of suitable weed-free mulch, seeding, and other measures as necessary.
- With the exception of active work areas, all disturbed soils that remain exposed, unprotected, or un-reclaimed for longer than one month will be stabilized as approved by BLM. This may be done through the use of native or sterile non-native seed, or application of a covering such as mulch or matting.

**Visual Resource Management**

- Limit surface disturbance to the minimum area necessary
- Use natural features such as trees, rock formations, or terrain, to conceal disturbed areas. Constructed berms that blend with the terrain may be useful for concealment.

- Minimize contrast of the structure or activity with the surrounding terrain by using the visual resource management principles of form, line, color, and texture.
- Paint structures a color that blends with the surrounding vegetation.
- Remove unnecessary equipment, structures, and debris from the site that are not necessary for daily operation.

**Wildlife Protection Controls**

- Incorporate wildlife habitat needs in relationship to planned activities.
- Minimize wildlife habitat loss and fragmentation by carefully planning and considering the location, size, and number of such things as roads, utilities, fencing, ponds, and well pads. Bury pipelines and power lines along roadways.
- If appropriate employ habitat enhancement in appropriate areas to offset habitat loss or fragmentation caused by the planned development.
- Accomplish interim rehabilitation and reclamation as soon as practicable after disturbance.
- Group structures and facilities in a common area.
- Design power lines to minimize raptor attraction.
- Install perch guards on utility lines to reduce risk of raptor electrocution and discourage raptor perching on utility poles by the use of anti-perching devices.
- Design activities to eliminate general hazards to wildlife.
- Restrict activities during critical periods such as nesting or fawning.
- Minimize noise by using appropriate noise reduction devices.
- Incorporate habitat requirements in interim and final rehabilitation.
- Limit activity to only the area that is necessary.
- Require that dogs be on leash in critical habit areas, or close the area to all dogs (on or off lease).
- Remotely monitor wells and production equipment.
- Monitor wildlife as needed to document impacts of planned development on population dynamics or behavior; and develop and implement mitigation based on the results of monitoring.
- Require all refuse containers employ a bear-proof design and be emptied on a regular basis.
- Net all oil and gas reserve and permanent pits to exclude birds; enclose pits within an 8-foot-high fence to exclude ungulates; enclose pits within a 2-foot solid barrier buried 6 inches into the soil to exclude small mammals and reptiles, and lined to prevent infiltration to groundwater.

**Livestock Management**

- Implement management tools such as fencing, stock ponds, and salt licks to manage livestock distribution as needed, and discourage grazing in unwanted areas such as riparian vegetation and sensitive wildlife habitat.
- Adjust livestock grazing in heavily used areas to allow native vegetation a period of recovery.
- Restoring temporarily disturbed areas, using native species, planting woody species, or use a biodegradable erosion-control fabric to enhance germination and seedling establishment
- Drill-seed at a rate of Pure Live Seeds per square foot as needed to establish healthy vegetation (rate may be double for broadcast-seeding or hydroseeding) and be preceded by adequate site preparation, including decompaction of soil and control of annual or biennial weeds
- Fence revegetated areas to exclude livestock for at least two full growing seasons
- Use culverts or hardened crossings for use of roads that cross streams
- Use erosion control devices around culverts as needed to reduce erosion and gulley formation.
- Construct fences and gates to ensure that livestock do not enter areas being protected for another resource that would be diminished by grazing or trampling

- Construct alternative water sources to disperse livestock use and reduce dependence on natural streams and riparian corridors

**Noxious and Invasive Weed Management**

- Rehabilitation disturbed sites as quickly as possible following interim or final rehabilitation guidelines as appropriate.
- Allow on supplementary livestock feed and revegetation mulches that are certified weed free.
- Clean vehicles regularly using water or air spray to reduce the chance of transporting weed seed from affected areas to non-affected areas.

# Appendix J

Disturbed Site Reclamation Monitoring and Success Criteria

# Appendix J

## DISTURBED SITE RECLAMATION STANDARDS, MONITORING AND SUCCESS CRITERIA

## 1.0 INTRODUCTION AND SUCCESS CRITERIA

The goal of the following reclamation standards and success criteria is to mitigate anticipated impacts to vegetation, soil and water resources from ground-disturbing activities by re-establishing a self-sustaining, diverse vegetation community composed of species native to the region in sufficient species density and diversity to closely approximate natural, undisturbed vegetation potential.

This Appendix supplements the discussion found in "Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development" (BLM 2006), commonly referred to as "The Gold Book". All ground-disturbing activities will be subject to these reclamation standards and monitoring requirements. These include resource improvements initiated by BLM, as well as permitted activities such as fluid and solid mineral development activities, including oil and gas development.

BLM is responsible for implementing these standards and compliance with monitoring requirements. Project proponents for all permitted activities will typically perform the reclamation work, and effect on-the-ground implementation. Projects must meet both interim and final reclamation objectives in order to retrieve any associated bonds, or for reclamation to be considered successful. For oil and gas development activities within the Federal Unit atop the plateau, five-year interim criteria must be met in order to have areas released from the total maximum disturbance area for the unit, or in order to move to the next development area. Interim reclamation objectives and success criteria have been split into short-term (two-year) and long-term (five-year) groupings. Two-year criteria are to be met in two or fewer years, while five-year criteria must be met in five or fewer years. For example, five-year criteria may be met in a little as two years, but must be met within five years for reclamation to be considered successful.

### 1.1 Short-Term (Two Year) Interim Reclamation Objectives and Success Criteria

Interim reclamation refers to those actions taken immediately after cessation of ground-disturbing activities. Interim actions are typically taken to stabilize a portion of a site that is no longer undergoing disturbance while activities simultaneously continue to disturb other portions of the same area. For example, interim reclamation may be conducted in perimeter areas of a natural gas well site when the larger footprint required for the development is reduced in area to that necessary for production. The following interim reclamation success requirements will be used to determine success after two years (two complete growing seasons):

a. Re-grade the site to approximate pre-disturbance topography to the extent practicable, in order to minimize disturbance, and lessen erosion potential.
b. Stabilize disturbed soil surface areas to reduce erosion and runoff to or below naturally occurring levels.
c. With the exception of active work areas, all disturbed soils that remain exposed, unprotected, or unreclaimed for longer than one month will be stabilized as approved by BLM. This may be done through the use of native or sterile non-native seed, or application of a covering such as mulch or matting,
d. Establish and maintain a healthy and diverse composition of the species naturally growing on the site which will provide for natural plant and community succession.
e. Prevent establishment of noxious weeds and undesirable plants on the disturbed areas and expansion onto adjacent uninfected areas.

f. Restore wildlife habitat and livestock forage.
g. Reduce visual contrast to meet established visual resource management objectives in all reclaimed areas.

**1.2 Long-Term (Five Year) Interim and Final Reclamation Objectives and Success Criteria**
Final reclamation will occur when no more ground-disturbing activities are expected to occur. The following interim reclamation success requirements will be used to determine success after five years (five complete growing seasons):

a. Stabilize the disturbed soil surface to reduce erosion and runoff to or below natural background levels. Flow pattern development will not have resulted in rills deeper than three inches, or spaced closer than on adjacent undisturbed hillsides. Activities do not contribute to pre-existing gullies actively down cutting or head cutting. No slumping or subsidence will occur as a result of surface disturbing activities.
b. With the exception of active work areas, all disturbed soils that remain exposed, unprotected, or unreclaimed for longer than one month will be stabilized as approved by BLM. This may be done through the use of native or sterile non-native seed, or application of a covering such as mulch or matting.
c. Re-grade the site to approximate pre-disturbance topography to the extent practicable, in order to minimize disturbance, and lessen erosion potential.
d. Achieve or exceed the pre-disturbance cover and diversity of native species on the site. Total cover will be at least 80 percent of the reference area and have a similar composition of woody, grass-like and herbaceous species. Frequency of the most dominant species will be at least 80 percent of their relative contribution on the reference site. Vegetative composition and density will include the following: 1) Grass and forb species, by percent cover, 2) Litter accumulation as determined by percent ground cover, 3) Bare ground as determined by percent ground cover, 4) Noxious weed species, by percent cover (with a treatment objective of zero percent relative cover and actual cover of less than five percent), and 5) Soil surface stability as determined by the absence or limited degree of surface erosion and plant pedestals.
e. State of Colorado A, B, or C listed noxious weeds or other undesirable plant species will be absent (including kochia and Russian-thistle), with an exception for cheatgrass. It may be necessary to treat adjacent infestations of noxious and undesirable species prior to disturbance. If cheatgrass is present adjacent to the disturbed area in overall concentrations of less than 50 percent vegetative cover, the percentage vegetative cover of cheatgrass on the reclaimed site will not exceed five percent. In areas where adjacent lands have greater than 50 percent cheatgrass cover, the percentage cover on reclaimed lands will not exceed 30 percent.
f. Restore visual quality, reduce visual contrast and enhance aesthetic values to meet visual resource management objectives on all areas of surface disturbance.

## 2.0 RECLAMATION PLANS

Reclamation plans will be submitted for BLM review and approval prior to surface disturbing activities. Reclamation plans will be considered as COAs for oil and gas leases and reviewed and approved through activity or project specific planning for other resource management activities. Reclamation plans will address the following requirements in sufficient detail to demonstrate an understanding of the potential reclamation site and activities required to achieve the stated success criteria. These plans will incorporate the following reclamation topics and fully develop appropriate site-specific BMPs for each permitted action and location.

**2.1 Site-specific Baseline Information:**

a. Pre-disturbance terrain and contour
b. Pre-disturbance land use
c. Seasonal weather patterns
d. Topsoil depth and other limitations to plant root growth
e. Vegetation type, dominant species cover, density, and productivity by strata

**2.2 Reference Site Selection and Documentation:**

a. Appropriate reference sites will be assessed, selected, and characterized following Ecological suite Inventory (ESI) methods and standards, or an approved equivalent system (see Attachment A for an example).
b. Reference sites will be approved by BLM prior to a permitted disturbance.

**2.3 Site-specific Revegetation Plan:**

a. Size of disturbed versus reclaimed area
b. Proposed surface finish and grades
c. Proposed topsoil handling and treatment
d. Proposed seed mix (seeding rate, species, and variety)/plant schedule (container size and off-center spacing)
e. Treatment of noxious and undesirable species
f. Proposed seeding/mulching techniques
g. Ongoing maintenance activities expected
h. Monitoring plan

**2.4 Bond Agreement Information (if applicable), or Conditions for Future Activity**

Bonds to be held against achievement of reclamation success criteria will be negotiated on a site-by-site basis. In general, the amount of a bond will be considered a percentage of the total reclamation costs for a project sufficient to ensure reclamation success. These costs will be demonstrated in the reclamation plan. Documentation of compliance with bonding requirements sufficient to assure reclamation will also be included as part of the approved reclamation plan.

Future associated development activities may be precluded until successful reclamation is achieved for a given area or project.

## 3.0 RECLAMATION PRACTICES AND STANDARDS

The following practices and standards are intended to be applied simultaneously to all appropriate BMPs to all reclamation sites. Some standards are only appropriate for interim or final reclamation, while others will be used in either situation. Practices and standards are intended to provide direction and clarify BLM's intent for reclamation activities. The intent of BLM's land use planning (RMP) process is to identify standards and objectives to be met on public lands. Specific methodologies are not considered to be activity or implementation level planning decisions and not RMP decisions. As such, practices are provided to clarify BLM's intent for reclamation activities. The following list is not considered to be all-inclusive, but rather is presented to provide a sense of the minimum requirements that will be required to produce acceptable reclamation outcomes. Additional practices may be required, practices may be withdrawn, or practices may be modified during activity, implementation, or project level planning; this may be done without future land use plan (RMP) decisions or amendments. Monitoring and adaptive management practices will be used to refine and clarify needed actions consistent with the goals and objectives of this plan. Reclamation practices and standards are listed below.

### 3.1 Interim Reclamation Practices and Standards

a. Limit surface disturbance to the minimum area necessary by avoiding development of roads, pipelines, and well pads on steep slopes; minimize the potential for surface disturbance through careful planning; grouping facilities to the extent possible; and sharing rights-of-way such as burying pipelines along roadways.

b. Stockpile topsoil when possible and prudent (not in areas of seleniferous or erosive soils, or in areas with noxious weed populations without pretreatment), following all topsoil salvage and storage BMPs; or if directed by BLM plan for salvage, direct-haul, and application (live handling) of topsoil from a disturbance site to a site undergoing concurrent revegetation.

c. Minimize the area necessary for construction activities; determine the minimal area needed to facilitate necessary activities, and initiate interim reclamation as quickly as practicable after construction.

d. Silt fencing will be necessary in areas in proximity to water features such as streams, ponds, and wetlands or in other situations where wind or water erosion may otherwise move sediments into sensitive or valuable surrounding habitat.

e. Interim reclamation will include recontouring of the disturbed surface to blend with surrounding terrain, spreading salvaged or stockpiled topsoil evenly on areas to be reclaimed, and revegetating with native plants.

f. Use seed mixes containing native, early-succession species, or species with ability to readily establish quickly in recently-disturbed soil areas. In areas subject to occasional vehicle travel, interim revegetation will include species selected accommodate occasional activity such as vehicle travel, vehicle parking, or temporary staging areas.

g. Drill seed the disturbed area with a seed mix of species native to the local area at a rate sufficient to achieve site stabilization and achieve desired cover based on reference sites (rate would be doubled for broadcast or hydroseeding where drill seeding is impracticable) following adequate soil preparation that includes removal of weeds and undesirables species, decompaction ("fluffing") of compacted soil, and harrowing to prepare the seedbed.

h. Mulching will be required to stabilize soil, maximize moisture infiltration, and improve the chances for revegetation success. Mulch seeded areas with certified weed-free native hay or straw at a rate sufficient to achieve site stabilization and establish native species. If physical conditions preclude this, apply appropriate hydromulch with a non-asphalt tackifier.

i. Control and eradicate all State of Colorado A-, B-, and C-listed noxious weeds and undesirable species within reclaimed areas. One aspect of reducing the potential for noxious weed establishment is consideration of the sequence and timing of revegetation.

j. Fencing will be required to limit wildlife and livestock grazing for a minimum of two growing seasons or until plants are sufficiently established to persist under some physical disturbance. Seeded species will be considered established when at least 50 percent of plants are producing seeds. Fencing will be installed after dirtwork, grading, and seeding are completed and prior to livestock turnout on the allotment. The use of less-palatable grasses and forbs or fencing will be used as approved by BLM to limit wildlife and livestock presence along roadways, or other disturbed areas.

### 3.2 Long-Term (Five Year) Interim and Final Reclamation Practices and Standards

a. Remove all equipment, debris, and surface structures that are not necessary for the intended use of the site. Remaining structures will blend in to the extent possible with the surrounding terrain. Consider the use of natural features such as trees, rock formations, terrain, or berms to conceal

roads, pipelines, and well pads. Paint structures a color that blends with the surrounding vegetation.

b. Recontour all disturbed areas to blend with the surrounding terrain to the extent practicable. Areas that have received heavy equipment use such as roads and well sites will be ripped to a depth sufficient to accommodate the establishment of native vegetation similar to the surrounding undisturbed area.

c. As soon as practicable, spread salvaged or stockpiled topsoil to a uniform depth across all disturbed areas. The surface must blend with the surrounding non-disturbed area. (A rough surface will accommodate broadcast seeding better than a smooth surface.)

d. Revegetate with native plant species similar in mix and kind to the appropriate reference plant community. The type of cultural material (seeding or planting) used will depend on the attributes of the site and revegetation goals. As needed, utilize a combination of seeding grasses and forbs, and containerized nursery stock shrub and tree planting.

e. Drill seed the disturbed area with a seed mix of species native to the local area at a rate sufficient to achieve site stabilization and achieve desired cover based on reference sites (rate would be doubled for broadcast or hydroseeding where drill seeding is impracticable) following adequate soil preparation that includes removal of weeds and undesirables species, decompaction ("fluffing") of compacted soil, and harrowing to prepare the seedbed.

f. 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, or as approved by BLM.

g. Mulching will be required to stabilize soil, maximize moisture infiltration, and improve the chances for revegetation success. Mulch seeded areas with certified weed-free native hay or straw at a rate sufficient to achieve site stabilization and establish native species. If physical conditions preclude this, apply appropriate hydromulch with a non-asphalt tackifier.

h. State of Colorado A-, B-, or C-listed noxious weeds or other undesirable plant species will be absent (including kochia and Russian-thistle), with an exception for cheatgrass. It may be necessary to treat adjacent infestations of noxious and undesirable species prior to disturbance. If cheatgrass is present adjacent to the disturbed area in concentrations of less than 50 percent vegetative cover, the percentage vegetative cover of cheatgrass on the reclaimed site will not exceed five percent. In areas where adjacent lands have greater than 50 percent cheatgrass cover, the percentage cover on reclaimed lands will not exceed 30 percent.

i. 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.

j. Fencing will be required to limit wildlife and livestock grazing for a minimum of two growing seasons or until plants are sufficiently established to persist under some physical disturbance. Seeded species will be considered established when at least 50 percent of plants are producing seeds. Fencing will be installed after dirtwork, grading, and seeding are completed and prior to livestock turnout on the allotment. The use of less-palatable grasses and forbs or fencing may be required or approved by BLM to limit wildlife and livestock presence along roadways, or other disturbed areas.

## 4.0 MONITORING

Annual monitoring and reporting of results will be required for all reclaimed areas. Monitoring will occur annually for either a minimum of five years or until performance standards are obtained, whichever is longer. Monitoring methods and reporting standards will be included in reclamation plans and approved by BLM prior to disturbance. Monitoring methods are outlined below.

### 4.1 Methods

Monitoring methods will be approved as part of a site reclamation plan, prior to site disturbance. In general, methods must be used that will yield appropriate quantitative measures by which to address success criteria parameters against a reference site.

a. Plant species composition and cover will be sampled using either point intercept transect or plot sampling at a sufficiency to demonstrate statistical adequacy at the 85 percent level.

b. Woody species (tree and shrub) density and survivorship will be assessed using plot or belt transect sampling.

c. Fixed photo points (location to be determined and used during baseline conditions sampling).

### 4.2 Monitoring Reports

Reports of annual monitoring efforts will be submitted annually to BLM for approval. Each report will address the results of the monitoring in terms of each success criterion and compared to the same parameters for the reference site. Additionally, each report will address the following items:

a. Text and data to illustrate trends in terms of site conditions against each of the agreed-upon success criteria

b. Tabulated woody (tree and shrub species) containerized planting survivorship

c. Tabulated vegetation cover data for planted and seeded herbaceous species

d. Annotated photographs from fixed photo points illustrating conditions before and after mitigation activities are completed

e. A figure showing locations of fixed photo points and data sampling locations

f. A brief discussion of the overall mitigation success, incorporating monitoring data. Problem areas identified during the monitoring session will be discussed and adaptive management remediation activities will be recommended, as necessary.

g. A description of any adaptive management activities performed since the previous annual report for the site as well as planned actions to be taken if plant establishment efforts are sub-standard or completely fail. For these circumstances, the cause of failure must be stated and how corrective actions will mitigate these causes.

## ATTACHMENT A:
## Alternative Approach to ESI Reference Sites
## Example of a Quantitative Success Sampling Assessment Tool

## FLORISTIC QUALITY INDEX

I. Floristic Quality Indices (after Taft et al., 1997)

1. For the reference species list, assign an index based on the affinity to "natural areas". Individual species assignment range from 0-10 with "10" being considered the highest fidelity to natural areas. This index is termed the coefficient of conservatism (C). General categories for species assignments consist of the following:

X 0-1: Taxa that are adapted to severe disturbance, particularly anthropogenic. Disturbance occurs so frequently that often only brief periods are available for growth and reproduction. Generally considered ruderal species/opportunistic invaders.

X 2-3: Taxa within this category are associated with more stable, though degraded habitat. Generally considered ruderal-competitive species, found in a variety of habitats.

X 4-6: Taxa that have a high consistency of occurrence within a given community type and will include many dominant or matrix species for several habitats. Species will persist under moderate disturbance.

X 7-8: Taxa associated mostly with natural areas but can persist where the habitat has been somewhat degraded. Increases in the intensity or frequency of disturbance may result in reduction in population size, or taxa may be subject to local extirpation.

X 9-10: Taxa exhibiting a high degree of fidelity to a narrow range of synecological parameters. Species within this category are restricted to relatively intact natural areas.

Assignment of the "C" value should be based upon field experience of principal investigators (A-Team), consultation with local or regional plant ecologist/ taxonomists, description of habitat preferences in floristic manuals or published synecological or autecological studies. Values to be assigned should be considered in the context of the defined reference domain (geographic distribution) and range of variability (disturbance gradient) within the HGM subclass of interest.

2. Calculation of the Floristic Quality Index

X Determine the mean coefficient of conservatism ($\bar{C}$) by summarizing all coefficients in the inventory unit (reference site or sample within the reference site) and dividing by the number of taxa (N), or $\bar{C} = \Sigma C/N$.

X Multiply the mean coefficient of conservatism ($\bar{C}$) by the square root of the total number of taxa. The floristic quality index is then indicated by:

$$FQI = \bar{C} (\sqrt{N})$$

*From:*

Taft, J.B., G.S. Wilhelm, D.M. Ladd, and L.A. Masters. 1997. Floristic quality assessment in Illinois; a method for assessing vegetation integrity. Erigenia 15:3-95.

# Appendix K

Glenwood Springs Field Office
Resource Monitoring Plan

# Glenwood Springs Field Office

# Resource Monitoring Plan

February 2006

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# I. Introduction

Monitoring rangeland health and evaluating the effects of management practices is an essential part of wise land management. Monitoring is the orderly collection, analysis, and interpretation of resource data in order to evaluate progress in meeting management objectives and/or land health standards. The Glenwood Springs Field Office (GSFO) will conduct rangeland monitoring to determine the effects of specific management actions on resource conditions.

Management objectives established in land use plans, coordinated resource management plans, activity plans and land health assessments form the foundation for determining the level and intensity of monitoring studies required. When establishing objectives, they must be well defined, measurable and realistic in order for the results of monitoring studies to be useful.

## A. Purpose

The purpose of this monitoring plan is to establish a clear, consistent approach to conducting monitoring studies in the Glenwood Springs Field Office. Rangeland monitoring should be designed to obtain required data to address one or more of the following concerns; *1) determine present condition of the allotment/landscape/watershed in relation to the Colorado Standards for Land Health (Appendix 1), 2) determine causes of problems in meeting land health standards or management objectives, 3) evaluate the relative success or failure of a given management practice in achieving the management objectives, and 4) assess changes in land health over time.*

The strategy incorporated into this monitoring plan includes the evaluation of impacts associated with livestock and big game grazing on public rangelands and does not address or identify methods used to determine impacts of other land uses such as mineral development, reclamation practices, recreational use levels or rights-of-way actions. Ocular assessments of the overall impacts of these and other land uses relative to the land health standards may be gathered during formal land health assessments and may be extremely valuable to land managers in making future allocation decisions, but methods used for evaluation are not brought forth in this effort.

The procedures identified in this plan outline a standard approach for monitoring, however, different or additional methods may be needed where values or management objectives dictate. Regardless of what methods are used on a particular study location the same method should be continued over the years for consistency, unless it can be demonstrated that the existing studies do not provide the necessary data to make sound, supportable management decisions.

## B. Physical and Biological Environment

1. Location

   The Glenwood Springs Field Office is located in west central Colorado, primarily in Garfield and Eagle Counties, but also includes portions of Mesa, Pitkin, Rio Blanco and Routt Counties. Interstate 70 traverses through the middle of the administrative unit. The land ownership pattern is highly fragmented between private, state, and federal, with 566,042 acres (44%) being administered by the Bureau of Land Management.

2. Climate/Topography

   The climate of the GSFO is semi-arid and is greatly influenced by topography and elevation. The topography of the area varies from steep mountains and rolling foothill zones to gently sloping alluvial terraces and narrow valley floors. Elevations range from 5,000 feet near Debeque to 11,275 feet on Castle Peak. Total annual precipitation ranges from less than 12 inches to more than 30 inches depending on geographical locations and elevation. The majority of the precipitation received is in the form of snow during the winter months (November - March) or during thunderstorm events in the summer months.

3. Vegetation

   The GSFO administrative area lies primarily in the Southern Rocky Mountains and Utah High Plateaus Ecoregions. At the lower elevations, relatively low annual average precipitation has a direct bearing on overall forage productivity and potential natural communities. Vegetative communities include salt desert shrubs, sagebrush steppe, pinyon/juniper woodlands, oakbrush/mixed mountain shrubs, aspen, mixed conifers and badlands.

4. Wildlife

   The GSFO supports year-round habitat for mule deer and elk. Greater sage grouse habitat occurs throughout much of the public lands in Eagle and Routt Counties. Lynx denning and foraging habitat is found at the upper elevations of the Field Office and four linkage corridors have also been identified within the GSFO administrative area. Other wildlife species include mountain lion, black bear, turkey, bald and golden eagles, peregrine falcon, other raptors, bats, migratory songbirds, numerous small mammals, reptiles, and amphibians.

## C. Grazing Administration

The Glenwood Springs Field Office administers grazing within 255 allotments, of which 58 are currently un-allotted due to terrain, lack of forage, lack of fencing or allocations for other resource uses. The allotments support a total of 46,505 permitted animal unit months (AUMs) for cattle, sheep and horses.

## D. Coordination

Monitoring activities within designated allotment units, herd management areas or landscapes will include consultation, cooperation and coordination (CCC) with range users, the Colorado Division of Wildlife (DOW) and other interested parties, prior to, during the collection of, and through the evaluation period of any monitoring studies. The most important concept in the CCC objective is to develop trust, understanding and a sound working relationship between BLM, the range user, DOW and members of the interested public.

1. Wildlife

   Studies established in those specific allotments identified as possessing wildlife/livestock conflicts will require close coordination with and input from the Division of Wildlife. DOW personnel will assist in developing management objectives for the area and in the planning, implementation and analysis of the subject monitoring studies.

2. Permittees/Lessees

   The range user should be encouraged to share responsibility for selecting key areas, developing management objectives, making field observations and collecting on-the-ground data. The range user may also provide specific operational experience that may be lacking by the individual range management specialist. The following procedure is suggested to accomplish this element and ensure that all parties are in agreement.

   a. Review the case file on each specific allotment to determine historical use, present levels of grazing, distributional patterns, etc. prior to meeting with the range user. Discuss potential conflicts or issues in the office with other resource specialists who may have an interest in the allotment or data to support the need for management changes.

   b. Schedule an informal meeting with the range user in the field to discuss and better understand their operational procedures and allow the opportunity for them to show you the allotment, how the livestock normally use the allotment, their expectations of future grazing activities, etc.

   c. Introduce the concepts of Colorado Standards for Healthy Rangelands. Discuss with the range user any apparent failures in meeting the standards and some of the guidelines for livestock grazing that have been adopted to address the failures of the standards.

   d. Document the field visit and discussion as it pertains to grazing activities and encourage the range user to provide written documents involving their operational procedures, conflicts and philosophies.

   e. Continue to discuss and develop specific objectives and options that could be

implemented to ensure progress toward meeting the failed standard.

f. Identify key areas for monitoring studies to be established.

3. Interdisciplinary Staff

The use of an interdisciplinary team to set up and conduct monitoring within each allotment is a desirable process, but often becomes unfeasible based on budgetary constraints and other workload priorities of each specialist. Therefore, an interdisciplinary team should be used to monitor livestock grazing impacts in those allotments where the degree, amount, intensity and importance of the issues and resources involved are considered extremely high to the general public, field office and/or land users. Examples of such situations might be an allotment that involves lynx habitat, supports Colorado River cutthroat trout or a Special Status plant species, or allotments currently failing one or more of the Colorado Standards for Healthy Rangelands based on a formal Land Health Assessment.

On other allotments, an interdisciplinary team should be used to help identify key or critical areas and set management objectives for the allotment, but the rangeland management specialist responsible for the administration of that particular allotment should establish and complete most of the monitoring studies. This consolidates the effort to the individual with the most knowledge of the grazing management of the area, and ensures a central point of contact for proper consultation, coordination and communication throughout the process with the permittees, DOW and other affected parties.

## II. Management Objectives

The goal for livestock grazing management as discussed in the Glenwood Springs 1984 RMP and amended following adoption of the Colorado Standards for Public Land Health relates to providing a target number of AUMs of livestock forage commensurate with meeting public land health standards. *Specific resource objectives will be developed for each allotment* and will be listed in the Monitoring Files for that allotment. These objectives should be fairly specific, simple, and measurable. The objectives should identify the most immediate responses that should occur as a result of a management action. Objectives should be attainable within an evaluation period and should not exceed two evaluation periods. The intensity of monitoring will vary depending on the objectives developed, as well as on the resource values, changes anticipated, and timeframes established.

In the absence of identified management objectives for an allotment, the monitoring established will be designed to determine whether current stocking rates are appropriate and whether the Colorado Land Health Standards are being met.

## III. Establishing Priorities

### A. Allotment Categorization

Due to limited funding and time constraints, BLM cannot intensively monitor the effectiveness of authorizations and management actions on all rangelands it administers. Therefore priorities need to be established on an allotment, watershed, wildlife habitat unit or landscape basis and efforts will be focused on those areas.

The following factors will be used in prioritizing allotments for monitoring:

1. Allotments in which a determination has been made that Standards are not being met as a result of a formal Land Health Assessment and monitoring is needed to determine causal factors.
2. Allotments which have undergone management changes to make progress toward meeting a Standard or move toward a management objective. Monitoring will be needed to determine if management actions taken are making significant progress toward meeting the management objectives and/or Land Health Standards.
3. Allotments with concerns regarding meeting Standards or Allotment Management Objectives based on prior monitoring, professional judgment, or public feedback.

4. Allotments due for Grazing Permit Renewal in the next few years. Gather data regarding use levels and resource conditions prior to developing the NEPA analysis for permit renewal. Level of monitoring intensity can be dictated by I, M, and C allotment categorization.
5. Allotments due for Land Health Assessments in the next few years. Establish studies to determine if resource problems exist so that consultation and coordination with the appropriate land users can be initiated prior to the Assessment being conducted.
6. I, M, C Allotment Categorization will be the basis for prioritizing all other allotments.

GSFO categorized each of its allotments into one of three categories based on the BLM's Final Grazing Management Policy. These categories were:

* "I" (Improve) – Manage the allotment to improve the currently unsatisfactory resource conditions. These allotments are generally given the highest priority for project development, monitoring emphasis, management plan development and public investment. ;
* "M" (Maintain) – Manage the allotment to maintain currently satisfactory resource conditions;
* "C" (Custodial) – Manage the allotment in a custodial manner, while protecting existing resource values.

The factors used in establishing allotment categories were range condition, present management, resource potential, resource conflicts, level of controversy and economic investment opportunity. In addition, the GSFO considered disposal

parcels, access problems, prospective livestock cuts, and office commitments. Based on these criteria and input from other agencies, there are 98 allotments classified under AI@, 41 as an AM@ and 119 managed as a AC@ category.

This categorization should be reviewed periodically to determine whether the category assigned to each allotment is still valid in light of new information or issues.

Stipulations that have been made part of a grazing authorization, such as utilization restrictions, would be classified as "compliance inspections" to ensure compliance with the authorization.
If budget or manpower restrictions impose a constraint on completing scheduled studies, the above priorities will determine which studies will be accomplished and which will not. These priorities will also dictate the intensity/frequency of the monitoring studies to be conducted. If the Field Office administrative area is experiencing a severe or prolonged drought, other immediate management priorities, such as conducting use supervision, may take precedence over that year's monitoring workload.

Refer to **Appendix A** for a listing of the current highest priority allotments. The list of highest priority allotments is subject to change as management objectives are achieved or as new issues arise.

## B. Monitoring Intensity

The Glenwood Springs Field Office has been divided into three geographical areas with one area assigned to each Rangeland Management Specialist (RMS) for administration. Within each of these respective areas, the RMS, in coordination with other field office specialists, prioritizes the allotments based on the factors identified above. This prioritization forms the basis for determining the intensity of monitoring required, the type of studies necessary to address the issues, schedules for monitoring, and associated workload requirements. The issues identified by the field office specialists will determine which specialists, besides the RMS, need to be involved in monitoring and data collection.

The monitoring method, number of studies and frequency of data collection for each allotment will vary depending on the allotment prioritization, the resource values and identified conflicts, and the specific allotment objectives. In general, High Intensity monitoring will be conducted on those allotments identified in the High Intensity Allotment List in Appendix A. The remaining lower priority I and M category allotments will have moderate intensity studies performed to detect major changes in resource condition. "C" category allotments will receive low intensity monitoring efforts. However, for those High Intensity Allotments in which the permittee has agreed to implement livestock management changes to conform to the Grazing Management Guidelines and improve allotment conditions, less intensive monitoring may be required.

## C. Short-term vs. Long-term Monitoring

Monitoring of management actions consists of both short-term and long-term monitoring. Short-term monitoring studies include those studies used to determine preliminary standards conformance, proper stocking levels, livestock distribution problems, and wildlife/livestock dietary overlap concerns. Short-term monitoring is also used to assure that the management actions outlined in Activity Plans are being followed. Results from this monitoring provide the basis for immediate adjustments in management actions.

Intensive, Short-term Monitoring

For allotments where resource concerns have been identified, where standards are not being met and causal factors have not been determined, where AMP development is being considered, or where stocking levels may be inappropriate, short-term, intensive monitoring will be conducted to obtain the information necessary to resolve the issues and implement changes in management, if necessary.

Studies for these determinations include rapid assessment, actual use, utilization, use pattern mapping, and climatic data. The minimum monitoring data that will be collected is: Actual Use (by direct counts or Actual Use forms), Utilization and Climate Data. Actual Use and Utilization studies will be conducted every year of the Intensive Monitoring period. Upon completion of the prescribed monitoring period, the data will be compiled and analyzed and an evaluation of the allotment completed. Wherever trend data is available, it will be included in the evaluation.

The evaluation will include narrative and graphical data, as appropriate. If adjustments in grazing management are needed to achieve rangeland health or meet management objectives, an environmental analysis will then be prepared and a decision issued. If the evaluation indicates no management changes are needed, this conclusion will be briefly documented and placed in the monitoring file.

Short-term, intensive monitoring should precede or at least coincide with all other studies. Short-term monitoring methods to be used within the Field Office are listed in Table 1 below.

Table 1

| SHORT TERM MONITORING METHODS | | |
|---|---|---|
| Method | Attribute Measured | Target Area |
| Actual Use | Record of animal numbers and pasture use dates | Entire allotment |
| Utilization Map | Utilization patterns, developed by general reconnaissance of the area | Entire allotment |
| Key Species Method | Utilization of key species | Key Areas |

| | | |
|---|---|---|
| Cole Browse Method | Utilization of browse species | Key Areas (Big Game) |
| Residual Measurements (Stubble Height) | Height of vegetation remaining at end of grazing season | Riparian Areas |
| Professional Judgment | Documented observations | Entire Allotment |

Long term Monitoring

Long-term trend monitoring is used to determine the effectiveness of the management actions in achieving the specific management objectives. These studies involve the collection of cover, density, frequency, and/or species composition of the plant community. The data is compared to an established baseline and analyzed over time to determine if the appropriate actions that were initiated are making progress toward meeting management objectives or rangeland health standards.

Long term monitoring includes both condition and trend studies. Condition studies are generally inventories such as Land Health Assessments and Ecological Site Inventories in which data will be collected on a one-time or infrequent basis to establish a *baseline* of current conditions.

Long-term trend studies generally require a period of five or more years before any conclusive results can be obtained. Quantitative and qualitative sampling and measuring techniques are used to measure changes in vegetation or physical attributes over time. These changes are compared to a baseline to determine whether the measured attribute is moving toward or away from the established management objectives (i.e. the trend).

Long term monitoring methods to be used in the Field Office are shown in Table 2.

Table 2

| LONG TERM MONITORING METHODS | | |
|---|---|---|
| Trend | Attribute Measured | Target Area |
| Daubenmire Cover Class | Canopy cover, ground cover, composition, frequency | Key Areas, Riparian Areas |
| Nested Frequency | Frequency, ground cover | Key Areas |
| Photo Plot (1m x 1m) | Ocular estimate of cover | Key Areas, Riparian Areas |
| Photo Point | Ocular assessment of cover, structure | Key Areas, Riparian Areas |
| Cole Browse Method | Age and form class of shrubs | Wildlife Key Areas |
| Condition | Attribute Measured | Target Area |
| Ecological Site Inventory | Composition of vegetation by weight (lbs of forage production/ac) | Area wide Key Areas |

| | | |
|---|---|---|
| Land Health Assessment | Ocular assessment of composition, cover, age classes, soil stability | Area wide |

**Appendix B** lists the general schedule in which the various monitoring studies will be conducted based on allotment prioritization. This schedule will remain flexible based on the specific needs of each allotment and on annual budget constraints. At the time each study is established, the frequency of re-reading will be determined based on the management objectives, current site conditions, the expected time frame for achieving the objectives, and/or the need for data for upcoming NEPA analysis (grazing permit renewals).

## IV. Monitoring Concepts

Proper selection of study sites is critical to the success of any monitoring program. The stratification, key area, and key species concepts shall be used when selecting study sites to show the effects of current grazing management. The site selection process used and the management objectives for each site should be documented in the monitoring files.

### A. Stratification

Stratification is a means of dividing an area of rangeland into smaller, more homogeneous units. Allotments, pastures, wildlife habitat areas, watershed units or other management areas may be divided into areas having similar characteristics. These may be areas having similar vegetation, soils, topography, or grazing use.

Some criteria that should be considered in stratifying an area are:

1. Vegetation Type. Each major vegetation type may be a separate stratum.

2. Range Site. Range sites with their specific potential plant associations and soil characteristics may be considered criteria for stratifying an area.

3. Present ecological status. The present ecological status of the range site may be used as a basis for stratification.

4. Soils and Topography. Differences in soils are usually expressed as differences in vegetation, but there may be instances where the soil and topography may be more significant than vegetation in stratifying such areas as fragile watersheds or rare plant habitat.

5. Grazing Systems. Areas subjected to similar grazing treatments may be considered in stratification.

6. Utilization Patterns. Grazing utilization patterns can play a key role in stratifying

an area as well as in locating key areas.

7. Suitability. Suitability of rangelands for use by different classes of livestock can also be used in stratifying rangelands.

8. Threatened, Endangered or Sensitive Species Habitat. In some cases, habitat for threatened, endangered, or sensitive species may be an important consideration in stratifying an area.

Topographic maps and aerial photographs may be very helpful aids in the stratification of a management unit. A stratified map of the allotment should be created and stored in the monitoring file.

## B. Key Areas

Monitoring studies should be established in key areas. Key areas are indicator areas that reflect what is happening on a larger area as a result of on-the-ground management actions. Depending on the management objectives, a key area may be a representative sample of a large stratum, such as a pasture or allotment, or it may be a representative sample of a small stratum having important grazing value, such as a heavy use area around water, a riparian area, etc. An interdisciplinary team should be used to select these areas. Permittees, lessees, and other interested parties should be invited to participate as well. The criteria that were used in the selection of key areas or key species will be documented on the Study Location and Documentation Data Form **(Illustration 1)**.

1. Criteria for Selecting Key Areas.
   Proper selection of key areas is critical to the success of a monitoring program. Some criteria that should be considered in selecting a key area are listed below. A key area:
   a. Should be representative of the stratum in which it is located.
   b. Should be located within a single ecological site and present plant community.
   c. Should contain the key species or have the potential to produce the key species.
   d. Should be foraged by livestock or wildlife when the allotment or pasture is used. Small areas of natural concentration such as those immediately adjacent to salt, roads, or trails are usually not suitable key management areas because they reflect higher levels of use than representative for the stratum. Likewise, areas remote from water or having limited accessibility may be suitable as reference areas for comparison purposes, but should not be considered key management areas because they will not be affected by changes in grazing management.
   e. Should be capable of and likely to show response to management actions.
   f. May be selected to represent special or unique situations such as a riparian zone, special status species population or habitat, or heavily grazed area.

g. Should be changed when the pattern of use is significantly modified because of a change in season of use, kinds or class of animals, water supplies or other factors affecting distribution.

2. Number of Key Areas.

The number of key areas, which are selected to represent a particular stratum or range site, depends on the size of the stratum and on data needs, but may ultimately be limited by funding and personnel constraints. A minimum of one key area should be established in each pasture of each intensively managed allotment. More than one key area may be necessary in each pasture or allotment depending on the vegetation present and the objectives to be measured. For example, in a pasture or allotment containing a sagebrush/grass type and a riparian zone, one key area in each may be appropriate if there are different objectives for each area.

3. Objectives

Objectives should be developed so that they are specific to the key area. Monitoring studies can then be designed to determine if these objectives are being met.

## C. Critical Areas

Critical areas are areas that should be evaluated separately from the remainder of a management unit because they contain special or unique values. Critical areas may include sage grouse nesting habitat, lynx winter foraging habitat, riparian areas, known populations of special status plants, etc. The ecologist, wildlife biologist or the range management specialist most closely involved with determining the objectives for those areas will generally monitor these areas.

## D. Key Species

Key species are generally an important component of a plant community. Key species serve as indicators of change and may or may not be forage species. More than one key species may be selected for a stratum depending on management objectives and data needs. In some cases, problem plants or indicator species, (poisonous plants, species which increase with grazing, etc.) may be selected as key species.

The selection of key species depends on the plant species in the present community, the present ecological status and the potential natural community for the particular range site. Key species are typically an important component of the plant community.

More than one key species may be chosen for a particular key area. In areas where there is more than one period of use, several key species may be selected. For example, on an area with both spring and summer grazing use, a cool season plant

may be the key species during the spring, while a warm season plant may be the key species during the summer.

Key species may or may not be key forage species. For example, threatened, endangered, or sensitive plants that have no particular forage value may be selected as key species. If these species are particularly susceptible to grazing damage, management objectives and use levels may be established specific to these species regardless of use levels elsewhere on the allotment.

Normally, the key species selected should be present, or potentially so, on each key area. However, on depleted rangelands these species may be sparse or absent. If a key area does not contain any plants of the key species because of severe depletion, it may be necessary to conduct monitoring studies on other species that comprise the bulk of the forage and extrapolate the effects on the establishment of the key species.

The NRCS Range Site Descriptions will provide a list of those plant species which occur within the potential natural communities. These descriptions should be consulted when selecting key species that are absent or sparse within identified key areas.

## V. Study Design and Analysis

### A. Planning the Study

1. **Choose sample sites**
   Stratify the allotment and choose one or more key areas for establishing the studies**.**

2. **Establish Management Objectives**
   Objectives for an allotment or landscape should be based on indicators of land health standards and the potential of the range site or sites of concern. Objectives should be specific and measurable and should include a reasonable timeframe for achievement, generally within 5 to 10 years or one grazing cycle. Objectives are generally specific to key areas. Examples: Increase the canopy cover of bluebunch wheatgrass from 3% to 6%; or Provide 40% ground cover of desirable perennial species to protect the site from erosion.

3. **Study Design**
   The number of points, quadrats or transects needed depends on the monitoring objectives and the variability of the samples. The frequency of data collection should be determined before studies are implemented.

   Randomly select the starting point and the bearing of the transect within the study

area. If the examiner is unable to collect an adequate sample with this transect before leaving the ecological site, additional transects can be run from the same transect location stake at different, randomly-selected bearings. Alternatively, additional transects can be established in the key area with random starting points and bearings.

## B. Statistical Considerations

### 1. Random or Systematic Sampling

Critical to valid monitoring study design is that the sample be drawn randomly from the population of interest. All of the statistical analysis techniques available are based on knowing the probability of selecting a particular sampling unit. If some type of random selection of sampling units is not incorporated into the study design, the probability of selection cannot be determined and no statistical inferences can be made about the population.

With linear study design, such as in utilization, stubble height or Daubenmire studies, systematic sampling is a very common technique. Data is collected along a transect at specified intervals. The starting point of the transect must be randomly selected. i.e. If the interval between observations is 5 paces, a number between 0 and 4 is randomly selected to represent the distance from the reference post or baseline to start making observations. Additional observations are made at 5-pace intervals from this starting point. This is a valid sampling technique, particularly useful for natural populations that are clumped or clustered in spatial distribution.

### 2. Confidence Intervals

The best way to judge how well a sample estimates the true population total is by calculating a Confidence Interval. The confidence interval is a range of values that is expected to include the true population size (or utilization or any other parameter) a given percentage of the time. Confidence intervals are set around an estimated average value to indicate that the true average of the population will occur within those limits a specified percentage of the time. Confidence intervals are the principal means of analyzing utilization data. For instructions on calculating confidence intervals, see the Interagency Technical Reference, *Planning for Monitoring*.

### 3. Sample Size Determination

An adequate sample is vital to the success of any successful monitoring effort. Adequacy relates to the ability of the observer to evaluate whether the management objective has been achieved. Depending upon how large a sample is taken and how variable the data is in the area sampled, the estimate from the sample may be very close to the true value or very far from it. The more narrow the confidence interval, the greater the precision of the data. (The width of the confidence interval is determined by the variability of the measurements.)

It makes little sense, for example, to set a management objective of increasing the density of a rare plant species by 20 percent when the monitoring design and sample size is unlikely to detect changes in density of less than 50 percent. Formulas for calculating sample sizes are given in the Technical Reference, *Planning for Monitoring*.

### C. Study Documentation

Permanently mark the location of each study with a reference post (fence post) placed about 30 meters from the actual study location. Record the distance and bearing from the reference post to the study location.

Permanently mark the study location itself by means of driving rebar or angle iron stakes into the ground at the randomly selected starting point. Baseline studies require that both ends of the transect be permanently staked.

### D. Data Analysis and Interpretation

Utilization and residue (stubble height) studies do not compare data differences between years, so significance tests are not ordinarily employed. The appropriate analysis of utilization data depends upon whether the management objective is written based on the average or median percentile utilization. Confidence intervals are then calculated around this average or median.

For stubble height data, the average should never be used as a measure of the central tendency. Because utilization data are often not normally distributed (i.e. some plants may be much taller than average and would skew the resulting average stubble height) using the average will not guarantee that the majority of stubble heights are close to the management objective. Using the median ensures that at least half of the plants measured meet or exceed whatever objective has been set. Other percentiles can also be used. For example, the objective could be that at least 60 percent of the plants be taller than 4 inches.

## VI. Monitoring Studies

The types of studies selected depend on the issues of concern, the management objectives, the vegetative type, and budget and manpower. Once established, sampling methods should not be changed without justification. Changes should be made only after an evaluation of the data shows that the existing sampling method is not providing the necessary data. All changes in sampling methods should be documented and approved by an interdisciplinary team of resource specialists.

### A. Actual Use

Actual use data is necessary to correlate utilization and trend data in determining stocking rates and grazing capacity. Only those permittees operating under an AMP with after-the-fact billing may be required to submit livestock actual use data. Actual use will be reported by the permittees to the Field Office within 15 days of the end of the grazing period. A copy of the Actual Use form is found in **Illustration 2**.

Where the range manager deems it necessary, alternative ways to gather or verify actual use data may be used, including counting livestock as they enter or leave the allotment or spot check counts while livestock are in each allotment.

## B. Utilization

Utilization data will be used to measure the degree of grazing and browsing on specific areas of rangeland by livestock and wildlife. Utilization will be expressed as a percentage of the current year's production that has been consumed or destroyed. Residual measurement (stubble height) is the amount of forage material or stubble height remaining. Utilization data and residual measurements can be used: 1) to determine when livestock should be moved within a grazing allotment, 2) to identify livestock distribution patterns, 3) to correlate changes in rangeland trend or condition with degree of utilization, and 4) to estimate proper stocking levels when combined with other monitoring data.

Utilization data should not be used alone to determine stocking rates, but should also include actual use data, climatic information, ocular reconnaissance, and other pertinent information, such as trend data, where available.

Collecting Utilization Data and Stubble Height Measurements
A brief description of the concepts and techniques involved in each of the utilization study methods to be used in Glenwood Springs Field Office are discussed below. Utilization data will be collected in accordance with the Interagency Technical Reference Utilization Studies and Residual Measurements, 1734-3 and more detailed descriptions of each method are found therein.

1. Transect Location
   Utilization studies should be located within key areas. The starting point of the transect should be randomly located. The bearing and distance of the transect from the starting point should either be set by compass or directed toward a permanent, highly visible natural feature.

2. Observations
   Starting at the study location post, run the transect in the direction specified in the study folder. Observations are located at constant intervals along transects (generally every 5 steps unless the size of the key area or the distribution of key

species dictates otherwise). If the key species is not present at the selected interval, relocate the observation point to the nearest individual of that species within a 180 degree arc along the transect line. The next interval is measured from this relocated point.

Use pilot transects to determine the number of observation points needed. A larger number of observations tends to reduce inaccuracies in estimating utilization. As a general rule, continue until at least 20 plants of one or more key species have been recorded. If there are insufficient key plants present within the key area to make 20 observations of a single species, return to the reference post and run another transect with a different bearing. In the Comments section, note the lack of key species.

While conducting utilization transects, the observer should make notes regarding the general appearance of the range; i.e. overall vigor of vegetation, signs of concentrated use, and infestations of cheatgrass or other noxious weeds, etc.

3. Study Documentation
   GPS each study site and enter the data into GIS. Plot the data onto maps (preferably 1:24,000 scale), which will be maintained in the Monitoring Files.

4. Timing
   Livestock utilization should be documented generally within 5 days and no later than 10 days after the livestock have been removed from the allotment or pasture. If herbaceous dietary overlap between livestock and big game is a concern, conduct utilization studies both before and after the period of livestock use.

5. Frequency of Studies
   Utilization and residue studies may be conducted every year or as often as needed to satisfy the data requirements for evaluation of the management area. On allotments with AMPs or a grazing system, utilization should be conducted annually through one complete cycle of the grazing system, or for as long as necessary. It may be necessary to conduct utilization and residue studies annually until management objectives are achieved and maintained. After that, utilization may be conducted less frequently, or only when management actions, such as the class of livestock or season of use, changes.

6. Data Analysis
   Calculate confidence intervals around the estimate of average percent utilization for the Key Species Method and calculate confidence intervals around the median height for Stubble Height measurements.

**1. Key Species Method (formerly the Modified Key Forage Plant Method)**

The Key Species Method will be the primary method for determining utilization of herbaceous cover by livestock and wildlife throughout the field office.

Utilization studies are to be read no later than two weeks after livestock are removed from the allotment or pasture. Where there are both utilization transects and trend plots in an allotment or pasture, one utilization transect will always be run in the immediate vicinity of the trend plot. This provides site-specific grazing information for use in interpreting trend data. Other utilization transects may be run in other parts of the allotment or pasture as needed.

a. Sampling Process

Utilization levels are based on an ocular estimate of the amount of forage removed by weight on individual key species within a designated key area. At specified intervals along the pace transect, select the plant of the key species nearest the toe and estimate percent utilization by weight in one of seven utilization classes; 0-5%; 6-20%, 21-40%, 41-60%, 61-80%, 81-94%, and 95-100%. See **Illustration 3** for a copy of the Key Species Method form.

b. Utilization Cages

Utilization cages are useful for comparing grazed plants to ungrazed plants and will be established in key areas whenever possible. They also should be used if differences of opinion are occurring between the data collector and range user or in heavily utilized areas for comparison purposes. At the time when utilization studies are read, observe the growth of key species inside the cage and try to calculate the height of the various grass species with different percentages of current year's growth removed.

Current year's growth of key grass species within the cage may be clipped and weighed to determine the weights of the ungrazed grasses. The utilization cage will then be moved to another location within the key area. The weights of the ungrazed species will be compared to the weights of grazed key species clipped outside the utilization cage until the observer has calibrated his ocular estimations of percent utilization by weight removed. More detailed descriptions of how to calibrate ocular estimates is explained on p. 81-82 of TR 1734-3.

**2. Residual Measurement (Stubble Height Method)**

The concept of this method is to measure the height of herbage left ungrazed at any given time. Stubble height standards and measurements are especially useful in riparian areas where adequate stubble heights on streamside areas is needed at the end of the growing season for maintenance of plant vigor and streambank protection.

a. Sampling Process

At specified intervals, measure the stubble height of the key species nearest to the toe of the foot. Measurements should be in inches or centimeters of *leaf stubble* left. Do not include measurements of inflorescences. A copy of the

Stubble Height form is shown in **Illustration 4**.

**3. Cole Browse Method (Big Game or Sage Grouse Habitat)**

In some allotments with wildlife-livestock conflicts or some indication that browse utilization may be excessive, browse utilization transects will be run. If winter big game utilization is the primary concern, the study is to be done as early in the spring as possible and preferably, before livestock enter the allotment. If winter sheep or fall cattle utilization is the concern, the study should be done as soon after the livestock leave as possible.

The number of paces between points on the transect will be determined by the density of the browse species and will be noted on the study form. A photo should be taken from the start of the transect showing the orientation of the transect. This photo should be retaken every second time the transect is read.

Browse species should be included in the list of key species on big game winter ranges. The Cole Browse Method will be used to estimate utilization of browse species. This method provides data on age and form class, availability and hedging, estimated utilization, and growth and use indexes for key shrub species in the plant community.

Distinguishing current year's leader growth from last year's growth on sagebrush is often very difficult. The Cole Browse Method estimates the percent of available leaders that have been browsed and not the percent of growth removed. Therefore the Cole Browse Method, which estimates "percent of twigs browsed "rather than "percent of leader growth removed", is usually a more reliable estimate of utilization on sagebrush than other available methods. A minimum of 25 plants of each key browse species will be sampled. Utilization level will be an ocular estimate of the percent of twigs browsed.

Collecting Data on Browse Utilization

Utilization estimates should be made following livestock grazing and again following the season of use by big game. Estimate the percent of available leaders that have been browsed on each sample plant. Utilization is recorded in one of six classes: 0%, 1-10%, 11-40%, 41-60%, 61-90%, and 91-100% to record one of five classes of use. See Illustration 5 for a copy of the Cole Browse Method form.

Timing

Wildlife use should be conducted prior to May 15$^{th}$ or initiation of plant growth.

## C. Utilization Mapping

Mapped utilization patterns can be used to stratify a management unit and delineate key areas. Utilization mapping can also be used to determine areas of under or over-utilization to help identify needed range improvements. Use pattern mapping is also

essential for tracking the impacts of range improvements and management changes.

1. Sampling Process
   The first step in conducting utilization studies is preparing a base map that shows the ecological sites or vegetation types and physical features such as fences, water, and roads. Mapping utilization patterns involves traversing the allotment to obtain a general concept of the use levels. When another use zone is observed, the boundary of the use zone is recorded on the map. Areas that do not have any of the key species should also be delineated. Unused areas suitable for grazing and areas of animal concentration should be delineated to help identify range improvements needed to change grazing use distribution.

## D. Climatic Data

The principle objective for gathering climate data is to differentiate the influence of climatic factors on vegetative response from those due to management practices. Vegetative production and vigor varies based on precipitation received. Precipitation data should be used to adjust the current year's production and utilization results obtained.

One BLM-administered rain gauge is located along the Colorado River Road in the Horse Creek Allotment (08631). The gauge is read monthly. In addition, data will be gathered from NOAA weather stations across the Resource Area and used to estimate precipitation for each allotment in which studies are conducted.

Additional rain gauges may be established if it is determined that precipitation data from existing sources do not accurately reflect site-specific conditions.

## E. Trend Studies

Trend studies measure changes in vegetative and ecological condition from an established baseline. Trend also indicates whether the rangeland is moving toward or away from its potential or toward or away from specific management objectives. Trend studies are the primary method of measuring the success or failure of management practices.

Trend is measured by noting changes in characteristics of vegetative communities such as composition, density, canopy and ground cover, production and frequency of the vegetation. The trend studies to be conducted in this Field Office include: 3 ft x 3 ft (or 1 m squared) photo plots, photo points, Daubenmire transects, nested frequency transects, and the Cole Browse Method. Other recognized methods may be used or added to monitor other resource concerns such as water quality but should not be done so without coordination between the resource specialists. While each method is discussed separately here, in actual practice, these methods should usually be considered in combination, so that a more accurate trend picture is obtained.

1. **Photographs**

Photographs are often very effective in illustrating resource values and conditions. Use close-up and/or general view photographs with all of the study methods. Comparing pictures of the same site taken over a period of years furnishes visual evidence of vegetation and soil changes.

a. Photo Plots

This method involves taking a close-up photograph of a permanently marked 3 ft x 3 ft or 1 m x 1 m plot and a general view photograph depicting the study site. Angle iron stakes or rebar are driven into the ground at the lower left and upper right hand corners of the plot. Paint the stakes with brightly colored spray paint to aid in relocation.

Whenever possible, photos should be taken toward the south or southwest. This will avoid shadows across the photo plot. The photo of the plot should be taken from directly above the plot. Comparing photographs of the same site taken over a period of years will furnish visual evidence of overall vegetation and soil changes. For low-intensity monitoring, photo points could be the primary monitoring tool, but generally photo points are used to supplement other trend studies. If photo plots are the sole source of information, qualitative evaluations can be made from these photographs to identify potential problems and the further need for specific monitoring. This study is to provide a long-term photographic record, save time and manpower, and still provide a qualitative assessment of gross changes.

1) Establishing Photo Plots

a) Photo plots should be located in key areas and should include at least one of the key species being studied.

b) Iron rebar stakes or angle-iron stakes are to be set in the upper right and lower left hand corners of the plot. Photos should be taken as close as possible to the peak growth period of the key forage species being studied.

c) The photo should be taken as close to the peak of growth of the key species as possible.

d) A reference post should be placed within 100 ft of the plot to permanently mark the location of the plot. Record the distance and bearing from the reference point to the plot.

2) Documenting the Study

a) The plot location should be recorded with a GPS unit and entered into GIS.

b) The study location should be documented on the Study Location and Documentation Data Form (Illustration 1).

c) Photos should be taken using a 28 mm lens and color film. Identification Labels (**Illustration 6**) should be placed next to the plot and included in the photograph.

3) Scheduling

Ideally photo plots should be recorded at the same time of year and at the peak of growth of the key species. For efficiency, photo plots should be recorded when trend studies are scheduled. If frequency transects are not scheduled, then the photo plot should be taken when utilization transects are read.

b. Photo Points (General View Photographs)

Photo points are general view photographs taken from a permanent reference point. When associated with a permanent transect, the photo point should be taken from one end of the transect. When not associated with a permanent transect, the location of the photo point should be GPSed and the photo should include a reference point in the foreground (a fence post or fenceline, etc.).

The Photo Identification Label is placed in an upright position so that it will be visible in the foreground of the photo. Photographs taken from photo points should be brought to the field to assist in relocating the photo point and to ensure that the same photograph is retaken (bearing, amount of skyline, etc.)

## 2. Nested Frequency Transects

In the 1980's and 1990's, GSFO established nested frequency transects on several of the high priority allotments. The nested frequency study method was used because it is easy to conduct and is subject to less reader bias than some of the other methods, since it involves only the ability to accurately determine ground cover, and to identify individual species and determine whether they occur in the plot or not. However, with the advent of the Colorado Standards for Public Land Health and the associated indicators for each standard, it became apparent that the nested frequency method alone does not correlate well with many of the specific indicators of standards. Other studies such as the Daubenmire or the Line Intercept method, provide more direct feedback concerning Standards 1 and 3. Therefore, when new studies are established, GSFO will utilize the Daubenmire Method with the ground cover method. Where nested frequency transects have been established previously, these will be re-read at the next scheduled evaluation period and will then be replaced with Daubenmire transects.

Nested Frequency transects will continue to be conducted only where: 1) it is determined that the Daubenmire Method will not furnish the necessary data to

determine whether management objectives or land health standards are being met, or 2) It is desirable to continue to conduct Nested Frequency transects in conjunction with Daubenmire transects to maintain continuity in data collection. Other trend study methods will be conducted only when it is determined that the Daubenmire Method will not provide the necessary data to determine if management objectives are being met.

All transects should be established in key areas. In some cases, it may be necessary to disregard existing studies that are not representative. If a study was set up in an area that does not meet the criteria for a key area, the information being collected may not be useful during an evaluation. In this case, there may be a need to reestablish the study. Written documentation for re-establishment and/or the reasons for no longer collecting data at an established study location shall be placed in the appropriate study file. The Nested Frequency form is shown in **Illustration 7**.

### 3. Daubenmire Transect

The Daubenmire Method consists of systematically placing a 20 x 50 cm rectangular frame along a permanently marked baseline transect. General view photographs should be taken each time the transect is read. Land health indicators measured by this method are canopy cover, ground cover and species composition.

Daubenmire trend transects should be established adjacent to a 3 ft x 3 ft (1m x 1m) photo plot. This should also be an area where utilization data is being collected. If possible, the transect should be located directly south of the photo plot so that aspect photos of the plot would also depict the transect. A photo point of the transect should be taken each time the transect is read.

a. Establishing Studies.
   1) Randomly locate the transect within the study area.
   2) Permanently locate the baseline by means of two rebar posts, usually placed 100 ft apart. (A longer transect or additional transects may be used if the variability in vegetative characteristics warrants more plots.) Stretch a 100 ft tape between the stakes as close to the ground as possible.
   3) Place a reference fence post within 100 feet of the transect and record the distance and bearing from the reference post to the starting point of the transect.
   4) GPS the starting point of the transect and enter it into GIS.

b. Running the Transect and Recording Information
   1) Sampling Process
      In general, 50 frames are measured along the baseline, but this number may vary depending on the variability of the site and the coefficient of

variation measured during the pilot study. The Daubenmire frames are divided into six (6) classes. The frames are placed on the right hand side of a 100-foot tape with the lower left hand corner of the frame aligned with the 2-foot mark on the tape and read at each 2-foot interval along the tape. Percent canopy coverage of each species is recorded within one of six classes: (1-5%, 5-25%, 26-50%, 51-75%, 76-95%, and 96-100%). A copy of the Daubenmire Cover Class form is found in **Illustration 8**.

Canopies extending over the quadrat are estimated even if the plants are not rooted in the quadrat. In addition, ground cover is recorded at each of the four corners of the frame using a pin flag or other finely honed point. If the point is not small enough, basal coverage will be greatly overestimated. A narrative will accompany the trend data describing the observed range condition and trend indicators.

c. Timing of Studies

Ideally, Daubenmire transects should be read at the peak of the growing season in rested pastures. However, for those allotments or pastures that are grazed each year during the growing season, transects should be read at the same time of year so that cover comparisons between years will reflect the same degree of grazing use.

## 4. Big Game Habitat Monitoring (Browse Monitoring)

As discussed previously in the Utilization monitoring section, big game habitat monitoring will consist of the Cole Browse Method.

This method records estimates of the age and form class of shrubs and the degree of hedging.

Form Class measures the availability of the plant for browsing and the degree of hedging. Form classes fall into one of eight categories ranging from “all available, little or no hedging” to “dead”. Age Class data reflects the establishment, survival and decadence of key browse plants. Plants are recorded as seedlings, young, mature, or decadent. See the Cole Modified Browse Form for a complete description of the age and form classes. Numerous Cole Browse Method transects have been established throughout the Field Office. The locations of these transects are plotted in GIS and are found in **T:\gisdata\gsfo\wildlife\browse transects**. These transects will be read when other trend studies in the pasture or allotment are scheduled to be read.

## 5. Riparian Habitat Monitoring

Riparian areas are critical habitats for the majority of Colorado’s aquatic and terrestrial wildlife. Livestock are attracted to riparian areas for the water, shade,

gentle gradients and succulent vegetation found there. Often, particularly during the warmer months of the year, these riparian areas can be concentration points for livestock. Riparian studies are necessary to insure that management practices leading to proper use of the rest of the allotment are not inadvertently degrading the riparian areas.

Riparian monitoring techniques will depend on the resource objectives for the riparian area. Generally, changes in riparian vegetation attributes will be documented through the use of riparian photo points. Photo points would subjectively show the health and trend of the riparian vegetation but would yield no measurable, objective data. Any other study initiated in a riparian area will have to be tailored to meet an identified concern.

Riparian areas to be monitored will be prioritized based on the results of Riparian PFC assessments. Generally, those riparian areas rated Functioning-at-Risk or "Nonfunctioning" will receive the highest priority for monitoring. Specific objectives for management and monitoring on the highest priority riparian areas will be developed. Riparian photo points or other monitoring techniques will be established based on the specific objectives for the area.

a. Riparian Photo Plots/Points
   The Riparian Photo monitoring will consist of both close-up and general view photos. One close-up photo will be taken looking directly down at a 3 ft x 3 ft or 1m x 1m photo plot permanently staked with rebar or angle iron. Standing in the same location, general view photographs will be taken in three directions, looking directly across the stream, looking upstream and looking downstream.

b. Frequency
   On high-intensity allotments, riparian monitoring photos or transects will be done every 3-5 years. More frequent readings may be necessary particularly if predicted changes are occurring at an accelerated rate which may result in deterioration of identified key areas within the 5 year period.

## 6. Special Status Plants Population Monitoring

Threatened, endangered and proposed species are protected by the Endangered Species Act. In addition, BLM national policy directs State Directors to afford protection to federal candidate and BLM Sensitive species (BLM 6840 Manual). The policy directs BLM to inventory and monitor these species, develop management plans that include specific habitat and population management objectives designed to recover the species, and ensure that BLM activities are carried out in a manner consistent with the objectives for those species.

There are currently six special status plant species known to occur within the

Glenwood Springs administrative area. The plants and their current status are listed below:

a. *Sclerocactus glaucus* (Uinta Basin hookless cactus) – Threatened
b. *Penstemon debilis* (Parachute penstemon) – Federal Candidate
c. *Phacelia scopulina var. submutica* (Debeque phacelia) – Candidate
d. *Astragalus debequaeus* (Debeque milkvetch) – BLM Sensitive
e. *Mentzelia argillosa* (Southwest stickleaf) – BLM Sensitive
f. *Penstemon harringtonii* (Harrington's penstemon) – BLM Sensitive

The first five species are found only in the westernmost portion of the Resource Area (west of Rifle) and therefore, only management actions in those allotments west of Rifle have the potential to affect these species. *Penstemon harringtonii*, occurs in the sagebrush steppe between 6,800 feet and 9,200 feet in elevation. This species appears to be concentrated in Eagle County but outlying populations have been found south of Rifle in the Beaver Creek watershed and in the Roaring Fork watershed south of Glenwood Springs.

In 1988, an extensive inventory for *Sclerocactus glaucus* was conducted within potential habitat in the area surrounding Debeque, Colorado. This inventory expanded a previous inventory conducted in the area north and east of Debeque in 1985. All populations found were mapped and counted. In addition, data regarding age class and condition were recorded. In 1993, all populations within the Glenwood Springs Field Office were resurveyed and population size, age class and condition were recorded. In 2001, a representative sample of these populations was reinventoried.

Long-term monitoring studies have been established on two populations of *Penstemon harringtonii* in Eagle County. One study lies within the Blowout AMP Allotment (08643), the other is within the North Bellyache Allotment (08712). Macroplots were established at each study site. The macroplots were further divided into belt transects and quadrats were run at randomly selected locations along the belt transects. Within each quadrat, all the *Penstemon harringtonii* plants were counted and the coordinates of their locations were recorded. These monitoring plots were established in 1995 and will be read annually for at least ten years. This monitoring method allows the documentation of changes in population size and distribution through time. The study design. layout, and data forms are maintained by the Denver Botanic Gardens. Annual reports are sent to GSFO and are filed in the Special Status Plants folders.

There are two populations of *Penstemon debilis* within the Glenwood Springs Field Office. One of the populations has been counted over a period of years, but no formal long-term monitoring of the population or habitat has been conducted. In 2003, a complete count should be made of both populations. Other data will also be collected, such as the number of rosettes per cluster, percent of plants that

flowered or set fruit, evidence of recruitment, disease or herbivory, etc.

Representative populations of each special status plant species within the Field Office should be monitored at least every 5 years to detect changes in population trends. The monitoring techniques chosen will depend on the life history, density, and areal extent of the population of interest, and on the population management objectives. For special status species in which habitat needs are known, monitoring may include assessments of the habitat condition. If trends are declining, additional studies may be needed to determine the cause of the decline. If livestock grazing is determined to be a significant contributing factor in the declining population size or other parameters (i.e. failure to meet Colorado Standard 4), appropriate action must be taken prior to the next grazing season as stated in 43 CFR 4180.

## 7. Vegetation Treatments

Vegetative treatments are designed to meet specific management objectives for an area, and usually involve decreasing production of one or more species and increasing the production of more desirable species. Monitoring studies verify the success or failure of the treatment in achieving the management objective and may provide valuable lessons for future treatment plans.

a. Factors to Consider

1) Before and After Studies

Ideally, studies are established prior to implementing a vegetative treatment and then are repeated for a number of years following the treatment. However, with prescribed burning it is often difficult to predict which parts of the project area will burn and with any vegetative treatment it is generally impossible to predict which parts of the proposed treatment will later be representative of the whole treatment.

2) Paired Plot Studies

The use of paired plots established both inside and outside of the treatment area to evaluate the success of treatments is subject to bias from several sources:

* The treated area often covers all of the best soils and gradients in the immediate area. Areas not treated are often stony, steep, or have shallow soils. This makes finding an area representative of what the treatment area was like before it was treated difficult.

* The area surrounding the treated area sometimes benefits from the treatment. Aerial seeding can spread seed into the surrounding area. A shift of grazing and browsing to the treated area can decrease utilization in the surrounding areas. Conversely, if the areas surrounding a treatment are used as loafing areas, their utilization can increase.

b. Methodology

The specific study methods used to monitor treatment areas can vary considerably with the treatment, the area to be treated, and the objectives of the treatment. In general, the best study methods would combine before/after and paired plot studies.

Using ocular reconnaissance, select an area outside of the treatment area that is similar to the present production within the proposed treatment area. The selected non-treatment area should then have a pilot study established with an intensive, site-specific method. After the treatment has reached full production, an average site on it can be selected for a comparison study plot.

The specific studies to be used will depend on the site specific conditions and the objectives.

## VII. Allotment Evaluations

The end result of any monitoring effort is a periodic evaluation of an allotment and its management objectives. Sound, believable studies data is often the only justifiable reason for changing present management. A correct and accurate interpretation of that data will heavily influence any decision for change and will often indicate possible solutions for problems identified by the data.

Allotment evaluations will consist of analyzing changes in trend over time and the reasons for these changes. These evaluations will be in a narrative and graphical form and will include data from trend analysis, utilization studies, climatic data, actual use information and field observations by BLM staff, range users, and other interested parties.

The final evaluation will determine if the management system on each allotment is achieving or making significant progress toward achieving the management objectives. If the objectives are not being met, a determination as to the validity of the objectives will be made. If the objectives are valid, changes in management based on the data gathered will be discussed.

The **Evaluation Period** for each allotment will be determined at the time the monitoring studies are established. The evaluation timeframe will vary by allotment and will depend on a number of factors including the allotment prioritization, the severity and complexity of issues involved, the period of time in which resource changes are expected to occur, the grazing permit renewal schedule, and staff time constraints. The specific studies established, the intervals at which studies will be reread and the year the allotment will be evaluated will be entered into the Monitoring Spreadsheet on the computer's shared drive at **S:\Rangeland Monitoring**. Generally, the high priority Category I and M allotments will have an evaluation every 6-8 years. Low priority Category I and M allotments will be evaluated every 8-10 years. Category C allotments will be evaluated

on an as needed basis. More frequent evaluations can be done if interim data gathering or land health assessments indicate significant problems may be occurring.

## VIII. Range Condition Assessments (Inventories)

The Federal Land Policy and Management Act (FLPMA) of 1976 and The Public Rangelands Improvement Act (PRIA) of 1978 require that rangelands be inventoried to compare existing range conditions against the potential for the site. This may be done by determining the similarity of the present vegetation to the potential natural community for the site or the desired plant community as established through management objectives.

In addition to monitoring, inventories will be conducted to provide current information on ecological condition relative to the Colorado Land Health Standards and ecological status relative to the site potential. Condition assessments are designed to reflect ecological condition at a single point in time and are not intended to replace monitoring of changes over time. Two types of condition assessments are proposed for the Glenwood Springs Field Office. These are Ecological Site Inventory and Land Health Assessments.

### A. Ecological Site Inventory (ESI) TR 1734-7, Ecological Site Inventory

ESI is the BLM standard vegetation inventory technique. The methodology is presented in Tech Reference 1734-7, Ecological Site Inventory. By comparing the species composition by weight of the present plant community with the expected composition at ecological climax, a relative rating of present condition is obtained. The information is used to help develop appropriate management objectives for an area.

Objectives: 1) To provide a quantitative basis for predicting the extent and direction of changes that can result in the plant community as a result of specific management actions; 2) To supplement trend information by confirming the direction and magnitude of change in ecological condition over time; 3) To assist the land manager in developing appropriate management objectives for an area.

Range condition will be monitored on an allotment basis. Ecological status will be determined when trend studies are established. Key areas will be reassessed only if the analysis of trend data indicates a significant change has occurred.

### B. Land Health Assessments (TR 1734-6, Interpreting Indicators of Rangeland Health)

1. Objective

The primary purpose of conducting formal Land Health Assessments is to

qualitatively determine whether a management unit (allotment, watershed, or other area) is currently achieving the Colorado Standards for Public Land Health and conforming to the Guidelines for Livestock Grazing.

2. Schedule
   The Glenwood Springs Field Office is in the ongoing process of completing formal Land Health Assessments on all public lands within the Field Office. These assessments are done on a landscape basis to address issues and management practices at a landscape scale. The Field Office has been divided into 13 Landscape Units. Each year a formal Land Health Assessment is conducted on one of these landscape units. The assessment of any specific landscape may be conducted before, after or during the monitoring process described above.

3. Assessment Procedure
   Glenwood Springs Field Office has been utilizing and will continue to utilize an Interdisciplinary Team approach. Team members should represent a cross section of skills and knowledge related to the physical and biological aspects of the resource area. Team members should also be familiar with the Colorado Standards and associated indicators. Non-BLM members representing user groups, organizations, or other interested publics are encouraged to be a part of the team.

   The assessment of public land health may involve varying intensities and scales. The use of existing data, such as soil and vegetation inventory and mapping, rangeland monitoring, riparian proper functioning condition (PFC) assessments, water quality data, soil erosion data, T&E species data, and wildlife habitat and population data, is encouraged. If insufficient information exists, further data collection, including the BLM's rapid assessment procedure, and monitoring, may be necessary. In the case of a formal rapid assessment, the ID team collects and uses qualitative information to better understand and determine the landscape potential, capability, condition, and trends being influenced by current management.

   a. Establishing Baseline Studies
      Before conducting a formal assessment it is useful to gather data on existing conditions and trends. Where no monitoring studies exist, it may be useful to establish and read baseline transects prior to conducting the assessment to provide data on existing conditions (canopy cover, ground cover, age classes, etc). This data can be useful for comparisons with reference sites. Where formal monitoring studies already exist it may be useful to reread these studies to determine general trends. This information may be incorporated into the land health assessment.

   b. Determining Potential and Capability

Each ecological site must be evaluated relative to areas of similar potential when observing the standards and indicators. For this reason, it is extremely helpful to locate "reference sites" of the same ecological site for comparison purposes. Reference areas are areas of similar geology, climate, landform, ecological site and socio-economic condition which approach the site potential or are in the range of natural variability for a functioning site.

In some areas the potential of the site has been permanently or temporarily altered by past human activity. In these circumstances, a site should be observed relative to its existing potential rather than its historic potential. This does not refer to ongoing activities affecting public land health. When socioeconomic factors outside the jurisdiction of the BLM affect the potential of a site, the basis for observing the standards and indicators is called the capability of the site. The authorized officer must determine if the standards and indicators are going to be evaluated in comparison with the natural potential or some other capability. If the authorized officer determines the need to measure the standards against a capability other than the natural potential, that capability must be described and documented.

c. Setting Goals and Objectives
Another aspect of the assessment process may involve setting goals, objectives, and desired future conditions where they do not exist. This will include the desired condition from a social/economic aspect as well as from a biological and ecological position. Where goals, objectives and desired future conditions have not been established for appropriate landscape situations, the ID team should do so in conjunction with the existing objectives established if monitoring studies have been initiated. Finding and using reference areas for comparison purposes is very useful in setting realistic goals and objectives. These areas provide clues as to site potential and health.

4. Methodology
The method used in the GSFO consists of a combination of BLM's riparian proper functioning condition assessment technique to address Standard 2, Vegetative Cover and Dominant Species estimates, a Biological and Physical Indicators form based on the Technical Reference, Interpreting Indicators of Land Health to address Standards 1 & 3, and water quality testing to address Standard 5. Where special status species populations or habitat are known to exist within the site being assessed, additional data is collected to address these species. A Rangeland Health Site Documentation Worksheet is also completed to record the location of the assessment and other relevant site features. The upland health assessment procedure is described in the Interagency Technical Reference 1734-6, Interpreting Indicators of Rangeland Health. The use of the Riparian PFC forms is fully described in BLM Tech References 1737-9, Process for Assessing Proper Functioning Condition (for lotic riparian areas) and 1737-11, Process for Assessing Proper Functioning Condition for Lentic Riparian-Wetland Areas.

5. Evaluation
   A number of possible outcomes can result from the assessment process. These include:

   a. Standards are being met - "Healthy". The area or allotment meets the standards and conforms to the guidelines or is making significant progress toward meeting the standards. Review the existing terms and conditions to ensure that they will provide for continued achievement of or progress towards the standards and guidelines. Continue or initiate monitoring activities that will provide assurance that the area continues to meet or make significant progress towards meeting the standards.

   b. Standards are not being met - The area is either "At Risk" or "Non-functional". The Interdisciplinary team must determine if grazing is a significant factor in failing to meet the standards. Review the best resource information available, such as quantitative data from monitoring and inventories, qualitative information, professional knowledge, and knowledge provided by public land users and others. If inadequate information is available to determine whether current livestock grazing is a significant factor in failing to meet the standards, initiate action to gather the information needed to make the determination. Identify solutions and implement appropriate actions to make progress toward achieving land health. Although 4180 Regulations require the Authorized Officer to take appropriate action to ensure significant progress towards meeting the standards, in general, funding for new range developments or vegetation treatments will focus on "At-risk" sites. These are sites where the ecological condition has not crossed an ecological threshold beyond which intensive, active management input is required to restore land health. Identify what monitoring will be done to determine progress towards achieving land health.

   c. Don't know if standards are being met - continue with existing monitoring or implement additional monitoring to focus on attributes/ indicators in question. Evaluate for trend towards or away from achieving land health.

The primary focus of future management actions and ongoing monitoring will be on "at-risk" landscapes. Healthy areas will need monitoring, albeit at a less intensive level, to ensure conditions don't deteriorate. Unhealthy areas are lower priority than At Risk areas because they generally will require a greater investment of time, money and human resources to restore to health than an At Risk area. Greatest benefits for the least cost can be expected in the At Risk category.

6. Determining Causes
   Determine the relationship between existing land uses and the failure to meet the standards. Causes of failing to meet standards can be determined through a combination of data sources, including utilization studies (transects), grazing

exclosures, climate data, aerial photos, and other background information about the area being assessed (i.e. water diversions, recent storm events or other major disturbance factors, upland and/or upstream conditions and uses). Once the cause or causes have been determined, monitoring information would be used to plan appropriate projects, modify uses or take other necessary management actions designed to make significant progress toward meeting the standards.

## IX. Study File Organization

Locations of all studies will also be documented through the use of a GPS unit and the data entered into GIS (**T:\gisdata\gsfo\range\studies locations**).

Monitoring data will be kept in two six-way file folders; one for short-term monitoring studies and the other for long-term monitoring studies. The organization of studies data will be as follows:

**File 1. Short-term Studies**

1. Allotment Information (Maps showing land status, pastures, range improvements, and studies locations and Study Location and Documentation Data Forms)
2. Use Supervision Forms
3. Actual Use Records or Certificates of Livestock Count
4. Utilization Pattern Mapping
5. Utilization forms (Key Species and Cole Browse)
6. Climate Data

**File 2. Long-term Studies**

1. Allotment Map (showing studies locations and Ecological Sites) and Study Location and Documentation Data Forms
2. Allotment Management Plans (if no plans exist, then Allotment Management objectives and Description of authorized grazing use, # AUMS, period of use, etc.)
3. Trend Studies Forms
4. Trend Photos
5. Allotment Evaluations
6. Miscellaneous (PFC forms, etc)

## APPENDIX A

High Intensity Allotments

| Allotment Name | Allotment Number | Mgt Category | Issues/Concerns | Existing Studies |
|---|---|---|---|---|
| Rifle Unit | | | | |
| Alkali Creek Common | 08130 | I | Stds 1,3,5, season of use | 3 FT, 3 P, |
| Brush Creek Common | 18012 | I | Season of use, forage availability | No data |
| Clough-Alber | 18909 | I | Riparian cond, CRCT, season of use | 4 P, 2 RP, 1 FT? |
| East Fork Common | 18910 | I | Riparian cond, CRCT | 9 P, 5 FT, |
| Hogback Common | 18026 | I | Stds 1, 3, stocking level, livestock distribution, season | 3 P, 3 FT, |

| | | | | |
|---|---|---|---|---|
| | | | of use | |
| Hubbard Mesa | 18903 | I | Stds 1,2,3,5, season of use, stocking level | 3 P, 3 FT, 8 CB |
| Webster Park | 18902 | I | Season of use, Stds 1,3, forage availability, % federal range | 1 P, 1 CB, |
| Simpson & Nichols | 18022 | M | Season of use, Std 3, livestock distribution | |
| Eagle Unit | | | | |
| Deer Pen | 08616 | I | Sagegrouse habitat, P/J encroachment, old age class sagebrush | 2 P, |
| E Hardscrabble | 08502 | I | Riparian cond, livestock distribution | 6 P, 3 RP, 1 CB, |
| Greenhorn | 08641 | I | Sagegrouse habitat, P/J encroachment, old age class sagebrush | 4 P, |
| Luark | 08672 | I | Allotment bdry adj, stocking levels | 1 P, 1 CB, |
| Piskey | 08606 | I | Stds, low pern grass prod, P/J encroachment, old age sage | 2 P, |
| Spring Creek | 08614 | I | Allotment bdry adj, stocking levels | 1 CB |
| Upper Cottonwood | 08639 | I | P/J encroachment, old age sage, season | 1 P, |
| W Hardscrabble Com | 08504 | I | Riparian cond, livestock distribution, | 5 P, 1 FT, 3 RP, 2 CB |
| Bull Gulch Com | 08625 | M | Season of Use, P/J encroach, old age sage, lack of water (distribution) | |
| Catamount Common | 08619 | M | Season of Use | |
| West Castle | 08620 | M | Season of use, | |

| | | | | |
|---|---|---|---|---|
| | | | Riparian, livestock distrib | |
| Roaring Fork/South Eagle Unit | | | | |
| South Canyon | 08217 | I | Trespass, Stocking levels and/or distrib | 1 P, |
| Blowout AMP | 08643 | I | OHV use, livestock distrib | 8 P, 1 FT, |
| Prince Creek | 08341 | I | Riparian, livestock distrib | 3 P, 1 CB, |
| Vulcan AMP | 08213 | I | Livestock distr, utilization | 2 P, IMP cover & util obj |
| Crown Com | 08334 | I | Livestock distr, utilization | P |
| Upper Garfield Com | 08222 | I | Riparian, Livestock distr, utilization | 2 DT, P, 1 CB, |

P = photo plot/point
RP = Riparian photo point
FT = Nested Frequency transect
CB = Cole Browse transect
DT = Daubenmire transect

## APPENDIX B

| MONITORING SCHEDULE | | | | |
|---|---|---|---|---|
| Monitoring | Study | Intensity | | |
| | | High Priority (”I”) | Mid Priority (some “I” and “M”) | Low Priority (“C”) |
| Short Term Monitoring | Actual Use | Actual Use forms and/or Actual Counts; Annually | Actual Counts as needed | None |
| | Utilization Map | Annually, until use patterns are established | None | None |
| | Key Species | Annually on key areas | Every 3 years | None |
| | Cole Browse | Twice annually on conflict areas | Annually on conflict areas | None |

| | | | | |
|---|---|---|---|---|
| | Stubble Height | Annually on riparian areas of concern | Every 3 years | None |
| Long Term Monitoring | Daubenmire Cover Class | Every 6 years | Every 8 years | None |
| | Nested Frequency | Every 6 years or once before replaced | Every 8 years or once before replaced | None |
| | Photo Plot | Every 6 years | Every 8 years | Every 10 years |
| | Photo Point | Every 6 years | Every 8 years | Every 10 years |
| | Riparian Photo Points | Every 4 years | Every 6 years | Every 10 years |
| | Stream Cross-Sections | As needed | Every 10-13 years with LHA | None |
| Condition | Ecological Site Inventory | As funds allow; One time landscape or allotment inventory Reread key areas as trend indicates | As funds allow; One time landscape or allotment inventory Reread key areas as trend indicates | None |
| | Land Health Assessment LHA | Once as baseline 10 to13 years | Once as baseline 10 to 13 years | Once as baseline 10 to 13 years |

## Study Location & Documentation Data

| | |
|---|---|
| Study Method | Study Number |
| Allotment Name & Number | Pasture |
| District | Resource Area |
| Ecological Site | Plant Community |
| Date Established | Established by (Name) | Map Reference |
| Elevation | Slope | Exposure | Aerial Photo Reference |

Township Range Section 1/4 1/4 1/4

Location

Scale: ____ inches equals one mile

| | | | | |
|---|---|---|---|---|
| Key Species | | | | |
| 1 2 3 | | | | |
| Distance and bearing between reference post or reference point and the transect location stake, beginning of transect, or plot | | | | |
| | | | | |

Distance and bearing between location stake and bearing stake

| | |
|---|---|
| Transect Bearing | Vertical Distance Between Ground & Aligned Tape |
| Length of Transect | Plot/Frame Size |
| Sampling Interval | Total Number of Samples |

Notes (Description of study location, diagram of transect/plot layout, description of photo points, etc. If more space is needed, use reverse side or another page.)

Note: Depending on the study method, fill in the blocks that apply when a study is established. This documentation enables the examiners to conduct follow-up studies in a consistant manner to provide comparable data for analysis, interpretation, and evaluation.

Form 4130-5
(November 2004)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
OMB NO. 1004-0051
Expires: August 31, 2007

# ACTUAL GRAZING USE REPORT

Dear Grazing Operator:

In accordance with the terms and conditions of the permit or lease which authorizes your grazing use, please complete this form and return to the Field Office within 15 days after completing your authorized grazing use (43 CFR 4130.3-2(d)). This information, along with other studies data, is needed to evaluate the effectiveness of present management. Use a separate line for every day that you either turn livestock in or take livestock out of an allotment or pasture. Your cooperation in providing accurate information will be appreciated.

Allotment

FOR BUREAU OF LAND MANAGEMENT (BLM) USE ONLY

| ACTUAL GRAZING USE | | | | CALCULATION OF AUM'S GRAZING USE | | | | |
|---|---|---|---|---|---|---|---|---|
| PASTURE | DATE (Mo., Day, Yr.) | NUMBER AND KIND OR CLASS OF LIVESTOCK | | NO. AND KIND OF LIVE-STOCK | GRAZING PERIOD | | % PL USE | AUM'S |
| | | TURNED IN | TAKEN OUT | | BEGIN | END | | |
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I CERTIFY That this is a complete and accurate report of my grazing use.

Signature of Permittee/Leassee | Date

Title 18 U.S.C. Section 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.

*(Continued on page 2)*

Remarks *(Include other information such as death losses, disease, and unauthorized use by strays.):*

## NOTICES

The Privacy Act of 1974 and the regulations in 43 CFR 2.48(d) provide that you be furnished the following information in connection with information required by this permit.

**AUTHORITY:** Taylor Grazing Act, 43 U.S.C. 315, 316; Federal Land Policy and Management Act, 43 U.S.C. 1701; and Public Rangelands Improvement Act of 1978, 43 U.S.C. 1901, and 43 U.S.C. 1181d.

**PRINCIPAL PURPOSE:** Information will be used to document the actual amount of livestock grazing use on the public lands to calculate your billing, and to help evaluate the effectiveness of management actions in meeting resource management objectives.

**ROUTINE USES:** (1) This information is being collected to gather and document the actual amount of livestock grazing use on the public lands. (2) This information will be used to calculate your billing and to help evaluate the effectiveness of management actions in meeting resource management objectives. (3) Documentation for public information of the grazing use made on public lands. (4) Information from the record and/or the record will be transferred to appropriate Federal, State, local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecutions.

**EFFECT OF NOT PROVIDING INFORMATION:** Disclosure of the information is required to obtain a benefit in accordance with Sections 3 and 15 of the Taylor Grazing Act, Section 11 of the Alaska Grazing Act, Section 12 of the Reindeer Act, and Section 302 of the Federal Land Policy and Management Act.

The Paperwork Reduction Act of 1995 requires us to inform you that:
BLM collects this information to document the purpose, need, and other information for grazing use on the public lands.
Response to this request is required to obtain a benefit.
BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

**BURDEN HOURS STATEMENT:** Public reporting burden for this form is estimated to average 25 minutes per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004- 0051), Bureau Information Collection Clearance Officer (WO-630), 1849 C Street, N.W., Washington, D.C. 20240.

Page ____ of ____

## Key Species

| Study Number | Date | Examiner |
|---|---|---|
| | | |

| Allotment Name & Number | Pasture |
|---|---|
| | |

| Kind and/or Class of Animal | Period of Use |
|---|---|
| | |

| Class Interval | Int Mid (M) | Key Species | | | Key Species | | |
|---|---|---|---|---|---|---|---|
| | | Dot Count | No. By Class (C) | No. X Midmt. (C)(M) | Dot Count | No. By Class (C) | No. X Midpt. (C)(M) |
| 0-5% | 2.5 | | | | | | |
| 6-20% | 13 | | | | | | |
| 21-40% | 30 | | | | | | |
| 41-60% | 50 | | | | | | |
| 61-80% | 70 | | | | | | |
| 81-94% | 88 | | | | | | |
| 95-100% | 97.5 | | | | | | |
| | | Totals | | | Totals | | |
| Avg. Util. $= \frac{\Sigma(CM)^*}{\Sigma C}$ | | _____ = | | | _____ = | | |

(a) (0-5%). The key species show no evidence of grazing use or negligible use.

(b) (6-20%). The key species has the appearance of very light grazing. Plants may be topped or slightly used. Current seedstalks and young plants are little disturbed.

(c) (21-40%). The key species may be topped, skimmed, or grazed in patches. Between 60 and 80 percent of current seedstalks remain intact. Most young plants are undamaged.

(d) (41-60%). Half of the available forage (by weight) on key species appears to have been utilized. Fifteen to 25 percent of current seedstalks remain intact.

(e) (61-80%). More than half of the available forage on key species appears to have been utilized. Less than 10 percent of the current seedstalks remain. Shoots of rhizomatous grasses are missing.

(f) (81-94%). The key species appear to have been heavily utilized and there are indications of repeated use. There is no evidence of reproduction or current seedstalks.

(g) (95-100%). The key species appears to have been completely utilized. The remaining stubble is utilized to the soil surface.

Notes (use other side or another page, if necessary)

* Where C = The number of observations within each class interval (C column), M = the class interval midpoint (M column), and $\Sigma$ = the summation symbol.

Page ____ of ____

## Stubble Height

| Study Number | Date | Examiner |
|---|---|---|
| | | |

| Allotment Name & Number | Pasture |
|---|---|
| | |

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Site (or) | | | | | | |
| Species | | | | | | |
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
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| 33 | | | | | | |
| 34 | | | | | | |
| 35 | | | | | | |
| 36 | | | | | | |
| Total | | | | | | |
| Average | | | | | | |

*(Record averages on back of form.)*

**Illustration 4**

| Stubble Height Summary | | | |
|---|---|---|---|
| Species | Total Stubble Height | Number of Plants | Average Stubble Height |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Totals | | | |

Notes:

Page ____ of ____

## Cole Browse

| Study Number | Date | Examiner |
|---|---|---|
| | | |

| Allotment Name & Number | Pasture |
|---|---|
| | |

| Key Species | Kind and/or Class of Animal | Period of Use |
|---|---|---|
| | | |

| Pl No | Form Class | | | | | | | | Age Class | | | | Leader Use -% | Pl No | Form Class | | | | | | | | Age Class | | | | Leader Use -% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | S | Y | M | D | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | S | Y | M | D | |
| 1 | | | | | | | | | | | | | | 26 | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | 27 | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | 28 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | 29 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | 30 | | | | | | | | | | | | | |
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| 25 | | | | | | | | | | | | | | 50 | | | | | | | | | | | | | |

**Tot. % Form Classes**

____ ____ 1 - All available, Little or no hedging
____ ____ 2 - All available, Moderately hedged
____ ____ 3 - All available, Severely Hedged
____ ____ 4 - Partially available, Little or no hedging
____ ____ 5 - Partially available, Moderately hedged
____ ____ 6 - Partially available, Severely Hedged
Subtotal

____ ____ 7 - Unavailable
____ ____ 8 - Dead
Total

| Average Leader Length | | Use Index | |
|---|---|---|---|

**Tot. % Age Classes**

____ ____ S - Seedling, < 1/8" diam.
____ ____ Y - Young, 1/8" to 1/2" diam.
____ ____ M - Mature, > 1/2" diam.
____ ____ D - Decadent, 50% or more dead
____ ____ Total

Total ____

| Leader Use Class | Value |
|---|---|
| 0% | 0% |
| 1-10% | 5% |
| 11-40% | 25% |
| 41-60% | 50% |
| 61-90% | 75% |
| 91-100% | 95% |

Average Leader Use ____

**Illustration 2**

| Pl No | Leader Length 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Total Length | No Ldrs. Meas. |
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| 49 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| | | | | | | | | | | Totals | | |

Total Length / No Leaders Meas. = Average Leader Length _____ =

Notes (use another page, if necessary)

Page 2



**Illustration 2** *page 2*

DATE _____

NO. _____

R.A. _____

ALLOT. _____

PAST. _____

NESTED PLOT FREQUENCY WORKSHEET

UTM: ZONE_____ X_____Y_____ ALLOTMENT_____ NO. QUADRATS_____

STUDY NUMBER_____ LOCATION _____ OBSERVER_____ DATE_____

Frame Size Legend 1 = 6”x 6”, 2 = 12” x 12”, 3 = 12” x 24”, 4 = 24” x 24”

| | BELT NUMBER | | | | | FREQ/PLOT SIZE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Species | 1/2 | 3/4 | 5/6 | 7/8 | 9/10 | 1 | 2 | 3 | 4 | |
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| ANNUALS | | | | | | | | | | |
| SEEDLING | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| COVER | BASAL VEG | | | | | COVER SUM | B.V. | | | |
| | Overstory Veg | | | | | | OSV | | | |
| | BARE SOIL | | | | | | Bare | | | |
| | LITTER | | | | | | Lit | | | |
| | ROCK | | | | | | Rck | | | |
| | MICRO CRUST | | | | | | MBC | | | |

NOTES: Indicate here if you recorded all veg. or just key species. Put additional remarks on reverse. No. %

1. Don’t record annuals (only live perennials) 2. Only record overstory if have no basal hit on veg. (only live perennials)

## Daubenmire

Page ____ of _____

| Study Number | Date | Examiner | Allotment Name & Number | Pasture |
|---|---|---|---|---|
| | | | | |

| Transect Number and Location | Number of Quadrats |
|---|---|
| | |

| Plant Species | Quadrat | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
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| Plant Species | Quadrat | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
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Illustration 9

## Daubenmire Summary

Page ____ of _____

| Study Number | Date | Examiner | Allotment Name & Number | Pasture |
|---|---|---|---|---|
| | | | | |

| Study Location | Number of Quadrats |
|---|---|
| | |

| Cover Class | Mid-Point | Species | | Species | | Species | | Species | | Species | | Species | | Species | | Species | | Species | | Species | | Species | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | Number | Product | Number | Product | Number | Product | Number | Product | Number | Product | Number | Product | Number | Product | Number | Product | Number | Product | Number | Product | Number | Product |
| 1 1-5% | 2.5 | | | | | | | | | | | | | | | | | | | | | | |
| 2 5-25% | 15 | | | | | | | | | | | | | | | | | | | | | | |
| 3 26-50% | 37.5 | | | | | | | | | | | | | | | | | | | | | | |
| 4 51-75% | 62.5 | | | | | | | | | | | | | | | | | | | | | | |
| 5 76-95% | 85 | | | | | | | | | | | | | | | | | | | | | | |
| 6 96-100% | 97.5 | | | | | | | | | | | | | | | | | | | | | | |
| Total canopy | | | | | | | | | | | | | | | | | | | | | | | |
| Number of Samples | | | | | | | | | | | | | | | | | | | | | | | |
| % canopy cover | | | | | | | | | | | | | | | | | | | | | | | |
| Species composition | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | | | | | | | | | | | | | | | | | | | | | | | |

Illustration 10

# Evaluation Sheet (Front)

Aerial Photo:_____

Management Unit:_____ State:_____ Office:_____ Range/Ecol. Site Code:_____
(Allotment or pasture)

Ecological Site Name:_____ Soil Map Unit/Component Name:_____

Observers:_____ Date:_____

Location (description):_____

T. ____ R. _____ or _____N. Lat. Or UTM E_____m Position by GPS? Y / N
UTM Zone___, Datum___

Sec. _____, _____ _____W. Long. N_____m Photos taken? Y / N

Size of evaluation area:_____

Composition (Indicators 10 and 12) based on:__Annual Production, __Cover Produced During Current Year or __Biomass

---

Soil/site verification:

Range/Ecol. Site Descr., Soil Surv., and/or Ecol. Ref. Area:
Surface texture _____
Depth: very shallow __, shallow __, moderate __, deep __
Type and depth of diagnostic horizons:
1. _____ 3. _____
2. _____ 4. _____
Surf. Efferv.: none __, v. slight __, slight __, strong __, violent __

Evaluation Area:
Surface texture _____
Depth: very shallow __, shallow __, moderate __, deep __
Type and depth of diagnostic horizons:
1. _____ 3. _____
2. _____ 4. _____
Surf. Efferv.: none __, v. slight __, slight __, strong __, violent __

Parent material _____ Slope _____% Elevation _____ft.

Topographic position _____ Aspect _____

Average annual precipitation _____inches

Seasonal distribution _____

---

Recent weather (last 2 years) (1) drought _____, (2) normal _____, or (3) wet _____.

Wildlife use, livestock use (intensity and season of allotted use), and recent disturbances:

_____
_____
_____
_____

Off-site influences on evaluation area:

_____
_____
_____
_____

Criteria used to select this particular evaluation area as REPRESENTATIVE (specific info. and factors considered; degree of "representativeness")

_____
_____
_____
_____

Other remarks (continue on back if necessary)

_____
_____
_____
_____

Reference: (1) Reference Sheet:_____; Author:_____; Creation Date:_____
or (2) Other (e.g., name and date of ecological site description; locations of ecological reference area(s))_____

# Evaluation Sheet (Back)

| Departure from Expected | Code |
|---|---|
| None to Slight | N-S |
| Slight to Moderate | S-M |
| Moderate | M |
| Moderate to Extreme | M-E |
| Extreme to Total | E-T |

**Instructions for Evaluation Sheet, Page 2**

(1) Assign 17 indicator ratings. If indicator not present, rate None to Slight.
(2) In the three grids below, write the indicator number in the appropriate column for each indicator that is applicable to the attribute.
(3) Assign overall rating for each attribute based on preponderance of evidence.
(4) Justify each attribute rating in writing.

| Indicator | Rating | Comments |
|---|---|---|
| 1. Rills | S H | |
| 2. Water-flow Patterns | S H | |
| 3. Pedestals and/or terracettes | S H | |
| 4. Bare ground _____% | S H | |
| 5. Gullies | S H | |
| 6. Wind-scoured, blowouts, and/or deposition areas | S | |
| 7. Litter movement | S | |
| 8. Soil surface resistance to erosion | S H B | |
| 9. Soil surface loss or degradation | S H B | |
| 10. Plant community composition and distribution relative to infiltration | H | |
| 11. Compaction layer | S H B | |
| 12. Functional/structional groups | B | |
| 13. Plant mortality/decadence | B | |
| 14. Litter amount | H B | |
| 15. Annual production | B | |
| 16. Invasive plants | B | |
| 17. Reproductive capability of perennial plants | B | |

| E-T | M-E | M | S-M | N-S |
|---|---|---|---|---|
| | | | | |

**Attribute Rating Justification**
Soil & Site Stability:

S (10 indicators):
Soil & Site Stability
Rating: _____

| E-T | M-E | M | S-M | N-S |
|---|---|---|---|---|
| | | | | |

**Attribute Rating Justification**
Hydrologic Function:

H (10 indicators):
Hydrologic Function
Rating: _____

| E-T | M-E | M | S-M | N-S |
|---|---|---|---|---|
| | | | | |

**Attribute Rating Justification**
Biotic Integrity:

B (9 indicators):
Biotic Integrity
Rating: _____

# Reference Sheet

**Author(s)/participant(s):** _____

**Contact for lead author:** _____

**Date:** _____ **MLRA:** _____ **Sub-MLRA:** _____ **Ecological Site:** _____ This *must* be verified based on soils and climate (see Ecological Site Description). Current plant community *cannot* be used to identify the ecological site.

**Composition (Indicators 10 and 12) based on:** __Annual Production, __Foliar Cover, __Biomass

**Indicators.** For each indicator, describe the potential for the site. Where possible, (1) use numbers, (2) include expected range of values for above- and below-average years and natural disturbance regimes for **each** community within the reference state, when appropriate and (3) cite data. Continue descriptions on separate sheet.

1. Number and extent of rills:

2. Presence of water flow patterns:

3. Number and height of erosional pedestals or terracettes:

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are **not** bare ground):

5. Number of gullies and erosion associated with gullies:

6. Extent of wind scoured, blowouts and/or depositional areas:

7. Amount of litter movement (describe size and distance expected to travel):

8. Soil surface (top few mm) resistance to erosion (stability values are averages – most sites will show a range of values):

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):

10. Effect of plant community composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:

11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):

12. Functional/Structural Groups (list in order of descending dominance by above-ground production or live foliar cover (specify) using symbols: >>, >, = to indicate much greater than, greater than, and equal to; place dominants, subdominants and "others" on separate lines):
    Dominants:
    Sub-dominants:
    Other:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):

14. Average percent litter cover ( _____%) and depth ( _____ inches).

15. Expected annual production (this is TOTAL above-ground production, not just forage production):
_____ - _____ lbs./acre or kg/ha (choose one)

16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site.:

17. Perennial plant reproductive capability:

# Functional/Structural Groups Sheet

**State** _____ **Office** _____ **Ecological Site** _____ **Site ID** _____

**Observers** _____ **Date** _____

| **Functional/Structural Groups** | | | **Species List for Functional/Structural Groups** |
|---|---|---|---|
| Name | Potential[1] | Actual[2] | Plant Names |
| | | | |
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| | | | |
| Noxious Weeds | | | |
| Invasive Plants | | | |
| Biological Crust[3] | | | |

**Indicate whether each "structural/functional group" is a Dominant (D)** (roughly 40-100 % composition), **a Sub-dominant (S)** (roughly 10-40% composition) **a Minor Component (M)** (roughly 2-10% composition), or **a Trace Component (T)** (<2% composition) based on weight or cover composition in the area of interest (e.g., "Actual[2]" column) relative to the "Potential[1]" column derived from information found in the ecological site/description and/or at the ecological reference area.

**Biological Crust**[3] dominance is evaluated solely on cover, not composition by weight.

# Evaluation Matrix

**State** _____ **Office** _____ **Ecological Site** _____ **Site ID** _____

**Authors** _____ **Revision Date** _____

| | Departure from Reference Sheet | | | | |
|---|---|---|---|---|---|
| Indicator* | Extreme to Total | Moderate to Extreme | Moderate | Slight to Moderate | None to Slight |
| 1. Rills _____ | | | | | Reference Sheet: _____ |
| Generic Descriptor | Rill formation is severe and well defined throughout most of the site. | Rill formation is moderately active and well defined throughout most of the site. | Active rill formation is slight at infrequent intervals; mostly in exposed areas. | No recent formation of rills; old rills have blunted or muted features. | Current or past formation of rills as expected for the site. |
| 2. Water Flow Patterns _____ | | | | | Reference Sheet: _____ |
| Generic Descriptor | Water flow patterns extensive and numerous; unstable with active erosion; usually connected. | Water flow patterns more numerous and extensive than expected; deposition and cut areas common; occasionally connected. | Number and length of water flow patterns nearly match what is expected for the site; erosion is minor with some instability and deposition. | Number and length of water flow patterns match what is expected for the site; some evidence of minor erosion. Flow patterns are stable and short. | Matches what is expected for the site; minimal evidence of past or current soil deposition or erosion. |
| 3. Pedestals and/or Terracettes _____ | | | | | Reference Sheet: _____ |
| Generic Descriptor | Abundant active pedestalling and numerous terracettes. Many rocks and plants are pedestaled; exposed plant roots are common. | Moderate active pedestalling; terracettes common. Some rocks and plants are pedestaled with occasional exposed roots. | Slight active pedestalling; most pedestals are in flow paths and interspaces and/or on exposed slopes. Occasional terracettes present. | Active pedestalling or terracette formation is rare; some evidence of past pedestal formation, especially in water flow patterns on exposed slopes. | Current or past evidence of pedestaled plants or rocks as expected for the site. Terracettes absent or uncommon. |

* Descriptions for each indicator should be more specific than those listed in the Generic Descriptors, if possible, and refer to the criteria included in the None to Slight description, which is based on the Reference Sheet (Appendix 1).

**Departure from Reference Sheet**

| Indicator* | Extreme to Total | Moderate to Extreme | Moderate | Slight to Moderate | None to Slight |
|---|---|---|---|---|---|
| 4. Bare Ground | | | | | Reference Sheet: |
| Generic Descriptor | Much higher than expected for the site. Bare areas are large and generally connected. | Moderate to much higher than expected for the site. Bare areas are large and occasionally connected. | Moderately higher than expected for the site. Bare areas are of moderate size and sporadically connected. | Slightly to moderately higher than expected for the site. Bare areas are small and rarely connected. | Amount and size of bare areas match that expected for the site. |
| 5. Gullies | | | | | Reference Sheet: |
| Generic Descriptor | Common with indications of active erosion and downcutting; vegetation is infrequent on slopes and/or bed. Nickpoints and headcuts are numerous and active. | Moderate in number to common with indications of active erosion; vegetation is intermittent on slopes and/or bed. Headcuts are active; down-cutting is not apparent. | Moderate in number with indications of active erosion; vegetation is intermittent on slopes and/or bed. Occasional headcuts may be present. | Uncommon, vegetation is stabilizing the bed and slopes; no signs of active headcuts, nickpoints, or bed erosion. | Match what is expected for the site; drainages are represented as natural stable channels; vegetation common and no signs of erosion. |
| 6. Wind Scoured, Blowout, and/or Depositional Areas | | | | | Reference Sheet: |
| Generic Descriptor | Extensive. | Common. | Occasionally present. | Infrequent and few. | Match what is expected for the site. |

* Descriptions for each indicator should be more specific than those listed in the Generic Descriptors, if possible, and refer to the criteria included in the None to Slight description, which is based on the Reference Sheet (Appendix 1).

| | Departure fromReference Sheet | | | | |
|---|---|---|---|---|---|
| Indicator* | Extreme to Total | Moderate to Extreme | Moderate | Slight to Moderate | None to Slight |
| 7. Litter Movement (wind or water) _____ | _____ | _____ | _____ | _____ | Reference Sheet: _____ |
| Generic Descriptor | Extreme; concentrated around obstructions. Most size classes of litter have been displaced. | Moderate to extreme; loosely concentrated near obstructions. Moderate to small size classes of litter have been displaced. | Moderate movement of smaller size classes in scattered concentrations around obstructions and in depressions. | Slightly to moderately more than expected for the site with only small size classes of litter being displaced. | Matches that expected for the site with a fairly uniform distribution of litter. |
| 8. Soil Surface Resistance to Erosion _____ | _____ | _____ | _____ | _____ | Reference Sheet: _____ |
| Generic Descriptor | Extremely reduced throughout the site. Biological stabilization agents including organic matter and biological crusts virtually absent. | Significantly reduced in most plant canopy interspaces and moderately reduced beneath plant canopies. Stabilizing agents present only in isolated patches. | Significantly reduced in at least half of the plant canopy interspaces, or moderately reduced throughout the site. | Some reduction in soil surface stability in plant interspaces or slight reduction throughout the site. Stabilizing agents reduced below expected. | Matches that expected for the site. Surface soil is stabilized by organic matter decomposition products and/or a biological crust. |
| 9. Soil Surface Loss or Degradation _____ | _____ | _____ | _____ | _____ | Reference Sheet: _____ |
| Generic Descriptor | Soil surface horizon absent. Soil structure near surface is similar to, or more degraded, than that in subsurface horizons. No distinguishable difference in subsurface organic matter content. | Soil loss or degradation severe throughout site. Minimal differences in soil organic matter content and structure of surface and subsurface layers. | Moderate soil loss or degradation in plant interspaces with some degradation beneath plant canopies. Soil structure is degraded and soil organic matter content is significantly reduced. | Some soil loss has occurred and/or soil structure shows signs of degradation, especially in plant interspaces. | Soil surface horizon intact. Soil structure and organic matter content match that expected for site. |

* Descriptions for each indicator should be more specific than those listed in the Generic Descriptors, if possible, and refer to the criteria included in the None to Slight description, which is based on the Reference Sheet (Appendix 1).

**Departure from Reference Sheet**

| Indicator* | Extreme to Total | Moderate to Extreme | Moderate | Slight to Moderate | None to Slight |
|---|---|---|---|---|---|
| 10. Plant Community Composition and Distribution Relative to Infiltration and Runoff | | | | | Reference Sheet: |
| Generic Descriptor | Infiltration is severely decreased due to adverse changes in plant community composition and/or distribution. Adverse plant cover changes have occurred. | Infiltration is greatly decreased due to adverse changes in plant community composition and/or distribution. Detrimental plant cover changes have occurred. | Infiltration is moderately reduced due to adverse changes in plant community composition and/or distribution. Plant cover changes negatively affect infiltration. | Infiltration is slightly to moderately affected by minor changes in plant community composition and/or distribution. Plant cover changes have only a minor effect on infiltration. | Infiltration and runoff are not affected by any changes in plant community composition and distribution. Any changes in infiltration and runoff can be attributed to other factors (e.g. compaction). |
| 11. Compaction Layer (below soil surface) | | | | | Reference Sheet: |
| Generic Descriptor | Extensive; severely restricts water movement and root penetration. | Widespread; greatly restricts water movement and root penetration. | Moderately widespread, moderately restricts water movement and root penetration. | Rarely present or is thin and weakly restrictive to water movement and root penetration. | Matches that expected for the site; none to minimal, not restrictive to water movement and root penetration. |

* Descriptions for each indicator should be more specific than those listed in the Generic Descriptors, if possible, and refer to the criteria included in the None to Slight description, which is based on the Reference Sheet (Appendix 1).

| | Departure from Reference Sheet | | | | |
|---|---|---|---|---|---|
| Indicator* | Extreme to Total | Moderate to Extreme | Moderate | Slight to Moderate | None to Slight |
| 12. Functional/ Structural Groups (F/S Groups) See Functional/ Structural Groups Worksheet | | | | | Reference Sheet: |
| Generic Descriptor | Number of F/S groups greatly reduced **and/or** Relative dominance of F/S groups has been dramatically altered **and/or** Number of species within F/S groups dramatically reduced. | Number of F/S groups reduced **and/or** One dominant group and/or one or more sub-dominate group replaced by F/S groups not expected for the site **and/or** Number of species within F/S groups significantly reduced. | Number of F/S groups moderately reduced **and/or** One or more sub-dominant F/S groups replaced by F/S groups not expected for the site **and/or** Number of species within F/S groups moderately reduced. | Number of F/S groups slightly reduced **and/or** Relative dominance of F/S groups has been modified from that expected for the site **and/or** number of species within F/S slightly reduced. | F/S groups and number of species in each group closely match that expected for the site. |
| 13. Plant Mortality/ Decadence | | | | | Reference Sheet: |
| Generic Descriptor | Dead and/or decadent plants are common. | Dead plants and/or decadent plants are somewhat common. | Some dead and/or decadent plants are present. | Slight plant mortality and/or decadence. | Plant mortality and decadence match that expected for the site. |
| 14. Litter Amount | | | | | Reference Sheet: |
| Generic Descriptor | Largely absent or dominant relative to site potential and weather. | Greatly reduced or increased relative to site potential and weather. | Moderately more or less relative to site potential and weather. | Slightly more or less relative to site potential and weather. | Amount is what is expected for the site potential and weather. |

* Descriptions for each indicator should be more specific than those listed in the Generic Descriptors, if possible, and refer to the criteria included in the None to Slight description, which is based on the Reference Sheet (Appendix 1).

**Departure from Reference Sheet**

| Indicator* | Extreme to Total | Moderate to Extreme | Moderate | Slight to Moderate | None to Slight |
|---|---|---|---|---|---|
| 15. Annual Production _____ | _____ | _____ | _____ | _____ | Reference Sheet:_____ |
| Generic Descriptor | Less than 20% of potential production for the site based on recent weather. | 20-40% of potential production for the site based on recent weather. | 40-60% of potential production for the site based on recent weather. | 60-80% of potential production for the site based on recent weather. | Exceeds 80% of potential production for the site based on recent weather. |
| 16. Invasive Plants | _____ | _____ | _____ | _____ | Reference Sheet:_____ |
| Generic Descriptor | Dominate the site. | Common throughout the site. | Scattered throughout the site. | Present primarily in disturbed areas within the site. | If present, composition of invasive species, matches that expected for the site. |
| 17.Reproductive Capability of Perennial Plants (native or seeded) | _____ | _____ | _____ | _____ | Reference Sheet: _____ |
| Generic Descriptor | Capability to produce seed or vegetative tillers is severely reduced relative to recent climatic conditions. | Capability to produce seed or vegetative tillers is greatly reduced relative to recent climatic conditions | Capability to produce seed or vegetative tillers is moderately reduced relative to recent climatic conditions. | Capability to produce seed or vegetative tillers is slightly reduced relative to recent climatic conditions. | Capability to produce seed or vegetative tillers is not reduced relative to recent climatic conditions. |

* Descriptions for each indicator should be more specific than those listed in the Generic Descriptors, if possible, and refer to the criteria included in the None to Slight description, which is based on the Reference Sheet (Appendix 1).

# Standard Checklist

Name of Riparian-Wetland Area:_____

Date:_____ Segment/Reach ID: _____

Miles:_____ Acres:_____

ID Team Observers: _____

| Yes | No | N/A | HYDROLOGY |
|---|---|---|---|
| | | | 1) Floodplain above bankfull is inundated in “relatively frequent” events |
| | | | 2) Where beaver dams are present they are active and stable |
| | | | 3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region) |
| | | | 4) Riparian-wetland area is widening or has achieved potential extent |
| | | | 5) Upland watershed is not contributing to riparian-wetland degradation |

| Yes | No | N/A | VEGETATION |
|---|---|---|---|
| | | | 6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery) |
| | | | 7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery) |
| | | | 8) Species present indicate maintenance of riparian-wetland soil moisture characteristics |
| | | | 9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high-streamflow events |
| | | | 10) Riparian-wetland plants exhibit high vigor |
| | | | 11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows |
| | | | 12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery) |

| Yes | No | N/A | EROSION/DEPOSITION |
|---|---|---|---|
| | | | 13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy |
| | | | 14) Point bars are revegetating with riparian-wetland vegetation |
| | | | 15) Lateral stream movement is associated with natural sinuosity |
| | | | 16) System is vertically stable |
| | | | 17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition) |

(Revised 1998)

## Remarks

_____
_____
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## Summary Determination

**Functional Rating:**

Proper Functioning Condition _____
Functional—At Risk _____
Nonfunctional _____
Unknown _____

**Trend for Functional—At Risk:**

Upward _____
Downward _____
Not Apparent _____

**Are factors contributing to unacceptable conditions outside the control of the manager?**

Yes ___
No ___

**If yes, what are those factors?**

___ Flow regulations ___ Mining activities ___ Upstream channel conditions
___ Channelization ___ Road encroachment ___ Oil field water discharge
___ Augmented flows ___ Other (specify)_____

# Appendix L

Glenwood Springs Grazing Guidelines
for Riparian Areas

# Appendix L

## GLENWOOD SPRINGS FIELD OFFICE GRAZING MANAGEMENT GUIDELINES FOR RIPARIAN AREAS

## I. Supporting Documentation

Colorado Livestock Grazing Management Guidelines that are applicable to riparian areas:

"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, season, duration, distribution, frequency and intensity of grazing use and livestock health.

**3. Grazing management practices maintain sufficient residual vegetation** on both uplands and riparian sites to protect the soil from wind and water erosion, to assist in maintaining appropriate soil infiltration 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."

The bolded sections are probably the most important for riparian zones.

Excerpts from BLM TR 1737-14 1997 Grazing Management for Riparian-Wetland Areas:

"No single grazing management system has resulted in consistent recovery of degraded riparian areas. Many combinations of sites, resource condition, and impacts, as well as human perspectives, are involved. The grazing management system for an area should be tailored to the conditions, problems, potential, objectives, and livestock management considerations on a site-specific basis."

"Ehrhart (in press) concluded that the common denominator among riparian areas that were functioning properly, or at least improving, in eastern Montana was continual involvement by the operator or manager. As long as there is control of livestock distribution and grazing intensity, the specific grazing system employed may not be important (Clary and Webster 1989)."

"Successful grazing management strategies for riparian areas can usually be achieved using a combination of options, including grazing "prescriptions" that:

- Limit grazing intensity, frequency and/or season of use, thereby providing sufficient rest to encourage plant vigor, regrowth, and energy storage and minimize compaction of soils.

- Control the timing of grazing to prevent damage to streambanks when they are most vulnerable to trampling.

- Ensure sufficient vegetation during periods of high flow to protect streambanks, dissipate energy, and trap sediments."

"Proper distribution of livestock can be an effective and economical tool in managing riparian areas. In some areas that are degraded, some rest may required, especially where woody species are part of the management objective."

"Due to the variation in riparian sites and management objectives, one standard utilization and/or residual vegetation target is not appropriate."

"Utilization patterns relative to total forage distribution reveal that livestock distribution, coupled with timing, duration, and frequency of grazing are often the main problems. Most successful grazing strategies of "prescriptions also include additional practices or techniques that promote distribution of livestock…"

"Total stocking rate problems at the pasture, ranch, or allotment level are the exception rather than the rule in today's operations. The apparent overstocking of some areas while others are only moderately grazed or even ungrazed will not be solved by simply reducing numbers if other factors are not also changed. Reducing stocking rates may reduce the percentage of area in unsatisfactory condition, but the impacts around the foci of highly utilized areas (e.g., riparian areas, other waters, etc.) will remain the same until few, if any animals remain."

"Sometimes exclusion fencing can be the most practical approach for initiating rapid riparian recovery or improving highly sensitive areas, or it can be a temporary measure for initiating recovery."

"Using riparian pastures offers alternatives to eliminating livestock grazing and fencing riparian boundaries, which can be costly."

"Frequent riding and herding can effectively control livestock distribution in some situations."

## II. Recommended "Rule of Thumb" Guidelines

In consideration of the above, the following Rules of Thumb/Guidelines (not to be confused as mandates) are recommended to meet resource objectives and achieve Land Health Standards:

- Continuous season-long grazing strategies should be avoided. Adopt grazing strategies that limit the duration of grazing use and allow ample regrowth periods.

- Salt and supplemental feed placement should be done in a manner that attracts livestock away from riparian areas. Avoid placement of salt and supplemental feed adjacent to riparian areas. Place at least 0.25 and preferably 0.5 mile from riparian areas and in locations that encourage use of uplands.

- Develop additional water sources in uplands to attract livestock away from riparian areas.
- Adopt frequent riding and/or herding requirements where appropriate in AMPs or terms and conditions of grazing permits.
- Avoid using streams as fenced pasture boundaries. Fences that are adjacent to streams or zig-zag across streams tend to concentrate livestock near the stream.
- Consider exclusion fencing where practical or riparian pasture fencing.
- Adopt utilization and/or residual vegetation targets in AMPs or terms and conditions of grazing permits.[1]
- Apply guidelines that limit streambank shearing and trampling to acceptable levels in AMPs or terms and conditions of grazing permits.
- Conduct prescribed burning or other land treatments in uplands to provide better forage to attract livestock away from riparian areas.
- Employ rest from livestock grazing whenever appropriate (e.g., some rest may be required for degraded riparian areas where woody species are part of the management objective).

[1] GSFO has commonly used the following as a term and condition on grazing permits: "grazing in riparian areas by livestock will leave an average minimum 4-inch stubble height of herbaceous vegetation and will not exceed an average utilization of 40% of the current year's growth for browse species. Livestock will be moved to another portion of the allotment where utilization levels are still within acceptable limits or removed immediately from the allotment when the above utilization levels occur." A slightly older version of this term and condition used a 3-inch stubble height and 50% of the current year's growth for browse species. It is not known where either figures were derived; hence, there is reluctance to apply these in a land use plan amendment without supporting published research.

# Appendix M

Resources for Local Governments
to Address Energy and Mineral Impacts

# Appendix M

## RESOURCES FOR LOCAL GOVERNMENTS TO ADDRESS ENERGY AND MINERAL IMPACTS

This section outlines financial and programmatic resources available to help local governments address the impacts of energy and mineral extraction industries.

## *Attachments, Other Resources*

This section includes excerpts from text found at web sites listed at the end of this section. Several attachments have also been copied from documents posted at agency web sites, as noted on each image.

The graphics in Attachments M-1 and M-2 provide an overview how federal and state funds are distributed and used, as defined by statutes. Attachment M-3 is an Excel workbook with worksheets that demonstrate how state severance tax revenues and federal mineral leasing royalties are distributed, including funds that are available for local governments.

## *Overview*

There are three primary revenue sources that are directly affected by the activity level of energy and mineral industries operating within Colorado:

- Local Property Tax
- State Severance Tax
- Federal Mineral Lease Royalties

Severance Tax Credits are also available, allowing corporations to divert pre-tax dollars into local public/private partnerships for managing future impacts.

Local property tax revenues are administered by local governments.

Colorado state statutes define how federal mineral lease royalties and state severance tax revenues are administered through state agencies. Portions of the funds are distributed to affected local governments through:

- Direct distribution
- Severance Tax Credits
- Discretionary grants and loans

Other portions of the funds are used by state agencies to support programming that can benefit local governments that are directly affected, as well as programming that is less specific to affected communities, including:

- Technical assistance to affected local governments
- Programming in areas with affected local governments
- Education programming throughout the state.

Funding for local governments is administered through the Department of Local Affairs (DOLA). DOLA is charged to integrate tax operations with local government impact assistance programs through the Energy and Mineral Impact Assistance program. The program distributes related funds to local governments as direct allocations, grants and loans. The largest portion of the program funds are distributed through grants and loans.

Colorado agencies that receive a portion of the funds to provide technical assistance and support other programming include:

- Department of Local Affairs (DOLA)
- Department of Natural Resources (DNR)
- Colorado Water Conservation Board
- Department of Education (CDE)
-

More than half of all revenues are distributed to Colorado Department of Education

Following is a summary of how funding sources are distributed and how they can be accessed by local governments. The graphics in attachments M-1 and M-2 provide additional detail.

## Statute Stipulated Distribution Points

| | Local Government | | State Agencies | | | | |
|---|---|---|---|---|---|---|---|
| | COUNTIES | Towns; School Dist's | Dept of Educ. | DOLA | | DNR | |
| | | | State School Fund | Impact Assistance Fund | | DNR Trust Fund | |
| REVENUE | | | | | | CWCB | Ops Acct |
| Federal Mineral Leasing | X | [as available in 2nd 'cut'] | X | X | | X | |
| State Severance Tax | X | | | X | X | X | X |

## Potential Sources of Funding for Local Government

| | Local Government | | State Agencies | | | | |
|---|---|---|---|---|---|---|---|
| | COUNTIES | Towns; School Dist's | CDE | DOLA | | DNR | |
| REVENUE | | | State Fund | Energy Mineral Impact Fund | | CWCB | Ops Acct |
| Federal Mineral Leasing | Direct distribution | [direct distrib. as available in 2nd 'cut'] | General DOE grants | Grants and Loans | | Grants and Loans | |
| State Severance Tax | Direct distribution | | | | | | Grants |
| State Severance Tax Credit | Any local jurisdiction is eligible to partner with companies on tax credit project. | | | | | | |

## *State Severance Tax Revenues*

1977 the General Assembly found that "when nonrenewable natural resources are removed from the earth, the value of such resources to the state of Colorado is irretrievably lost." The Legislature established a severance tax on development, processing, or energy conservation of certain minerals and mineral fuels, declaring the tax to be means for the state "to recapture a portion of the lost wealth". The legislature also expressed its intent that "a portion be made available to local governments to offset the impact created by nonrenewable resource development."

## *Federal Mineral Lease Royalties*

Since the 1920's: Federal government has charged royalties on mineral production from federal lands and returned a portion of the revenues to the states, counties and school districts from which the minerals were withdrawn. In 1977 and 1982, the Colorado General Assembly passed legislation with a provision designating a portion of these federal funds to be deposited in a Local Government Mineral Impact Fund.

DOLA manages this fund through the Energy and Mineral Impact Assistance Program, including direct distributions and grants and loans for local governments.

## Energy and Mineral Impact Assistance Program

The Energy and Mineral Impact Assistance program was created in 1977 by the General Assembly to provide funds and technical assistance to "local governments to offset the impact created by nonrenewable resource development."

Designated Agency:
The Department of Local Affairs (DOLA) is designated as the agency responsible to integrate tax operations with local government impact assistance programs through the Energy and Mineral Impact Assistance program.

Funding:
Funding for the program is drawn from state severance tax revenues and federal mineral lease royalties. Being a federal royalty payment, many local governments have determined that federal mineral lease funds are exempt from TABOR limitations.

Administration:
Related funds are deposited into separate management funds:

- Local Government Severance Tax Fund, for state severance taxes
  [C.R.S. 39-29-101 through 39-29-114.]
- Local Government Mineral Impact Fund, for federal mineral lease royalties
  [C.R.S. 34-63-101 through 34-63-104]

Statutes governing the Energy and Mineral Impact Assistance program are broadly constructed to:

- Prioritize funding for "public schools and political subdivisions socially or economically impacted by…development, processing or energy conversion of fuels and minerals leased under said Federal Mineral Lands Leasing Act"
- Use funds for "planning, construction and maintenance of public facilities and for public services.

As prescribed by state statutes, DOLA ensures that portions of these two funds are distributed to local governments through: direct distributions, severance tax credits and grants and loans.

## Direct Distribution to Local Governments

Colorado's Energy and Mineral Impact Assistance program distributes a portion of the federal mining lease royalties and state severance tax revenues directly to local governments, using formulas defined by related statutes and regulations.

## Employee Residence Reports

Based on state statute C.R.S. 39-29-110 severance tax payers submit reports detailing the area of residence for their employees that qualify as "resident production employees". This does not include all persons employed by a company or by auxiliary service businesses. The count also does not include employees working on "stripper wells".

## State Severance Tax Revenues

- No application is required for direct distributions.
- DOLA makes this distribution in August of each year.
- Attachments M-1 and M-2, illustrate the formulas stipulated by state statute C.R.S.39-29-101 and used distribute funds to local governments and state programs.
    - Initially, 50% is distributed to DOLA's Local Government Severance Tax Fund and 50% to Department of Natural Resource's Trust Fund,
    - 15% of the DOLA's Local Government Severance Tax Fund is then distributed directly to local governments,
    - DOLA calculates, by mineral type (Coal, Metals, Oil and Gas),:
        - the 15% severance tax pot that will be distributed to local governments, based on the number of "resident production employees" that were reported to Department of Revenue by severance tax payers through Employee Residence Reports,
        - adds the prorated share of interest earnings that these funds have earned in the fiscal year,
        - adds any penalty collections,
        - calculates the specific payments to towns and counties.
    - At the conclusion of the exercise, the Department of Revenue sends the operator name and address list back to the COGCC with suggested updates for the next cycle in January.

## Federal Mineral Leasing Royalties

<u>Mineral Lease Payments from the State Treasurer</u> (CRS 34-63-101)

- No application is required.
- Depending on when information is received from the federal government, the State Treasurer makes quarterly payments to local governments.
- Attachments M-1 and M-2 illustrate the formulas stipulated by state statute [C.R.S.34-63] and used distribute funds to counties, towns, school districts and state programs. The distribution formula is set up in a cascade format, which provides a first cut share to the parties and then allocates residuals in a second and third cut.
    - The largest share of the funds goes to the State School Fund for distribution to school districts throughout the state under the School Finance Act,
    - 10% of the total goes to the Colorado Water Conservation Board for funding of local water supply development,
    - Local Government Distributions,
    - At each point in the formulas, distributions to counties are calculated based on the number of "resident production employees" reported to the Department of Revenue through annual Employee Residence Reports,
    - Counties, cities and school districts in counties with federal mineral leases receive direct payments on a quarterly basis, up to $1.2 M,
    - Another portion is distributed to local governments through the DOLA 's Energy and Mineral Impact Fund which has two distribution shares within the cascade formula,
    - The statute requires Counties to share their total distribution with schools and towns, based on a set formula. This minimum required split can be increased by the county commissioners and therefore varies from county-to-county and year-to-year.
        - Distributions to school districts are based on reported enrollment.
        - Distributions to towns are distributed proportional to population

Energy Mineral Impact Assistance Fund Distributions

- No application is required for direct distributions.
- DOLA makes this distribution in January of each year
- Based on C.R.S. 34-63-102 (3), a portion of the federal mineral leasing funds deposited in the Local Government Mineral Impact Fund are distributed directly to municipalities and counties. The calculations is based on:
    - A local government's "share" of the final residual overflow in the cascading formula.
    - The count for "resident production employees" (as reported in Employee Residence Reports to the Department of Revenue.

## *Diverting Pre-Tax Funds to Local Governments*

### Severance Tax Credits

Based on C.R.S. 39-29-107.5, the State allows severance taxpaying corporations to make contributions for local public facility and service projects and to convert a contribution into a severance tax credit if:

- The credit is taken on taxes for new or increased energy/mineral production, and
- The contribution is intended for use in addressing front-end impacts that will be associated with the new or expanding production.

Contribution Agreement

The severance taxpayer can create this kind of severance credit by forming an agreement with a local government for the contribution and submitting the agreement to DOLA for review and ensuring that the agreement specifies the following six items:

1. The taxpayer from which the contribution is being made and credit claimed.
2. The local jurisdiction to which the contribution is being made.
3. The need for such contribution relative to impacts from a new or expanding mineral operation.
4. The nature of the contribution in the form of a specific description of the quantities, term, and conditions which make up the contribution and procedures for conveyance. This may include cash transfers, properly valued materials and services, and losses from the purchase of public bonds issued by the jurisdictions.
5. The purpose of the contribution in the form of a description of the relationship of the contribution to need and its role in local government planning and mitigation programs.
6. The amount of the contribution as determined by fair market value of the contributed property and/or services at the time of the execution of the agreement.

Contribution Agreement Review and Tax Credit Decision

The submitted agreement will be reviewed by the state Energy and Mineral Impact advisory committee. The DOLA Executive Director will make the final decision.

- The criteria for review of agreements by the state advisory committee and executive director are similar to the funding guidelines used for the grant and loan program except for a greater emphasis on the need for front end financing before the new/expanded ad valorem tax base is established.

- Credit agreements must be reviewed and prioritized locally with other credit agreements and grant/loan requests submitted during a grant review cycle.

Approved Contribution Agreements

- If approved, the contribution agreement is sent to the State Department of Revenue as documentation for future credit claims by the corporation.
- Municipalities, counties, school districts and other special districts may use such a credit agreement to obtain industry contributions.

Before You Apply

More complete written information on the severance tax credit is available upon request from DOLA. Local units of government considering this mechanism are encouraged to their Department of Local Affairs' regional manager to discuss procedure and technical requirements.

## *Grants and Loans*

The largest distribution of funds from the Energy and Mineral Impact Assistance program occurs in the form of discretionary grants and loans.

### Technical Assistance for Prospective Applicants

Application forms, program guidelines and technical assistance are available from department regional managers. The application form and program guidelines are also available DOLA home page, www.dola.state.co.us.

### Application Deadlines

Three Funding Cycles
Applications are accepted continuously and considered in the course of three regular funding cycles each year.

Deadlines Posted and Announced
The application deadline for each of the funding cycles is posted on the Department of Local Affairs home page (www.dola.state.co.us) and announced through the Colorado Municipal League, Colorado Counties, Inc., and the Special District Association.

### Types of Financial Assistance Available

**Grants** for the:

- "planning, construction and maintenance of public facilities" and
- "provision of public services."

**Loans**
In 1985, the Energy Mineral Impact Assistance program was expanded [C.R.S. 39-29-110] to include loans or combinations of grant and loan funding for the "planning, design, construction, erection, building, acquisition, alteration, modernization, reconstruction, improvement, or expansion" of:

- "domestic wastewater treatment works", and
- "potable water treatment facilities."

## Eligible Activities

Examples of public facilities:

water and sewer infrastructure, town/city halls, county courthouses, community centers, public roads and streets, emergency medical and fire protection facilities and equipment.

Examples of public services:

community development assistance to local governments, internship programs and community revitalization assistance.

## Guideline for Maximum Grant or Loan Amounts

Maximum grant request: $500,000

While there is no absolute limit to the amount of funding an applicant may request, $500,000 is the suggested guideline.

NOTE: It is recognized that areas with the heaviest production incur unique impacts. DOLA may consider increasing the grant guideline when a project presents a compelling need, is critical to addressing significant impacts, represents a unique opportunity for enhanced quality of life, or is of monumental significance in strengthening a community for the future.

Maximum water and sewer loan request: $1,000,000

## Eligible Recipients

By statute, eligible recipients are:

- **Municipalities, counties, school districts and most special districts**, as "political subdivisions" that are "socially or economically impacted by the development, processing or energy conversion of fuels and minerals".
- **Non-profit corporations** that are being used by local government recipients to provide a public service, but the local government must assume responsibility administering funds that may be awarded and ownership for any real and/or tangible assets acquired with the funds awarded.
- **State agencies** are eligible recipients (of federal mineral lease funds), if they:
  - have specific spending authority from the General Assembly,
  - have the support of benefiting local governments, and
  - work on projects that addresses adverse impacts from energy and mineral development at local, regional or statewide level.

## Grant Project Selection Criteria

Following is an abridged version of the criteria or guidelines that DOLA staff and the state advisory committee use to review applications and making funding decisions. A full set of current guidelines is available at the DOLA home page [www.dola.state.co.us]:

a. The range and extent of impacts associated with energy and mineral development, processing or energy conversion affecting the applicant's jurisdiction, including areas indirectly affected. [The program maintains flexibility to respond to areas throughout the state with lesser impacts.]

b. Extent to which project addresses existing/projected community impacts.

c. Availability of alternative funding. Priority or level of funding may be adjusted, based on degree project relates to energy/mineral impacts.

d. Amount of local cash and other funds relative to the grant request amount. Larger matching amounts are generally more competitive.
e. The level of in-kind contributions committed to the project.
f. Local priority as designated by jurisdiction or by a countywide impact team.
g. Relationship of project to identified community goals and/or documented public health and safety issues.
h. The applicant's fiscal capacity and ability to pay, reviewing "the extent of local tax resources local tax effort in solving energy impacts."
i. Consistency with local/regional plans. Department staff will work with appropriate parties to resolve any conflicts before a decision.
j. Likelihood and urgency of timely implementation of the proposed project.
k. The overall feasibility of the proposed project.
l. The extent to which the proposed project may duplicate other efforts or is not coordinated with other related efforts.
m. Likelihood the project can be completed within the proposed budget.
n. The management capability of the applicant/implementers.
o. The consequences of not providing funding.

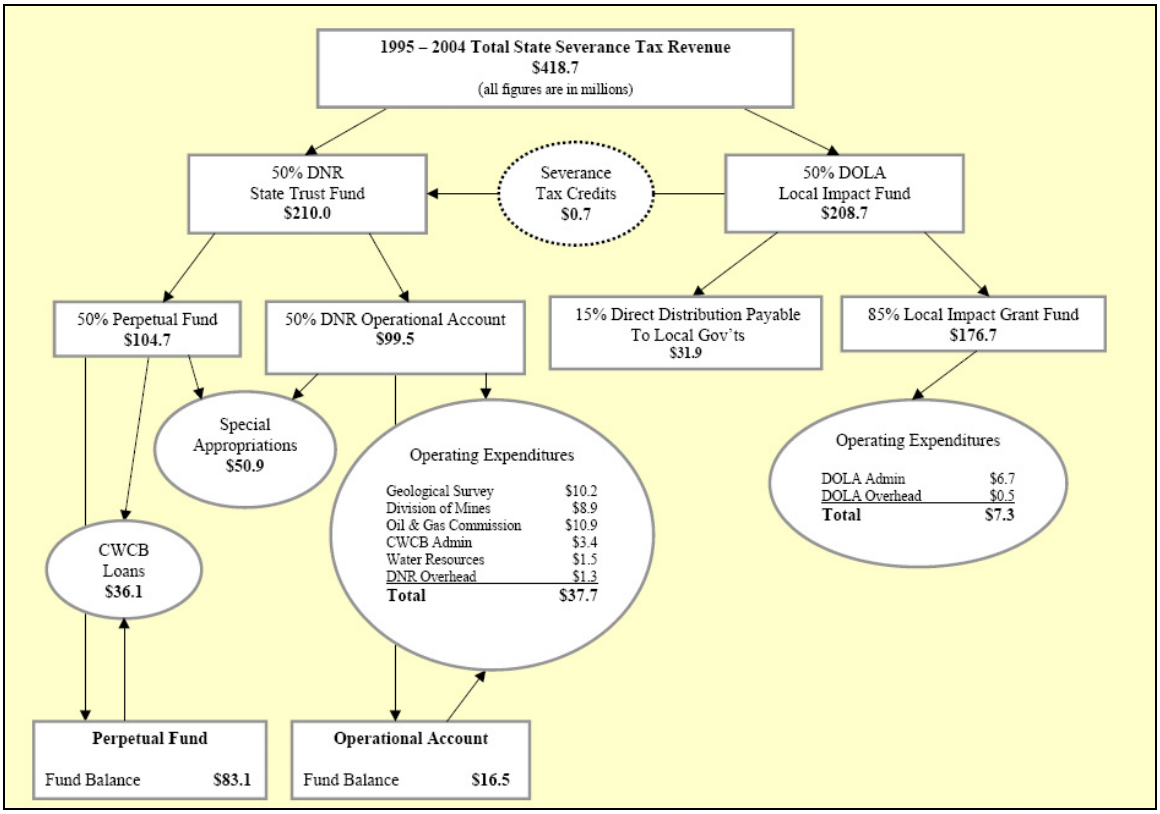
## Loan Project Selection Criteria

Following is an abridged version of the criteria or guidelines that DOLA staff and the state advisory committee use to review applications and making funding decisions. A full set of current guidelines is available at the DOLA home page [www.dola.state.co.us]:

a. By statute, the minimum interest rate is 5 percent. The loan term will generally not exceed 20 years. Payments are scheduled on an annual basis, with a principal and interest payment due September 1.
b. Loans will be authorized for only those parts of a domestic water or sewer system specified in C.R.S. 39-29-110(1)(b)(II). Raw water storage or transmission to a treatment facility cannot be considered for loans.
c. Loans generally will be the first option looked at for deferred maintenance and growth-related sewer and water projects.
d. The staff will identify for the state advisory committee those projects which appear to warrant a loan as a reasonable alternative to full grant funding.
e. Loan participation may be used as a means to increase local match for a project when local cash on hand is minimal.
f. Debt refinancing is generally not eligible.
g. Loan authority is not intended to deter communities from using traditional funding sources for projects.
h. The department will perform a community fiscal analysis to determine loan feasibility. The analysis will include a review of user rates, tap fees, overall community tax burden and fee structures, population statistics, existing debt service, financial statements, fund balances and anticipated capital improvements.

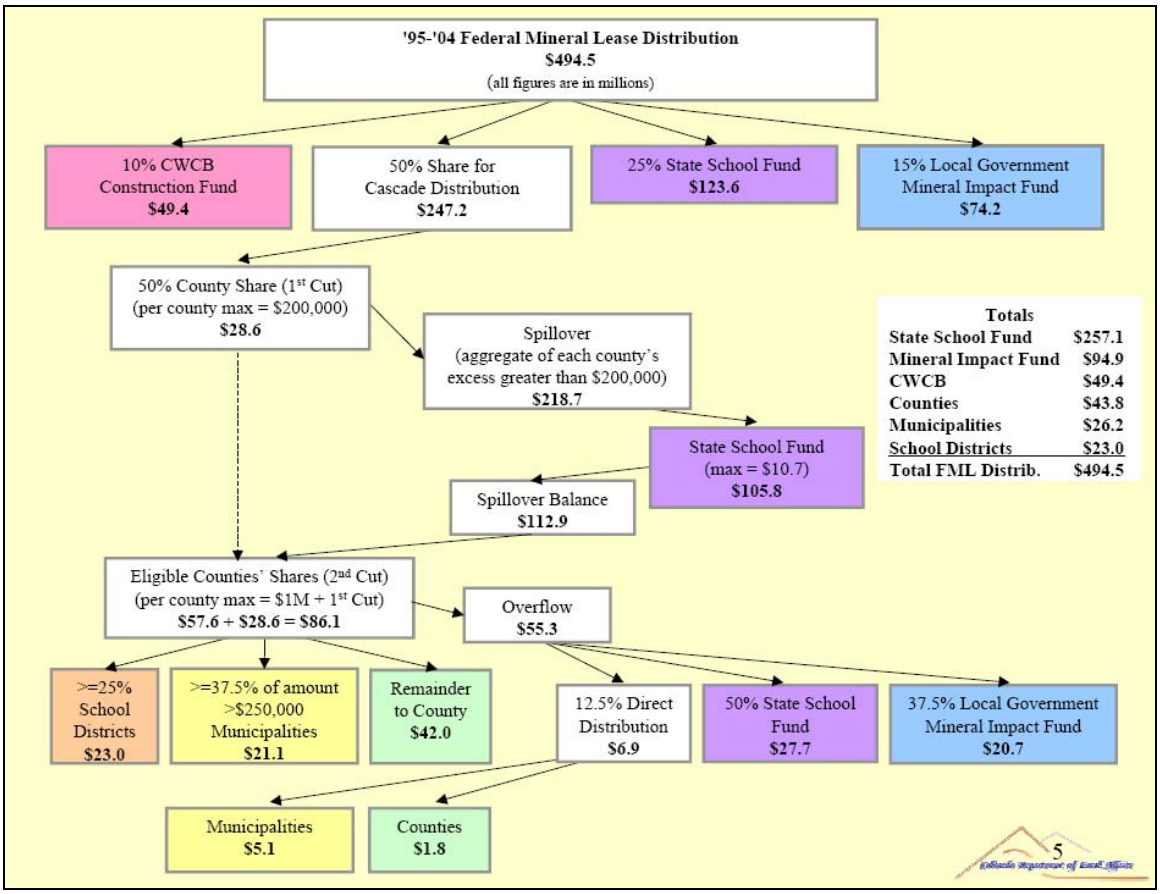
## Attachment M-1
## State Severance Tax Revenue Flow Chart
## From: Colorado Department of Local Affairs

http://www.dola.state.co.us/LGS/FA/EMIA/Documents/0511-EIAF-RoadShow-for-WEB.pdf



## Attachment M-2
## Federal Severance Tax Revenue Flow Chart
## From: Colorado Department of Local Affairs

http://www.dola.state.co.us/LGS/FA/EMIA/Documents/0511-EIAF-RoadShow-for-WEB.pdf



**Attachment M-3**
**Energy and Mining Impact Mitigation Funding Sources**
**Workbook Estimate for Local Governments**

## SUMMARY:
## Mining Impact-Related Revenues and Funding Sources

**County** **Garfield**
**Tax Year** **2003**

| | General Fund | Capital Budget |
|---|---|---|
| **LOCAL TAX REVENUES** | | |
| Property Tax on Oil and Gas ** | $ 3,400,000 | *at County's discretion* |
| **REVENUES DISTRIBUTED TO LOCAL GOVT** | | |
| State Severance Tax Revenue | $ 1,128,000 | *at County's discretion* |
| Federal Mineral Leasing Revenue<br>*5.5% of funds must go to Capital Budget* | $ 1,200,000 | $ 66,000 |
| BLM - Payment in Lieu of Taxes | $ 1,200,000 | |
| **TOTAL** | $ 6,928,000 | $ 66,000 |

***GRANTS and LOANS***
***Revenues administered by state agencies as part of competitive grant and loan programs****

| | | |
|---|---|---|
| Department of Local Affairs (DOLA) | | |
| Energy + Mineral Impact Fund | $ 45,712,500 | *at County's discretion* |
| Department of Natural Resources (DNR) | | |
| DNR Operations Account | $ 8,000,000 | *at County's discretion* |
| Colorado Water Conservation Board | $ 14,300,000 | *at County's discretion* |
| Department of Education | | |
| State School Fund<br>[governed by School Finance Act] | $ 39,400,000 | |
| **TOTAL** | $ | 68,012,500 |

# State Severance Tax Revenue Distribution

*** Required Fields*

## State Severance Tax Rate

[Source: DOLA ]

| | | |
|---|---|---|
| TAX YEAR | 2003 | |
| TAX RATE | 2.2% | (NOTE: rate varies annually, based on value of production) |

## State Severance Tax Revenues

(source: DOLA 2004)

| | $ |
|---|---|
| **Net Colorado Severance Tax** | 32,000,000 |

## Employee Residence Reports**

Number of Employees Residing within the County

As Reported to the State Dept of Revenue by Companies Paying Severance Taxes

(Source: DOLA, Garfield County)

| | |
|---|---|
| TAX YEAR | 2003 |
| Resident Production Employees Reported | 470 |
| Total Production Employees in Colorado | 1000 |

**** NOTE:** DOLA calculates the County's share, based on Employee Residence Reports and a set of other variables (like tax penalties paid by companies, etc.) that cannot be meaningfully projected.

# Distribution of Federal Mineral Leasing Funds

*** Required Fields*

## Assessed Valuation for Oil and Gas

(Source: DOLA Annual Report, 200__)

| | | |
|---|---|---|
| Assessed for Fed. Tax | $ | 130,000,000 |
| Exempted | $ | (4,000,000) |
| TOTAL Assessed | $ | 126,000,000 |

## Calculation of Federal Mineral Leasing Funds

[Source: DOLA Annual Report, 200__]

Based on the Federal Mineral Leasing Act, rental fees and royalties are collected based on the assessed valuation of a portion of the energy and minerals that are extracted from federal lands. Based on Leasing Act regulations, a substantial percentage of the oil and gas that is extracted is exempted from this assessment (see above).

Quarterly a net return for collected funds is calculated and 50% of the net is distributed to the state. Net return is calculated with deductions for administrative overhead and related claims from agencies like the departments that are managing areas of the Roan Plateau as part of the Naval Oil Shale Reserve.

## Return of Federal Mineral Leasing Funds to the Colorado Mineral Leasing Fund

[Source: Department of Revenue]

| Net Funds from CO | Colorado Mineral Leasing Fund | US Treasury |
|---|---|---|
| $ 126,000,000 | 50% of Net | 50% of Net |
| | $ 63,000,000 | $ 63,000,000 |

## Employee Residence Reports

Number of Employees Residing within the County [Resident Production Employees]

As Reported to the State Dept of Revenue by Companies Paying Severance Taxes

[Source: Department of Revenue]

| Year | County Resident Production Employees | State Total Resident Prod. Employees |
|---|---|---|
| 2003 | 475 | 1,000 |

## County's Estimated "Share" of Federal Mineral Leasing Funds**

Figure Estimated by DOLA, using Department of Revenue Reports

(Source: Department of Revenue)

| County's Estimated "Share" | NOTE: A local government's share of distributed funds is calculated at several points in this cascading formula based on the number of "resident production workers" that are reported to the Colorado Dept of Revenue by severance tax payers using Employee Residence Reports (see above). |
|---|---|
| 48% | |

## Distribution of Federal Mineral Leasing Funds through the Colorado State Treasurer and Dept of Local Affairs

| Colorado Mineral Leasing Fund | County's Estimated "Share" |
|---|---|
| $ 63,000,000 | 48% |

| | County of Origin | DOLA's Impact Assistance Fund | CWCB Construction Fund | State School Fund |
|---|---|---|---|---|
| FIRST 'CUT' | | | | |
| $ 63,000,000 | 50% of County's Estim 'Share', up to 200K | 15% of total | 10% of total | 25% of total |
| | $ 0 | $ 9,450,000 | $ 6,300,000 | $ 15,750,000 |
| SPILLOVER | | | | |
| $ 37,800,000 | | | | 100% up to $10.7M |
| | n/a | n/a | n/a | $ 10,700,000 |
| SECOND 'CUT' | | | | |
| $ 27,100,000 | Remaining bal of the 50%, up to $1.2M | | | |
| | $ 1,200,000 | n/a | n/a | |

| | |
|---|---|
| TOTAL Distribution to COUNTY | $ 1,200,000 |

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| | |
|---|---|
| SCHOOLS' Dist fr County $ 1,200,000 | Min 25% of County's Total Distrib |
| | $ 300,000 |
| TOWNS' Distrib fr County (IF County's Total >$250K) $ 950,000 | Min 37.5% of County's Total Distrib > $250K |
| | $ 356,250 |
| COUNTY's Balance $ 543,750 | Residual of Total Distrib to County |
| | $ 543,750 |

OVERFLOW

| | | | | |
|---|---|---|---|---|
| $ 25,900,000 | | 50% of overflow [for local govt grants] | | 50% of overflow |
| | n/a | $ 12,950,000 | n/a | $ 12,950,000 |

DISTRIBUTION thru DOLA

| | | |
|---|---|---|
| $ 12,950,000 | 25% of DOLA funds from Final 'Cut' | 75% DOLA Final 'Cut' (Residue to counties that have 'share' in Overflow) |
| | **NO** | $ 9,712,500 |

| | | | | |
|---|---|---|---|---|
| BALANCE | $ 543,750 | $ 32,112,500 | $ 6,300,000 | $ 39,400,000 |
| PLUS Distrib thru DOLA | **NO** | | | |

www.dola.state.co.us