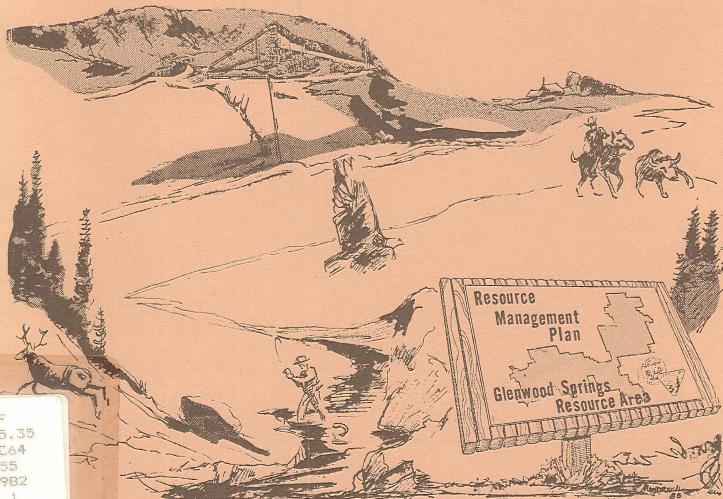




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Grand Junction District Office
764 Horizon Drive
Grand Junction, Colorado 81501

NOTICE

Enclosed for your review and comment is the draft environmental impact statement on the Glenwood Springs Resource Management Plan. This document is one of the first BLM environmental impact statements that analyzes the impacts of managing all the public land resources together rather than singly. The process used in developing the alternatives is new: (1) The Preferred Alternative was developed after formulating and analyzing the other alternatives rather than before, and (2) this environmental impact statement does not propose an action (a plan) at this time.

Your comments are invited on the alternatives presented and on the adequacy of the impact analysis. Please direct your written comments to the Area Manager, Glenwood Springs Resource Area, P. O. Box 1009, Glenwood Springs, Colorado 81602. Written comments should be received by close of business on February 2, 1983. Oral comments will be accepted at public hearings scheduled at the following locations.

<u>Place</u>	<u>Date and Time</u>
Holiday Inn Glenwood Springs, Colorado	December 7, 1982 2 p.m. to 4 p.m. and 7 p.m. to 9 p.m.
BLM Grand Junction District Office Grand Junction, Colorado	December 8, 1982 2 p.m. to 4 p.m. and 7 p.m. to 9 p.m.
Ramada Foothills Denver, Colorado	December 14, 1982 2 p.m. to 4 p.m. and 7 p.m. to 9 p.m.

Comments on the alternatives and on the adequacy of the impact analysis will be fully considered and evaluated. Comments on the alternatives will be used to modify the draft and to develop the final environmental impact statement on the proposed resource management plan.

Sincerely yours,



District Manager

#8938616

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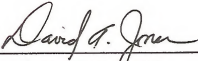
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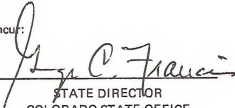
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ENVIRONMENTAL IMPACT STATEMENT

Draft (X)

Final ()

GLENWOOD SPRINGS RESOURCE AREA
GLENWOOD SPRINGS, COLORADO

Lead Agency

U. S. Department of the Interior, Bureau of Land Management

Type of Action

Administrative (X)

Legislative ()

ABSTRACT

This draft environmental impact statement on the Glenwood Springs Resource Management Plan describes and analyzes four alternatives for managing the public land resources in the Glenwood Springs Resource Area. They are the (1) Continuation of Current Management Alternative, (2) Resource Protection Alternative, (3) Economic Development Alternative, and (4) Preferred Alternative. The Preferred Alternative represents BLM's favored option for managing the Glenwood Springs Resource Area.

For further information regarding this environmental impact statement:

Alfred Wright, Area Manager
Bureau of Land Management
Glenwood Springs Resource Area
P. O. Box 1009
Glenwood Springs, Colorado 81602
Telephone: 303-945-2341

Date by which Comments Must Be Received: February 2, 1983

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COMMENTS ON THE ENVIRONMENTAL IMPACT STATEMENT ARE REQUESTED FROM THE FOLLOWING AGENCIES AND INTEREST GROUPS:

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Associated Governments of Northwestern
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Planning Departments
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Other Organizations

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Aspen Board of Realtors
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Club 20
Colorado Association of Soil Conservation
Districts
Colorado Association of 4-Wheel Drive Clubs
Colorado Cattlemen's Association
Colorado Dude and Guest Ranch Association
Colorado Farm Bureau
Colorado Guides and Outfitters Association
Colorado Mining Association
Colorado Open Space Council
Colorado Wool Growers Association
Independent Petroleum Association of
Mountain States
League of Women Voters
National Audubon Society
Rocky Mountain Oil and Gas Association
Sierra Club
The Wilderness Society
Trout Unlimited
Upper Colorado Board of Realtors
Western Slope Snowmobile Club

NUMEROUS ORGANIZATIONS AND INDIVIDUALS EXPRESSING INTEREST HAVE BEEN SENT COPIES OF THIS ENVIRONMENTAL IMPACT STATEMENT AND ARE INVITED TO COMMENT.

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SUMMARY

ALTERNATIVES ADDRESSED

A total of four alternatives are examined in this environmental impact statement: Continuation of Current Management Alternative, Resource Protection Alternative, Economic Development Alternative, and Preferred Alternative. These alternatives represent four options for managing the resources in the Glenwood Springs Resource Area. The Continuation of Current Management Alternative is the No Action Alternative required by the Council on Environmental Quality. Under this alternative, the current level of management for each resource would be retained. It was used to measure proposed changes from the present situation.

The Resource Protection Alternative favors natural environmental settings. Fragile and unique resources would be protected and enhanced by managing those resources whose values are easily altered or scarce throughout the region.

The Economic Development Alternative emphasizes the resources most important to the local economy. Local and regional economies would benefit through management of those resources that generate or produce goods, services, employment, and income.

The Preferred Alternative represents BLM's favored management approach. It includes aspects of both Resource Protection and Economic Development Alternatives and would provide a rational and balanced approach to public land management.

CONTINUATION OF CURRENT MANAGEMENT

Existing water quality would be maintained throughout the resource area. Therefore, no active management is proposed to reduce water quality problems in known problem areas. Also, actions would not be taken to increase water yield or protect critical watershed areas in the resource area. Critical watershed areas include erosion hazard areas, municipal watersheds, and debris flow hazard zones. Stipulations would be placed on any proposed projects within these areas to help reduce adverse impacts.

All existing restrictions on mineral activity would continue. These restrictions include 96,042 acres closed to mineral location, 52,960 acres closed to oil and gas leasing, and 4,286 acres closed to mineral sales. In addition, 10,755 acres recommended

as preliminarily suitable for wilderness designation under this alternative would be closed to all forms of mineral entry. Portions of the Grand Hogback would be identified as suitable for further consideration for coal leasing.

With the exception of a few selected streams on the Naval Oil Shale Reserve, little active management would occur on the fisheries located on public land in the resource area.

Few wildlife habitat improvement projects would be undertaken. Forage allocations for wildlife would result in a long-term 12 percent decline in existing big game populations.

Livestock grazing use on public land initially would be reduced by 30 percent. Following completion of proposed vegetation manipulation projects to increase forage, livestock grazing use would be within 10 percent of existing use levels.

Approximately 1.75 million board feet of timber and 3,720 cords of fuelwood would be offered for sale annually in the resource area. Generally, these volumes would be harvested on slopes less than 40 percent and would include commercial species only.

Existing recreational facilities and areas would be managed and maintained at current levels. No efforts would be made to meet future demands for recreational use.

Except for measures required by law and policy, actions would not be taken to protect cultural resources.

Portions of three wilderness study areas (Bull Gulch, Hack Lake, and Eagle Mountain) totaling 10,755 acres would be identified as preliminarily suitable for wilderness designation.

Other than the establishment of visual resource management classes (defined in the Glossary), no special management would be taken to manage visual resources.

All land tenure adjustments and proposals for new utility and communication facilities would be processed on a case-by-case basis as received.

Sporadic maintenance of existing roads and trails would continue. New roads or trails would not be added to the public land transportation network. Except on 2 percent of the resource area recommended as suitable for wilderness, the entire resource area would be open to off-road vehicle use.

In most cases, all wildfires would be suppressed, and a program would not be developed to manage

SUMMARY

wildfire to help meet other resource program objectives.

RESOURCE PROTECTION ALTERNATIVE

Measures would be taken to improve water quality in four problem areas near Castle Peak if the source of the problem were found to be on public land. This could help reduce salinity and sedimentation problems in the upper Colorado and Eagle Rivers. Existing water quality would be maintained on public land outside these areas.

Measures would be taken to increase water yield *throughout the resource area on all suitable sites*. Additional water yield increases would be gained through cooperation with other resource programs such as livestock grazing and wildlife management. Expected increase in water yield would be approximately 6,200 acre-feet of water per year potentially increasing stream flows and reservoir water levels.

Special management actions would be taken to *reduce potential adverse impacts and maintain existing conditions* of critical watershed areas in the resource area. Critical watersheds include erosion hazard areas, municipal watersheds, and debris flow hazard zones.

In addition to existing mineral restrictions, several new mineral restrictions would be added to protect fragile and unique resources. These additional restrictions include 33,100 acres closed to mineral location, 38,958 acres closed to oil and gas leasing, and 36,706 acres closed to mineral sales. The same areas identified under the Continuation of Current Management Alternative as suitable for further consideration for coal leasing would also be identified under this alternative.

Most streams and lakes in below average condition would be actively managed on public land to improve habitat conditions. An active monitoring program also would be developed.

Projects such as vegetation manipulations, introduction of species, water developments, and improved access would be undertaken by the wildlife program. These actions would significantly benefit all species. Forage allocations for wildlife would result in a 20 percent big game population increase over existing populations, potentially increasing hunting opportunities and generating income for the resource area.

Because wildlife would take precedence over livestock, livestock grazing use initially would be reduced by 17 percent. After completion of vegetation manipulations proposed to increase forage,

however, livestock use would exceed existing grazing levels resource area wide by 50 percent.

In the forest management program, two annual harvest levels are proposed. Under harvest level 1 (slopes less than 40 percent and commercial species only), the allowable cut would be .7 million board feet of sawtimber and 2,650 cords of fuelwood. Under harvest level 2 (all slopes and all species), the allowable cut would be 4 million board feet of sawtimber and 4,330 cords of fuelwood.

Management and maintenance of existing recreational facilities and areas would continue. In addition, a limited number of new projects, designations, and facilities would be developed. Some of the areas identified for recreation management include Hack Lake, Bull Gulch, Thompson Creek, and Deep Creek. These additions would help accommodate existing recreational demand, reduce the pressure on existing recreational use facilities, and protect fragile and unique resource values from degradation associated with recreation overuse.

In addition to measures required by law, actions would be taken to protect identified high priority cultural sites. The Blue Hill Archaeological District would receive special emphasis.

All four wilderness study areas totalling 30,630 acres would be identified as preliminarily suitable for wilderness designation. These are Castle Peak, Bull Gulch, Hack Lake, and Eagle Mountain.

In addition to visual resource management class designations (defined in the Glossary), three high quality scenic areas—Thompson Creek, Deep Creek, and Bull Gulch—would be identified for special management.

Public land would be zoned for disposal and retention. Any adjustments to land tenure would have to be consistent with these zones. Identified for disposal are 9,555 acres of public land and, with the exception of big game crucial winter range, this land generally contains insignificant resource values.

Three zones would be identified to guide the development of utility and communication facilities: suitable for consideration, sensitive, and unsuitable. New proposals for utility and communication facilities would be approved or rejected consistent with these zones. These zones would guide the manager in making case-by-case decisions and would aid the utility companies in planning project proposals. Land identified as unsuitable for utilities totals 63,627 acres. Most of the unsuitable land contains fragile and unique resources and areas identified as preliminarily suitable for wilderness designation.

Three miles of new road and 15 miles of new trail would be available for public use through the

ALTERNATIVES ADDRESSED

acquisition of 36 new easements. These additions would provide legal access into new areas benefiting public use and resource management.

Off-road vehicle restrictions would exist on 28 percent of the resource area to protect fragile and unique values.

Wildfire would be managed by zoning the resource area into three categories—fire suppression zones, fire management zones, and fire exclusion zones. These zones support the objectives of other resource programs and vary among alternatives accordingly.

ECONOMIC DEVELOPMENT ALTERNATIVE

Measures would be taken to improve water quality in four problem areas near Castle Peak if the source of the problem were found to be on public land. This could help reduce salinity and sedimentation problems in the upper Colorado and Eagle Rivers. Existing water quality would be maintained on the remaining public land outside these areas.

Measures would be taken to increase water yield *throughout the resource area on all suitable sites*. Additional water yield increases would be gained through cooperation with other resource programs such as livestock grazing and wildlife management. Expected increase in water yield would be approximately 13,167 acre-feet of water per year potentially increasing stream flows and reservoir water levels.

Special management actions would be taken to *reduce potential adverse impacts and maintain existing conditions* of critical watershed areas in the resource area. Critical watersheds include erosion hazard areas, municipal watersheds, and debris flow hazard zones.

In addition to existing mineral restrictions, several new mineral restrictions would be added (fewer than Resource Protection Alternative) to protect fragile and unique resources. These additional restrictions include 13,225 acres closed to mineral location, 19,083 acres closed to oil and gas leasing, and 13,275 acres closed to mineral sales. The same areas identified in the Continuation of Current Management Alternative would be identified as suitable for further consideration for coal leasing.

Most streams and lakes on public land in the resource area presently rated below average would be actively managed to improve habitat conditions. New access would be acquired to enhance management and use opportunities. An active monitoring program also would be developed.

Wildlife habitat management projects such as vegetation manipulations, introductions of species, water developments, and riparian habitat improvements would benefit all wildlife species. Forage allocations for wildlife would result in a 1 percent increase in existing big game populations in the resource area.

Because livestock would take precedence over wildlife, livestock grazing use would be increased 2 percent above existing use. After completion of vegetation manipulation projects proposed to increase forage, livestock use would exceed existing grazing levels by 68 percent.

In the forest management program, two annual harvest levels are proposed: under harvest level 1 (slopes less than 40 percent and commercial species only) the allowable cut would be 1.7 million board feet of sawtimber and 3,695 cords of fuelwood. Under harvest level 2 (all slopes and all species), the allowable harvest would be 6.3 million board feet of sawtimber and 7,950 cords of fuelwood.

Management and maintenance of existing recreational facilities and areas would continue. In addition, many new projects and facilities would be developed to accommodate both existing and future recreational demands. Some of the new areas include Hack Lake, Bull Gulch, Castle Peak, and Deep Creek.

In addition to measures required by law to protect cultural resources, actions would be taken to protect identified high priority cultural sites. The Blue Hill Archaeological District would receive special emphasis.

Portions of three wilderness study areas totaling 10,750 acres would be identified as preliminarily suitable for wilderness designations. These are portions of Bull Gulch, Hack Lake, and Eagle Mountain.

In addition to visual resources management class designations (defined in the Glossary), three high quality scenic areas would be identified for special management. These are Deep Creek, Thompson Creek, and Bull Gulch.

Public land would be zoned for disposal and retention. Any adjustments to land tenure would have to be consistent with these zones. Identified for disposal are 37,550 acres of public land containing some significant resource values, especially big game crucial winter range.

Three zones would be identified to guide the development of utility and communication facilities: suitable for consideration, sensitive, and unsuitable. New proposals for utilities and communication facilities would be approved or rejected consistent with

SUMMARY

these zones. These zones would guide the manager in making case-by-case decisions and would aid the utility companies in planning projects proposals. Land identified as unsuitable for utilities totals 53,323 acres. Most of the unsuitable land contains areas of fragile and unique resources and areas identified as preliminarily suitable for wilderness designation.

Eighty three (83) miles of new road and 42 miles of new trail would be available for public use through the acquisition of 52 new easements. This would significantly benefit those resource programs relying on legal access for management.

Off-road vehicle restrictions would be placed on 21 percent of the resource area to protect fragile resource values. Two intensive use areas would be provided for concentrated recreational off-road vehicle use.

Wildfire would be managed by zoning the resource area into three categories—fire suppression zones, fire management zones, and fire exclusion zones. These zones support the objectives of other resource programs and vary among alternatives accordingly.

PREFERRED ALTERNATIVE

Measures would be taken to improve water quality in two problem areas near Castle Peak if the source of the problem were found to be on public land. This could reduce salinity and sedimentation problems in the Eagle River. Existing water quality would be maintained on all public land outside these areas.

Measures would be taken to increase water yield throughout the resource area on suitable aspen sites. Additional water yield increases would be gained through cooperation with other resource programs such as livestock grazing and wildlife management. Expected increase in water yield would be approximately 5,748 acre-feet of water per year potentially increasing stream flows and reservoir water levels.

Special management actions would be taken to reduce potential adverse impacts and maintain existing conditions of critical watershed areas in the resource area. Critical watersheds include erosion hazard areas, municipal watersheds, and debris flow hazard zones.

In addition to existing mineral restrictions, new mineral restrictions would be added (fewest additions) to protect fragile and unique resources. These additional restrictions include 2,810 acres closed to mineral location, 2,810 acres closed to oil

and gas leasing, and 7,266 acres closed to mineral sales. The same areas identified under the other alternatives as suitable for further consideration for coal leasing would also be identified under this alternative.

Only a selected number of priority streams and lakes would be actively managed to improve habitat conditions. An active monitoring program would be established to determine conditions and trends on all other waters on public land.

Wildlife habitat improvement projects such as vegetation manipulations, water developments, and introductions of species would benefit all wildlife species. Forage allocations for wildlife would result in a 7 percent decline in existing big game populations in the resource area. This could have a moderate adverse impact on hunting opportunities in the resource area.

Because livestock and wildlife would be given equal importance, initial livestock grazing use would be increased 3 percent above existing levels. After completion of vegetation manipulations proposed to increase forage, livestock use would exceed existing grazing levels by 37 percent.

Approximately 1.8 million board feet of sawtimber and 3,720 cords of fuelwood would be offered for sale annually in the resource area. Generally, these volumes would be harvested on slopes less than 40 percent and would include commercial species only.

Management and maintenance of existing recreational facilities and areas would continue. In addition, many new projects and facilities would be developed. New facilities would help accommodate existing and future recreational use demands. Management would be focused on high use areas especially in areas with fragile and unique resource values. Some of the areas on which management would be focused include the upper Colorado River, Deep Creek, Hack Lake, Bull Gulch, and Castle Peak. No additional special designations would be proposed.

In addition to measures required by law to protect cultural resources, identified high priority cultural sites would receive special management and protection. The Blue Hill Archaeological District would receive special emphasis.

Portions of two wilderness study areas totalling 340 acres would be identified as preliminarily suitable for wilderness designations. These are Hack Lake and Eagle Mountain, both adjacent to existing U. S. Forest Service Wilderness Areas.

In addition to visual resource management class designations, two high quality scenic areas would

ALTERNATIVES ADDRESSED

be identified for special management. These are Deep Creek and Bull Gulch.

Public land would be zoned for disposal and retention. Any adjustments to land tenure would have to be consistent with these zones. Identified for disposal are 23,245 acres of public land containing some significant resource values, especially big game crucial winter range. However, those lands with highest values would be exchanged rather than sold.

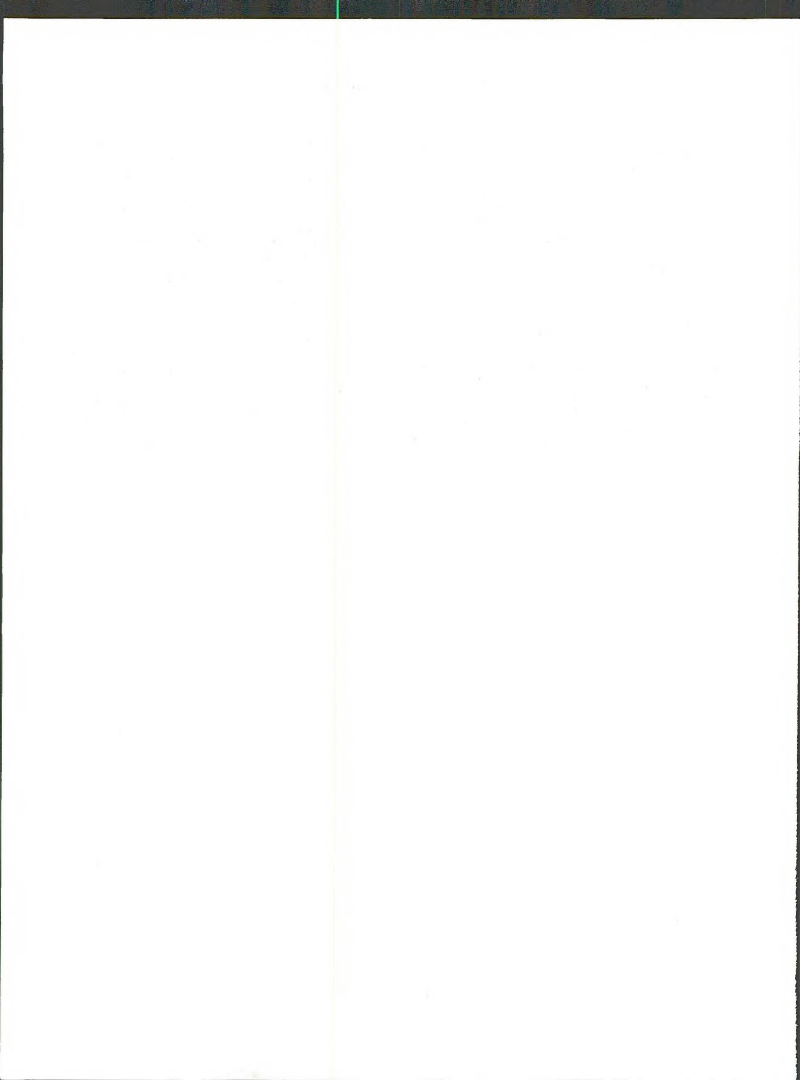
Three zones would be identified to guide the development of utility and communication facilities: suitable for consideration, sensitive and unsuitable. New proposals for utilities and communications facilities would be approved or rejected consistent with these zones. These zones would guide the manager in making case-by-case decisions and would aid the utility companies in planning project proposals. Land identified as unsuitable for utilities

totals 22,673 acres. This includes fragile and unique areas and land identified as preliminarily suitable for wilderness designations.

Forty-three (43) miles of new road and 40 miles of new trail would be available for public use through the acquisition of 50 new easements. This would significantly benefit those resource programs relying on legal access from management.

Off-road vehicle restrictions would be placed on 30 percent of the resource area to protect fragile and unique resource values. One intensive use area would be provided for concentrated recreational off-road vehicle use.

Wildfire would be managed by zoning the resource area into three categories—fire suppression zones, fire management zones, and fire exclusion zones. These zones support the objectives of other resource programs and vary among alternatives accordingly.



CHAPTER I

INTRODUCTION

As required by the Federal Land Policy and Management Act of 1976 and Bureau of Land Management (BLM) planning regulations 43 CFR Part 1600, *Public Lands and Resources; Planning, Programming, and Budgeting*, the BLM Glenwood Springs Resource Area is preparing a plan to update its management directions on public land resources. The plan will guide the resource management of approximately 566,000 acres of public land in the Glenwood Springs Resource Area, Grand Junction District (Fig. 1-1).

This draft environmental impact statement is intended to aid the decision makers in selecting an appropriate land use plan for the resource area. It is also intended to satisfy the Council on Environmental Quality regulations 40 CFR Part 1500, *Regulations for Implementing the National Environmental Policy Act of 1976*. Council on Environmental Quality regulations state "National Environmental Policy Act procedures must ensure that environmental information is available to public officials and citizens before decisions are made and before actions are taken."

Four alternatives for managing the public land resources are described and analyzed in this document. The alternatives concentrate on significant issues that need to be answered such as "which public land should BLM manage for forage production" and "which public land should be recommended to Congress as suitable for designation as wilderness." The alternatives offer differing choices for resolving the issues.

PURPOSE AND NEED

A resource management plan is needed to guide the management of the resources. Through the resource management plan, the BLM will be able to more effectively manage—

- Air Resources
- Water Quality
- Water Yield
- Critical Watershed Areas
- Minerals
- Aquatic Habitat
- Terrestrial Habitat

- Livestock Grazing
- Forest Land
- Recreation Resources
- Cultural Resources
- Wilderness
- Visual Resources
- Land Tenure Adjustments
- Transportation
- Utility and Communication Facilities, and
- Fire

This environmental impact statement will reduce the number of environmental impact statements prepared by the BLM. Whereas, in the past, a separate environmental impact statement was prepared to analyze the impacts of each major resource program such as livestock grazing or forest management, this environmental impact statement analyzes the impacts of managing all the resources as one action.

THE PLANNING PROCESS

The planning process described in BLM planning regulations 43 CFR part 1600, consists of nine action steps: (1) Inventory and Data Collection; (2) Identification of Issues; (3) Development of Planning Criteria; (4) Management Situation Analysis; (5) Alternative Formulation; (6) Assessment of Alternatives; (7) Selection of Preferred Alternative; (8) Selection of Resource Management Plan; and (9) Monitoring and Evaluation.

The first seven action steps have been completed and are summarized below. Detailed documentation of these steps is available for review in the Glenwood Springs Resource Area office.

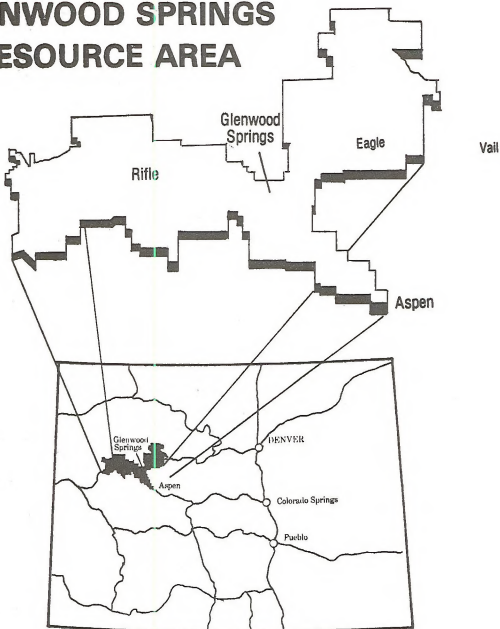
STEP 1. INVENTORY

During 1978-80, the public land resources were inventoried to establish a data base for use in the analysis of later steps. Chapter 4 of this draft envi-

INTRODUCTION

**FIGURE 1-1
LOCATION MAP**

**GLENWOOD SPRINGS
RESOURCE AREA**



COLORADO

PURPOSE AND NEED

ronmental impact statement describes the various resources that were inventoried.

STEP 2. IDENTIFICATION OF ISSUES

The general public, other federal agencies, and state and local governments were asked to identify public land management issues in the resource area. In addition, BLM identified management concerns that were not identified by these groups. This step determined the scope of the plan by determining the significant issues to be addressed. The issues are presented in Chapter 2 in the form of planning questions.

STEP 3. DEVELOPMENT OF PLANNING CRITERIA

Planning criteria were developed to identify the considerations and constraints that would be applied to the analysis throughout the planning process. For example, the criteria developed which apply to the issue, "Which public land is suitable for livestock grazing?" include (a) distance from water; (b) excessive slope or other physical barriers; (c) forage production; and (d) current and potential erosion. Planning criteria developed for each resource are available for review in the Glenwood Springs Resource Area Office.

STEP 4. MANAGEMENT SITUATION ANALYSIS

This step describes the capability of the resources to respond to the identified issues and concerns. It describes the resources that would be affected, explains how the resources are currently being managed, and lists possible options for managing the resources. The Management Situation Analysis was used in developing the Alternatives (Chap. 3) and the Affected Environment (Chap. 4).

STEP 5. ALTERNATIVE FORMULATION

Management options analyzed in step 4 were used to formulate the alternatives in this step. Several initial alternatives were considered but only three alternatives were finally selected. Alternatives not carried forward are listed at the end of Chapter 3 (Alternatives Considered but Eliminated from Detailed Study).

STEP 6. ASSESSMENT OF ALTERNATIVES

The physical, biological, economic, and social effects of implementing each alternative were analyzed. This step is the environmental analysis required by the National Environmental Policy Act and is presented in Chapter 5.

STEP 7. SELECTION OF PREFERRED ALTERNATIVE

The Preferred Alternative presented in Chapter 3 was formulated based on (1) issues identified through the process; (2) public and other agency input received at public meetings, workshops, and through newsletters; (3) formal coordination and consultation with other agencies; (4) decision criteria developed and considered by management; and (5) analysis of the impacts associated with the specific recommendations in each of the three previously-formulated alternatives. The Preferred Alternative is the fourth alternative. It was also analyzed for environmental impacts as described in step 6.

STEP 8. SELECTION OF RESOURCE MANAGEMENT PLAN

The eighth step is the plan selection approval process. It will be completed after publication of the final environmental impact statement. Figure 1-2 shows the procedures that will be followed in selecting the resource management plan.

STEP 9. MONITORING AND EVALUATION

The plan will be implemented according to an implementation schedule included in the Record of Decision and Final Resource Management Plan. The implementation schedule will be subject to adjustment because of possible funding constraints. If additional detailed information is needed for implementation, smaller site-specific plans will be written. The effects of implementation will then be monitored and evaluated. Standards will be developed to determine whether or not mitigation measures are satisfactory, assumptions used in analysis of impacts were correct, and whether significant changes in related federal, state, or local land use

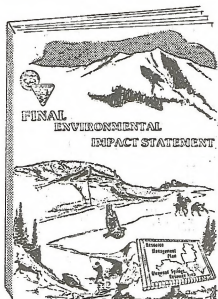
INTRODUCTION

FIGURE 1-2

STEP 8, SELECTION OF RESOURCE MANAGEMENT PLAN

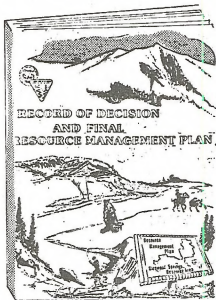
CONSIDER COMMENTS
ON DRAFT EIS

PREPARE FINAL EIS ON THE
PROPOSED RESOURCE
MANAGEMENT PLAN



PUBLISH RECORD OF DECISION
CONTAINING RESOURCE
MANAGEMENT PLAN

EVALUATE COMMENTS ON
FINAL EIS AND DECIDE ON
THE FINAL RESOURCE
MANAGEMENT PLAN



INTERRELATIONSHIPS WITH OTHER PROGRAMS

plans have been made. Monitoring and evaluation reports will be available for public review.

to the MMS concerning all surface-disturbing activities on lease areas.

INTERRELATIONSHIPS WITH OTHER PROGRAMS

BLM's programs and proposals are closely related to those of other agencies and individuals. These interrelationships are discussed below.

U. S. Department of Energy (DOE)

The Department of Energy administers the land on the Naval Oil Shale Reserve and provides some funding for management. BLM has surface management authority on the Naval Oil Shale Reserve and must coordinate all activities with the DOE.

FEDERAL

U. S. Geological Survey (USGS)

U. S. Soil Conservation Service (SCS)

The Soil Conservation Service coordinates and assists BLM on soil surveys, range site descriptions, stocking rates, vegetation surveys, and erosion and debris flow control measures.

The Geological Survey provides accurate maps that show the slope of land surface, the location of man-made features, and present land use. They also provide information on the composition and structure of rocks used in prospecting for minerals and fuels, designing engineering and construction works, and identifying natural hazards such as earthquakes and landslides. USGS provides data on surface and ground water supplies, water quality, and floods; knowledge of earth history and natural processes; appraisals of the Nation's energy and mineral resources; and classification of federal land for minerals and water power.

U. S. Fish and Wildlife Service (FWS)

The Fish and Wildlife Service coordinates and assists BLM on threatened and endangered species, habitat data, and inventory data exchange.

U. S. Army Corps of Engineers

U. S. Forest Service (USFS)

The U. S. Forest Service coordinates and assists BLM on adjoining allotments for management actions such as range readiness, prescribed burns, fire preparedness, and fire management zones. They also coordinate on access, fuelwood, Christmas tree, and timber sales. There is an interagency agreement to coordinate transportation planning, road use, and road maintenance.

The Corps of Engineers conducts floodplain mapping and issues 404 permits on projects in the area.

U. S. Bureau of Reclamation (BOR)

The Bureau of Reclamation provides coordination and assistance on salinity control measures.

U. S. Office of Surface Mining (OSM)

The Office of Surface Mining recommends approval or disapproval of coal mining and reclamation plans to the Assistant Secretary of Energy and Minerals. The BLM must concur with OSM's recommendations.

U. S. Federal Highway Administration (FHWA)

The highway administration provides coordination and assistance on transportation planning, easement acquisition, and construction. The FHWA also coordinates State Highway Department projects with the BLM.

U. S. Minerals Management Service (MMS)

The Minerals Management Service is responsible for supervision of oil, gas, and mineral leases, exclusive of coal operations, on federal land. The BLM provides recommendations and concurrence

STATE

Colorado Department of Natural Resources

The Department of Natural Resources through the *State Natural Heritage Inventory* provides as-

INTRODUCTION

sistance and information on threatened, endangered, and sensitive plant and animal species.

Colorado Division of Parks and Recreation

The Colorado Division of Parks and Recreation coordinates and assists BLM in the management of recreation in the resource area, especially along the upper Colorado River. They may become actively involved in the implementation of some site-specific proposals selected in the final plan.

Colorado Division of Wildlife (DOW)

The Colorado Division of Wildlife provides coordination, assistance, and information on wildlife populations project planning, funding, and project implementation. They also coordinate on sediment control measures in Milk and Alkali Creek drainages.

Colorado Mined Land Reclamation Board

The Mined Land Reclamation Board approves mining permits and licenses and mining and reclamation plans. BLM coordinates with the board and provides information about public land.

Colorado State Historic Preservation Office

The State Historic Preservation Office provides coordination, assistance, and information on determination of eligibility and cultural resource planning and examinations.

Colorado Department of Highways

The Department of Highways coordinates its projects with BLM when necessary.

Colorado Water Quality Control Commission

The Commission establishes water quality classifications on all stream segments for enforcement of PL 92-500, Federal Water Pollution Control Act of 1972.

Colorado Division of Water Resources

The Division of Water Resources is the agency which BLM applies to for water rights.

Northwest Colorado Council of Governments (NWCOGS) and Western Colorado Council of Governments (WCOGS)

The Colorado Council of Governments, an organization which represents cities and counties in management and planning, was consulted and provided input and coordination when needed.

Colorado Department of Local Affairs, Division of Planning

The Department of Local Affairs, Division of Planning, provided coordination and consultation on population projections and projection methodology.

Colorado State Forest Service

The Colorado State Forest Service coordinates and assists BLM and private forest land owners on cooperative timber and fuelwood sales. They also consult on prescribed burning implementation and fire management.

COUNTIES, CITIES, AND TOWNS

Counties

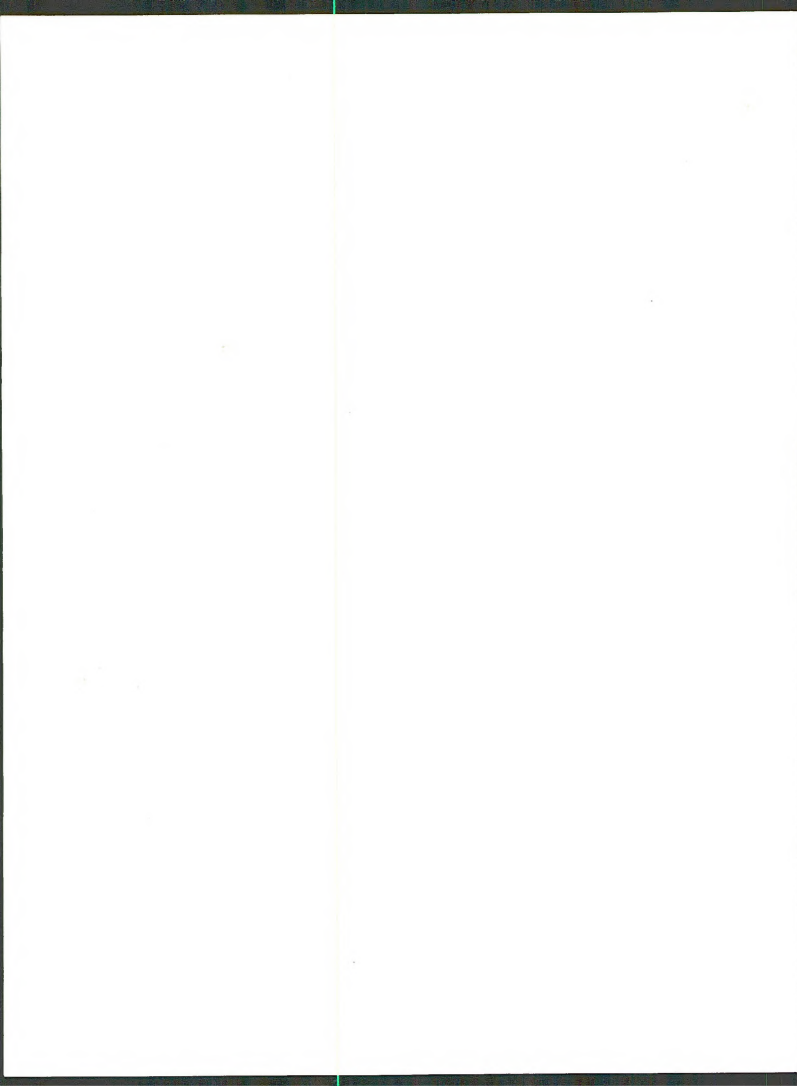
Portions of Garfield, Pitkin, Eagle, Mesa, and Routt Counties are included in the Glenwood Springs Resource Area. The Commissioners and various departments in Garfield, Pitkin, and Eagle Counties were consulted during the land use planning process. They provided input and coordination on planning policies, land tenure adjustments, transportation planning, fire and sediment control, rights-of-way, and other activities discussed in the plan. This environmental impact statement and the Preferred Alternative is compatible with their concerns.

Cities and Towns

The cities and towns of Parachute, Battlement Mesa, Rifle, Silt, New Castle, Glenwood Springs, Carbondale, Basalt, Snowmass, Aspen, Gypsum, and Eagle are within the Glenwood Springs Resource Area. Various town officials from these communities and others were consulted during the land use planning process. They provided input and coordination on planning policies, utility and communication facilities, land tenure adjustments, transportation planning, fire and sediment control, and other activities discussed in the plan. This environmental

INTERRELATIONSHIPS WITH OTHER PROGRAMS

Impact statement and the Preferred Alternative is compatible with their concerns.



CHAPTER 2

ISSUES AND PLANNING CRITERIA

ISSUES

At the beginning of the planning process, BLM, the general public, other federal agencies, and state and local governments identified issues and management concerns in the resource area (see Chap. 6, Consultation and Coordination). The issues were then screened to determine which issues would or would not be considered in the resource management plan.

Issues that would not be resolved in the resource management plan were documented and are on file in the Glenwood Springs Resource Area office. These issues were partially or totally administrative in nature or were outside the BLM's jurisdiction.

As an example, "Garbage on public land is degrading the visual resource." The resolution of this issue involves an administrative decision and the necessary budget to send someone out to clean up garbage. It does not involve a land use decision but only a commitment of manpower.

Another example, "Oil shale should be leased on the Naval Oil Shale Reserve near Rifle." The Department of Energy has the responsibility for leasing oil shale in this area.

Issues that would be resolved in the resource management plan were identified throughout the planning process and were used to determine the topics to be covered in the alternatives and to key in on the important decisions that needed to be made. These issues are listed below in the form of planning questions. Planning questions usually encompass several similar individual issues written in a form suitable for addressing in the plan. Each issue is followed by a reference (in parenthesis) indicating where the issue is addressed and on what map(s), if appropriate, the information is displayed. The maps are included in the map addendum that accompanies this environmental impact statement.

AIR QUALITY MANAGEMENT

How will the Clean Air Act, air quality classifications, and other federal and state legislation affect development on public land and adjacent private land? (Chap. 5)

WATER YIELD MANAGEMENT

Which public land should the BLM manage to maintain or enhance water yield? (Chap. 3 and Maps 3-2, 3-3, and 3-4)

WATER QUALITY MANAGEMENT

Which public land should the BLM manage to maintain or enhance water quality? (Chap. 3 and Map 3-1)

CRITICAL WATERSHED AREAS

1. Which public land should be managed to protect critical watershed values? (Chap. 3 and Map 3-5)
2. On what public land should the BLM appropriate water for public land management purposes? (Chap. 3)

MINERALS MANAGEMENT

1. Which public land should remain open to mineral exploration and development? (Chap. 3 and Maps 3-6, 3-7, 3-8, and 3-9)
2. Which lands containing federally-administered coal should be considered suitable for coal leasing and development? (Chap. 3 and Map 3-9)

AQUATIC HABITAT MANAGEMENT

1. Where should BLM manage fisheries habitat on public land? (Chap 3 and Map 3-10)
2. On what public land should the BLM appropriate water for public land management purposes? (Chap. 3)

ISSUES AND PLANNING CRITERIA

TERRESTRIAL HABITAT MANAGEMENT

1. Which public land should be maintained for wildlife use and where should private land acquisitions be made? (Chap. 3 and Maps 3-11, 3-12, and 3-13)
2. What levels of management intensity are appropriate, and what management practices are suitable for each level? (Chap. 3, Maps 3-11, 3-12, and 3-13, and Appendix A)
3. On what public land should the BLM appropriate water for public land management purposes? (Chap. 3 and Maps 3-11, 3-12, and 3-13)
2. What types of facilities and services should be provided to maintain suitable recreational opportunities to accommodate present and future use on public land? (Chap. 3 and Maps 3-23, 3-24, 3-25, and 3-26)
3. How should resource values be allocated and managed to provide and maintain suitable recreational opportunities on public land? (Chap. 3 and Maps 3-19, 3-20, 3-21, 3-22, 3-23, 3-24, 3-25, and 3-26)
4. Which natural and cultural features should be managed for recreational, scientific, and educational purposes? (Chap. 3 and Maps 3-23, 3-24, 3-25, and 3-26)
5. On what public land should the BLM appropriate water for public land management purposes? (Chap. 3)

LIVESTOCK GRAZING MANAGEMENT

1. Which public land should BLM manage for livestock forage production? (Chap. 3 and Map 3-14)
2. What level of management intensity should be practiced on public land managed for livestock forage production, and what management practices are involved in each level? (Chap. 3 and Appendix A)
3. On what public land should the BLM appropriate water for public land management purposes? (Chap. 3)

SOCIAL AND ECONOMIC CONDITIONS

1. What significant social and economic impacts can be expected to result from public land and resource management decisions, and what is the capacity of local institutions, traditions, communities, and people to absorb these impacts? (Chap. 5)
2. What social and economic needs of communities in the resource area could be addressed by BLM? (Chap. 3, especially Land Tenure Management and Critical Watershed Areas sections)

FOREST MANAGEMENT

1. Which public land should BLM manage for productive forest land and woodland? (Chap. 3 and Maps 3-15, 3-16, 3-17, and 3-18)
2. What techniques should be used to harvest forest products? (Appendix A)
3. What level of harvest should be allowed to sustain timber production? (Chap. 3)

CULTURAL RESOURCE MANAGEMENT

1. What is the value of each cultural resource, and how should these resources be protected? (Chap. 3)
2. Which public land should receive special designation, and which designation is most appropriate? (Chap. 3)
3. What can be done to prevent loss of cultural resources? (Chap. 3)

RECREATION RESOURCE MANAGEMENT

1. What types and levels of management should be required to provide suitable recreational opportunities on public land while protecting environmental quality and eliminating conflicts with adjacent landowners? (Chap. 3 and Maps 3-19, 3-20, 3-21, 3-22, 3-23, 3-24, 3-25, and 3-26)

WILDERNESS MANAGEMENT

1. Which public land should be recommended to Congress as suitable for designation as wilderness? (Chap. 3 and Map 3-27)

PLANNING CRITERIA

VISUAL RESOURCE MANAGEMENT

What type or level of management should be used to maintain or enhance the visual quality of public land consistent with multiple-use management objectives? (Chap. 3 and Maps 3-29, 3-30, 3-31)

LAND TENURE ADJUSTMENTS

Which public land should be classified for disposal and retention? (Chap. 3 and Maps 3-32, 3-33, 3-34)

TRANSPORTATION MANAGEMENT

1. Where is legal access to public land necessary or desirable? (Chap. 3 and Maps 3-38, 3-39, 3-40, and 3-41)
2. Which public land should be designated open, closed, or limited to off-road vehicle use? (Chap. 3 and Maps 3-35, 3-36, and 3-37)

UTILITY AND COMMUNICATION FACILITY MANAGEMENT

Which public land should be identified as suitable for utility and communication facility development? (Chap. 3 and Maps 3-42, 3-43, and 3-44)

FIRE MANAGEMENT

1. Which public land should be managed to reduce fire hazards? (Chap. 3 and Maps 3-45, 3-46, and 3-47)

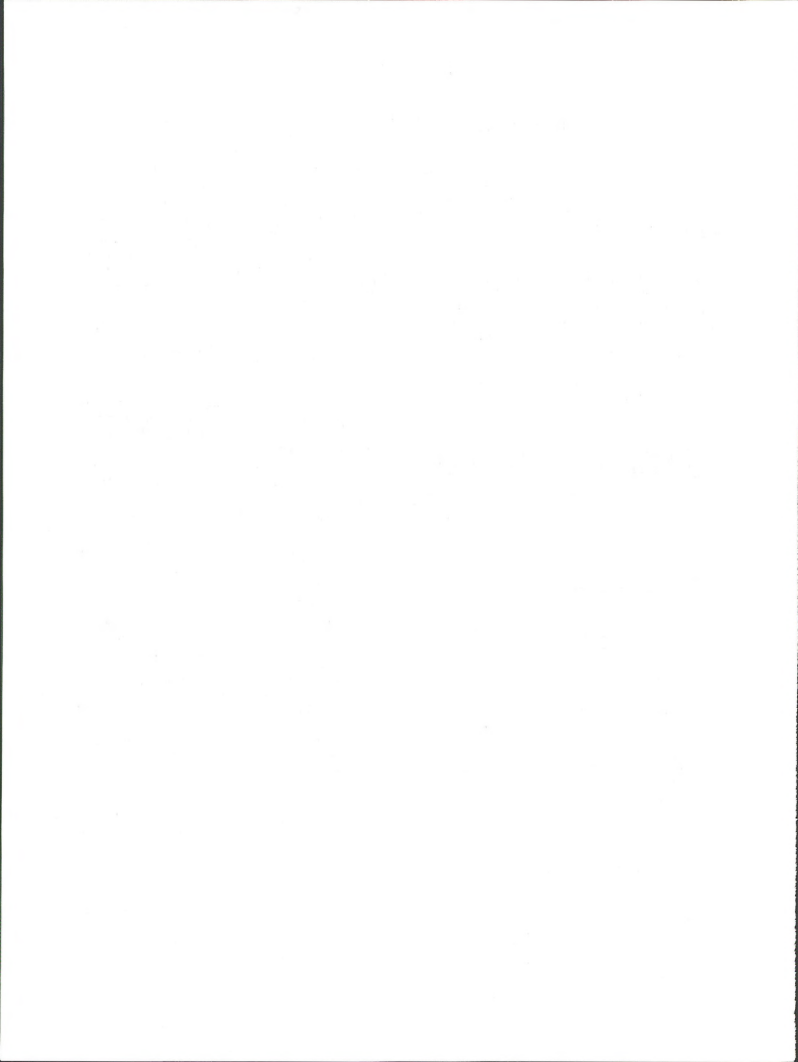
2. Which public land would benefit from fire when used as a management tool? (Chap. 3, especially Livestock Grazing, Terrestrial Habitat, and Water Yield Management sections, and Maps 3-45, 3-46, and 3-47)
3. How will controlled burning practices be implemented to minimize air quality impacts from resulting particulates? (Appendix B)

PLANNING CRITERIA

Planning criteria were developed to aid in the formulation of the resource management plan alternatives and in the environmental analysis process. More specifically, planning criteria (1) aided in the compilation and analysis of inventory data; (2) helped determine the level of detail and scope of the analysis of the recommendations; (3) identified specific laws, policies, and regulations limiting the types of recommendations appropriate for the plan; and (4) provided a logical thought process for developing the plan alternatives. Planning criteria are based on—

1. National, regional, and local laws and regulations;
2. Multiple-use and sustained yield principles set forth in the *Federal Land Policy and Management Act*;
3. BLM national and state director guidance;
4. Results of public participation and coordination with other federal, state, and local agencies;
5. Analysis of data and information needs; and
6. A systematic interdisciplinary approach to achieve integrated considerations of physical, biological, economic, social, and environmental conditions.

The complete set of planning criteria are available for review in the Glenwood Springs Resource Area office.



CHAPTER 3

ALTERNATIVES

INTRODUCTION

Chapter 3 describes in detail the alternatives considered in this environmental impact statement. It is divided into seven major sections: (1) General Criteria Used in Formulating the Alternatives, (2) Capability Units, (3) Management Philosophy, (4) Descriptions of the Alternatives, (5) How the Preferred Alternative Was Selected, (6) Comparative Analyses, and (7) Alternatives Considered but Eliminated from Detailed Analysis.

GENERAL CRITERIA USED TO FORMULATE ALTERNATIVES

All alternatives meet the following general criteria.

1. All alternatives are realistic and could be implemented.
2. All alternatives consider other agencies' plans and policies.
3. All alternatives reflect the sustained-use principle for renewable resources.
4. Each alternative provides a set of answers to the issues identified (see Chapter 2, Issues and Planning Criteria).
5. All alternatives were developed using the planning criteria developed for each resource (see Chapter 2, Issues and Planning Criteria).
6. All alternatives address areas of critical environmental concern.
7. All alternatives comply with existing laws and BLM policies and regulations.

CAPABILITY UNITS

To aid in the analysis of each alternative, the resource area has been divided into five geographical subdivisions. These geographical subdivisions are called capability units. Each unit has a distinct character defined by differences in geography, climate, ecology, political views, attitudes, values, and exist-

ing land uses. These subdivisions have been used throughout the document to display resource information and analysis findings. Figure 3-1 shows the capability unit boundaries. Capability unit boundaries are also outlined in gray on the alternative maps in the map addendum.

MANAGEMENT PHILOSOPHY

The management philosophy section describes by alternative the major emphasis or themes of each alternative. It provides an overview of the management direction for each alternative.

These themes will be used by the land manager in determining whether or not a new proposal not considered in the plan is consistent or inconsistent with the general management philosophy of the chosen alternative. However, the final determination of consistency with new proposals can be made only by comparing the site-specific outside proposal to the site-specific proposals in the chosen plan.

The following is a description of the resource programs that are emphasized in each alternative. All resource programs are addressed in each alternative, and the specific actions are explained in the Descriptions of the Alternatives. Only those programs that are emphasized in each alternative are addressed here.

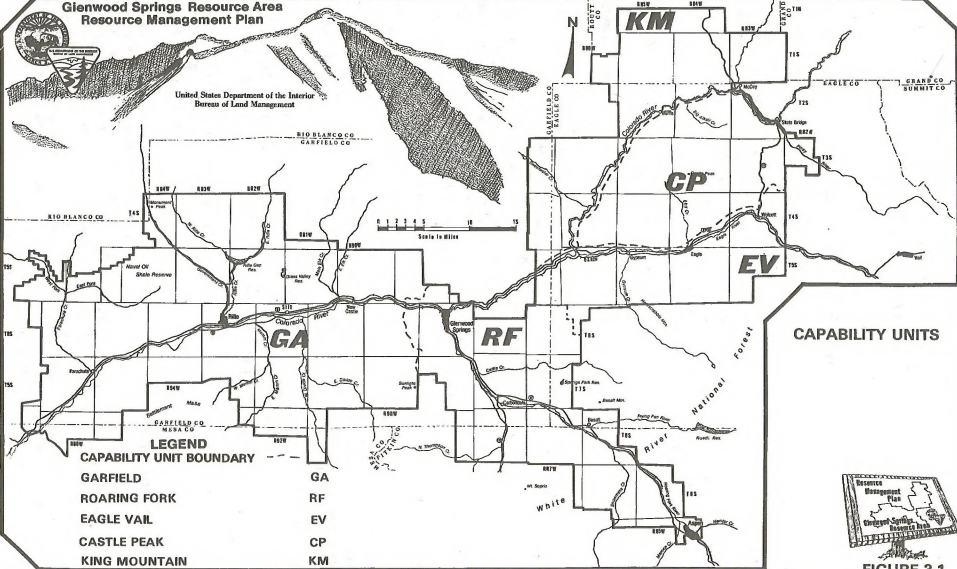
CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE

The Continuation of Current Management Alternative would manage resources at current levels. Any new proposals would have to be consistent with these levels.

Livestock grazing would continue resource area wide. Recreation management would be centered around floatboating on the upper Colorado River from State Bridge to Dotsero. Energy development, mainly oil and gas, would continue especially in the Garfield County area west of Glenwood Springs. Fisheries management to protect the Colorado River cutthroat trout would occur on the Naval Oil Shale Reserve. Protection of visual quality would

**Glenwood Springs Resource Area
Resource Management Plan**

United States Department of the Interior
Bureau of Land Management



CAPABILITY UNITS

- LEGEND**
- CAPABILITY UNIT BOUNDARY
 - GA GARFIELD
 - RF ROARING FORK
 - EV EAGLE VAIL
 - CP CASTLE PEAK
 - KM KING MOUNTAIN



FIGURE 3-1

ALTERNATIVES

DESCRIPTIONS OF THE ALTERNATIVES

be a high priority along the Interstate 70 and Highway 82 corridors and in the Castle Peak area. Forest management would be focused in the upper part of Eagle County on Black and King Mountains. The remainder of the resource area would be managed to protect fragile resources where possible, but overall management intensity in these areas would be low.

RESOURCE PROTECTION ALTERNATIVE

The Resource Protection Alternative emphasizes the management of fragile and unique resource values. New proposals would be allowed only if their management actions would not degrade these resource values protected under this alternative.

Water quality management would focus on four watersheds in the Castle Peak area. The Blue Hill Archaeological District near King Mountain would be managed to protect the cultural resources present there. Critical watersheds near Glenwood Springs, Rifle, and New Castle, in addition to erosion hazard areas scattered throughout the resource area, would be protected. Wildlife habitat would be intensively managed resource area wide. Numerous streams throughout the planning area would be improved for aquatic habitat. Visual resources would be given special emphasis resource area wide with special attention focused on the Interstate 70 and Highway 82 travel corridors. All wilderness study areas would be proposed as preliminarily suitable for wilderness designation, and recreation management would focus on the protection of fragile and unique recreation resources, especially in high use areas.

ECONOMIC DEVELOPMENT ALTERNATIVE

The Economic Development Alternative emphasizes the management of those resources contributing to the economic well-being of this resource area. New proposals not considered in the plan would be allowed only if they would not overly restrict other resources' abilities to produce economic goods or services.

Livestock grazing would be increased resource area wide on those allotments with potential for increases. Mineral development restrictions would be minimal, encouraging future development. Water yield increases would be accomplished through vegetation treatments resource area wide. Recreation would be managed to accommodate existing

and future recreation use demands and forest land would be managed to achieve maximum annual allowable harvest levels.

PREFERRED ALTERNATIVE

The Preferred Alternative emphasizes a balanced approach to land management in the resource area. Fragile and unique resources would be protected while not overly restricting other resources' abilities to produce economic goods and services. New proposals would be allowed only if they would not conflict with a particular management emphasis in the area of the proposal.

Livestock grazing and wildlife habitat would be managed resource area wide. Water yield management would occur only on aspen sites throughout the resource area. Critical watersheds near Glenwood Springs, Rifle, and New Castle and erosion hazard zones scattered throughout the resource area would receive special protection. Visual resources would be emphasized resource area wide, especially along the Interstate 70 and Highway 82 travel corridors. Mineral development would be emphasized in Garfield County west of Glenwood Springs. Forestry would be managed resource area wide at near current levels, and recreation would be focused on the upper Colorado River for float-boating and on high use areas to minimize resource degradation.

DESCRIPTIONS OF THE ALTERNATIVES

This section describes in detail the management actions that would be taken and the major impacts associated with those actions under each alternative. Abbreviations used in tables are as follows: CCMA—Continuation of Current Management Alternative, RPA—Resource Protection Alternative, EDA—Economic Development Alternative, and PA—Preferred Alternative.

Throughout this chapter you will find references to maps. These maps have been compiled in a separate map addendum that accompanies this document. Proposed management actions by resource are shown on individual maps in the map addendum. Proposed management actions by alternative are also included in a map packet in the back of the map addendum.

Standard operating procedures and project design features were developed by specific re-

ALTERNATIVES

sources to reduce impacts of proposed actions. These procedures and features are part of the alternatives and are required upon plan implementation. They are listed in Appendix B.

AIR QUALITY MANAGEMENT

Objectives, Proposed Management Actions, Support, Implementation, Consistency, and Effects would be the same under all alternatives.

Objective

To maintain existing air quality in the resource area.

Proposed Management Actions

Existing air quality would be monitored to establish a baseline from which to measure air quality changes associated with BLM or other agency proposals. Proposed projects would comply with all applicable local, state, and federal regulations to limit air quality degradation.

Support

Technical support would be required from air quality specialists in the Colorado State Department of Health, Region VIII; BLM Colorado State Office; and the U. S. Forest Service, Region II.

Implementation

Site-specific project plans for proposals affecting BLM and adjacent lands would be reviewed for compliance with existing laws and policies protecting these areas. Mitigation would be incorporated into project proposals to reduce air quality degradation. BLM personnel would coordinate with other state and federal agencies to develop a regional air quality monitoring program.

Consistency

These procedures are consistent with Colorado Department of Health Air Pollution Control Division and U. S. Environmental Protection Agency Region VIII, goals for air quality management.

Effects

Existing air quality in the resource area would be maintained.

WATER QUALITY MANAGEMENT

The resource area lies within two 208 planning regions. The Pitkin, Eagle, and Routt County portions lie within the Northwest Colorado Council of Governments' 208 region; the others fall within the Western Colorado Council of Governments' 208 region. BLM intends to comply with water quality guidelines developed in these 208 plans.

Objectives

Continuation of Current Management Alternative. To *maintain existing* water quality in the resource area.

Resource Protection, Economic Development, and Preferred Alternatives. To *maintain or improve existing* water quality in the resource area.

Proposed Management Actions

Under the Continuation of Current Management Alternative, actions to maintain water quality or reduce water quality degradation would be included in proposals where feasible.

Under the Resource Protection and Economic Development Alternatives **four areas** shown on Map 3-1 would be monitored to identify the origins of existing water quality problems. Under the Preferred Alternative, **two areas, Milk and Alkali Creek Basins**, shown on Map 3-1 would be investigated to identify the origins of existing water quality problems. Actions would be taken to improve the problems originating on public land using management techniques listed in Appendix A.

Remaining public land outside the water quality management areas would be managed to maintain or improve water quality through other programs.

Support

Under all alternatives, engineering support would be required in design and construction of proposals for protection of water quality. Erosion control structures would require, at a minimum, the filing of a permit with the Colorado State Engineer. Water rights would be required for perennial streams, on

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reservoirs over 10 acre-feet in size, or on dams taller than 15 feet.

Implementation

Under the Continuation of Current Management Alternative, proposed projects such as vegetation manipulations, timber sales, and range improvements would be designed to minimize water quality degradation. Site-specific analyses of sediment yield and other water quality parameters would be conducted for projects with potential for large-scale water quality impacts. Proposed fishery projects such as instream structures would be designed to improve or maintain existing water quality.

Under the Resource Protection, Economic Development, and Preferred Alternatives. Site plans to improve water quality would be prepared for water quality problem areas. Measures to maintain or improve water quality in other areas would be included in other resource program project designs wherever feasible.

Site-specific analyses of sediment yield and other water quality parameters would be conducted for projects with potential for large-scale water quality impacts.

Consistency

In the short term, under Resource Protection and Economic Development Alternatives, increases in sediment yield could possibly exceed allowable departure levels established in the Northwest Colorado Council of Governments' 208 plan. These increases would occur during implementation of range, wildlife, and water yield vegetation manipulations and during timber and woodland harvesting only if all activities were undertaken in the same watershed at the same time.

Except for 208 plans, local land use plans and policies do not specifically address water quality; however, actions proposed to maintain or improve water quality have received favorable support from affected city and county governments.

Effects

Continuation of Current Management. Existing water quality would be maintained but would not be improved.

Resource Protection and Economic Development Alternatives. Water quality in the upper Colorado and Eagle Rivers would be improved in the long term by reducing sediment and salinity

yields in four areas (if the source of the problems is found to be on public land).

Preferred Alternative. Water quality in the Eagle River would be improved in the long term by reducing sediment and salinity yields in two areas (if the source of the problems is found to be on public land).

WATER YIELD MANAGEMENT

Currently a program does not exist for increasing water yield in the resource area; therefore, a water yield management program is not described under the Continuation of Current Management Alternative.

Objectives

Resource Protection Alternative. To increase water yield in the *Garfield Capability Unit*.

Economic Development and Preferred Alternatives. To increase water yield throughout the *resource area*.

Proposed Management Actions

Except for acres and types of vegetation proposed for manipulation to increase water yield, proposed management actions are the same under the Resource Protection, Economic Development, and Preferred Alternatives. Table 3-1 shows these differences.

TABLE 3-1. SUMMARY OF WATER YIELD
PROPOSED MANAGEMENT ACTIONS

Proposed Actions	CCMA	RPA	EDA	PA
Acres proposed for Manipulation.		52,362	104,396	34,492
Types of vegetation proposed for manipulation.		Aspen, conifer, oak-brush	Aspen, conifer, oak-brush, sage-brush	Aspen

In the remainder of the resource area, vegetation manipulations to increase water yield would be incorporated into other projects, such as timber management and range improvement, where feasible.

Management actions that could be used in vegetation manipulations are listed in Appendix A. Maps

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3-2, 3-3, and 3-4 show the locations of proposed vegetation manipulations.

Support

Engineering support would be needed to design and lay out vegetation manipulation projects. Fire management support would be needed for planning and implementing prescribed fire and for managing natural fire in meeting the resource objectives.

Implementation

Initially, an experiment would be conducted to determine the actual expected increase in runoff and baseflow from aspen manipulations. Water yield management plans and environmental assessments would then be written for areas shown on Maps 3-4, 3-5, and 3-6. For the remainder of the resource area, vegetation manipulations to increase water yield would be incorporated into allotment management plans, habitat management plans, and forest management plans, where feasible.

Consistency

Local land use plans and policies do not specifically address water yield; however, increased water yield from public land has received favorable support from affected county governments.

Effects

Continuation of Current Management, Resource Protection, Economic Development, and Preferred Alternatives. Following are the expected long-term annual increases in water yield under each alternative. Continuation of Current Management Alternative—none; Resource Protection Alternative—6,200 acre-feet (Garfield Capability Unit only); Economic Development Alternative—13,200 acre-feet (throughout the resource area); and Preferred Alternative—5,700 acre-feet (in aspen areas). These increases would help increase streamflows and reservoir-water levels.

CRITICAL WATERSHED AREAS

Objectives

Continuation of Current Management. To maintain existing watershed conditions in all critical watershed areas.

Resource Protection, Economic Development, and Preferred Alternatives. To protect the municipal watersheds providing domestic water for the communities of Rifle and New Castle, to manage debris flow hazard zones adjacent to Glenwood Springs, and to protect watershed conditions in erosion hazard areas.

Proposed Management Actions

Under the Continuation of Current Management Alternative, existing watershed conditions would be maintained. Proposals affecting the debris flow hazard zones adjacent to Glenwood Springs would be coordinated with the city. Applicable recommendations evolving from the Glenwood Springs debris flow study would be implemented if feasible. Stipulations would be included in project proposals to mitigate possible adverse impacts.

Under the Resource Protection, Economic Development, and Preferred Alternatives, measures would be taken to protect critical watersheds from damage by motorized vehicle use, vegetation manipulations, timber harvesting, mineral development, fire, livestock grazing, and utility development. (These measures are presented in Table 3-2.) In addition, the debris flow hazard zones adjacent to Glenwood Springs would be designated as an area of critical environmental concern (ACEC) so that special management including recommendations evolving from the Glenwood Springs debris flow study could be implemented. Critical watershed locations are shown on Map 3-5.

Support

Fire management support would be needed under all alternatives for management of natural fire in meeting the resource objectives and for the protection of critical watershed values.

Under the Resource Protection, Economic Development, and Preferred Alternatives, engineering support would be needed to design measures for reducing runoff and soil loss in debris flow hazard zones.

Implementation

Under the Continuation of Current Management Alternative, site-specific project plans for proposals within critical watersheds would be reviewed for compliance with existing laws and policies protecting these areas. Mitigation would be added to project proposals not adequately addressing protection of critical watersheds.

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TABLE 3-2. SUMMARY OF RESTRICTIONS PROPOSED ON CRITICAL WATERSHED AREAS

Action	RPA			EDA			PA		
	MW ¹	DFHZ ²	EHA ³	MW ¹	DFHZ ²	EHA ³	MW ¹	DFHZ ²	EHA ³
Acres identified for protection (Map 3-5).....	5,858	7,126	50,200	5,858	7,126	50,200	5,858	7,126	50,200
Acres closed to off-road vehicle use (Maps 3-35, 3-36, and 3-37).....	0	0	4,200	0	0	0	0	0	0
Motorized vehicle travel limited to existing roads and trails during late spring (Maps 3-35, 3-36 and 3-37).....	0	0	8,500	0	0	8,500	0	0	8,500
Motorized vehicle travel limited to existing roads and trails year round (Maps 3-35, 3-36, and 3-37).....	0	0	4,000	0	0	8,200	0	0	41,700
Motorized vehicle travel limited to designated roads and trails year round (Maps 3-35, 3-36, and 3-37).....	5,858	7,126	33,500	5,858	7,126	33,500	5,858	7,126	0
Vegetation manipulations to increase forage and water yield prohibited.....	yes	yes	no	yes	yes	no	yes	yes	no
Timber harvesting prohibited.....	yes	yes	no	no ⁴	yes	no	no ⁴	yes	no
Oil and gas leasing prohibited (Maps 3-6 and 3-7).....	yes	no	no	yes	no	no	no	no	no
Oil and gas surface facilities prohibited (Maps 3-6 and 3-7).....	no	no	no	yes	no	no	yes	yes	no
Included in fire exclusion zone (Maps 3-44, 3-45, and 3-46).....	yes	yes	no	yes	yes	no	yes	yes	no
Suitability designation for utilities development (Maps 3-42 and 3-43).....	U ⁵	U ⁵	O ⁶	U ⁵	U ⁵	O ⁶	S ⁷	S ⁷	O ⁶
Livestock grazing limited to light grazing.....	no	yes	no	no	yes	no	no	yes	no
Designated as an ACEC.....	no	yes	no	no	yes	no	no	yes	no

¹MW—Municipal watersheds

²DFHZ—Debris flow hazard zone

³EHA—Erosion hazard area

⁴One stand of pinyon juniper on less than 40 percent slope in the Rifle municipal watershed could be harvested.

⁵U—Unsuitable.

⁶O—Open.

⁷S—Sensitive.

Applicable recommendations evolving from the Glenwood Springs debris flow study would be implemented as funding became available if feasible.

Under the Resource Protection, Economic Development, and Preferred Alternatives, debris flow hazard zones would be designated as ACECs. Any management proposals recommended in those areas would be coordinated with the city of Glenwood Springs and Garfield County. BLM site plans for management of the debris flow hazard zones would include any applicable recommendations evolving from the Glenwood Springs debris flow study.

Restrictions in all critical watersheds would be implemented upon approval of this resource management plan.

Consistency

Protection of municipal watersheds is consistent with Rifle and New Castle government priorities. Management of debris flow hazard zones is supported by the city of Glenwood Springs and Garfield County.

Effects

Continuation of Current Management Alternative. Degraded water quality and debris flow would continue to impact the communities of Rifle, New Castle, and Glenwood Springs. Soil erosion would continue to degrade water quality in high erosion hazard areas.

Resource Protection, Economic Development, and Preferred Alternatives. The water quality in the municipal watersheds of New Castle and Rifle would improve. Debris flowing into the town of Glenwood Springs and erosion in high erosion hazard areas would be reduced.

MINERALS MANAGEMENT

Objective

The objective under all alternatives is the same: To meet the demand for mineral exploration and development while protecting other resources from damage associated with mineral activities.

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Proposed Management Actions

Various mining laws govern the use and disposal of federal minerals. Under these laws, a person may *locate mineral claims, lease, or buy* federal minerals from the United States. BLM disposes of federal minerals under appropriate authority to allow development and production to occur.

To protect other resource values from damage associated with mineral activities, the BLM is allowed to withdraw lands for certain uses, thus closing them to mineral entry. The BLM may also place constraints on the associated mineral activities such as no surface facilities.

Under the Continuation of Current Management Alternative, land currently withdrawn for other uses would continue to be withdrawn. Existing constraints placed on mineral activities by other resources would also continue. Map 3-6 shows the locations of these withdrawals and constraints.

Additional constraints placed upon mineral activities under the other alternatives would protect high value recreation resources, wilderness resources, water resources (critical watersheds), and cultural resources. Locations of these additional constraints are shown on Maps 3-7 and 3-8.

Table 3-3 shows the existing and additional constraints placed on mineral activities. All withdrawals and constraints would become binding following plan approval and approval of petition for withdrawal. Lands not closed to mineral location, mineral leasing, or mineral sales would be open for mineral entry.

In addition to the withdrawals and constraints shown in Table 3-3, under all alternatives, approximately 28,500 acres in the Hogback Coal field (Map 3-9) would be assessed as acceptable for further consideration for coal leasing based on a coal unsuitability review (Appendix C). These lands are within the Uinta-Southwest Coal Region (Fig. 3-2). During the Regional Coal Leasing Program, tracts could be delineated from the area for inclusion in regional coal sale. Prior to inclusion in a regional sale, all tracts delineated would be examined in more detail (in a site specific analysis prepared by BLM). At that time, the need for additional stipulations and restrictions to protect surface resources will be examined.

Also, under all alternatives, approximately 1,560 acres would be unacceptable for coal leasing (Map 3-9) based on multiple-use conflicts. These conflicts were identified in a 1978 coal update of the Glenwood Springs Management Framework Plan. The coal update lists 13 reasons why this area would be unacceptable for coal development which are still valid today. One of the primary reasons for excluding this area is that it is situated in a housing development.

Support

Cadastral support would be needed under all alternatives to locate public land boundaries.

Implementation

Implementation would be the same under all alternatives:

Locatable Minerals. Prospectors could claim and develop locatable minerals on areas open to mineral location. BLM approval would not be needed if proposed operations would disturb 5 acres or less per year, but notification would be required. Operators proposing to disturb more than 5 acres per year would be required to submit a plan of operations under *43 CFR 3809, Surface Management of Public Lands under U. S. Mining Laws.*

Leasable Minerals. The 28,520 acres identified as acceptable for further consideration for coal leasing could be considered for lease in the Uinta-Southwest Regional Coal Sale. If considered for leasing in the sale, tracts would be delineated, expressions of interest would be sought, and a separate regional environmental impact statement would be prepared.

Mineral reports and environmental assessments would be prepared for all applications to prospect and develop geothermal, potassium, and other leasable minerals except oil and gas. Development that would not significantly conflict with environmental, economic, or social values would be approved.

Oil and gas development would occur on areas identified in the plan as open to leasing. Site-specific stipulations would be included in an oil and gas environmental assessment prior to the issuance of any lease.

Salable Minerals. Salable minerals (moss rock, top soil, sand and gravel, scoria, and fill dirt) would be purchased from established common use areas. Mineral reports and environmental assessments would be prepared on all government agency and individual applications to extract salable minerals outside of common use areas. Operations that would not conflict with environmental, social, or economic values would be accepted.

Consistency

The local land use plans for Garfield and Pitkin Counties state that mineral development should take place in such a manner as not to destroy the recreational and scenic values of the counties and that mineral activities should not destroy the ability

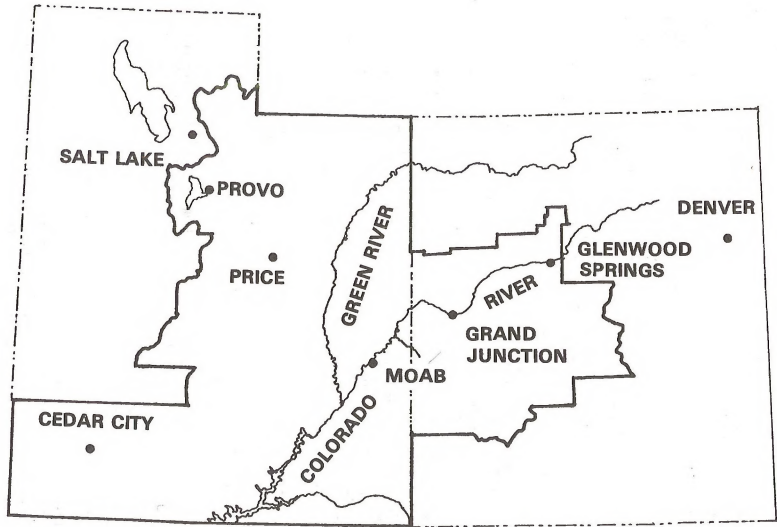


FIGURE 3-2
UINTA-SOUTHWESTERN UTAH COAL REGION

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TABLE 3-3. SUMMARY OF WITHDRAWALS AND CONSTRAINTS AFFECTING MINERALS

(in acres)

Mineral Activity and Reason for Closure	CCMA ¹	RPA ²	EDA ³	PA ⁴
Closed to Mineral Location				
Suitable Wilderness (Map 3-27)	10,755	30,630	10,755	340
Reclamation Project	1,892	1,892	1,892	1,892
Thompson Creek Natural Environment Area	4,286	4,286	4,286	4,286
Recreation Sites	250	250	250	250
*Naval Oil Shale Reserve	52,000	52,000	52,000	52,000
Public Water Reserves	5,120	5,120	5,120	5,120
Recreation and Public Purpose	1,430	1,430	1,430	1,430
Oil Shale Withdrawal	32,064	32,064	32,064	32,064
Deep Creek Canyon	2,470	2,470	2,470	2,470
Total	108,797	129,142	109,267	98,852
Percent of Resource Area—federal and federal mineral/private surface	14	17	14	13
Closed to Oil and Gas Leasing				
Suitable Wilderness	10,755	30,630	10,755	340
Thompson Creek Natural Environment Area	960	960	960	960
*Naval Oil Shale Reserve	52,000	52,000	52,000	52,000
Deep Creek Canyon	2,470	2,470	2,470	2,470
Municipal Watersheds	5,858	5,858	5,858	5,858
Total	63,715	91,918	72,043	55,770
Percent of Resource Area—federal and federal mineral/private surface	8	12	10	7
Closed to Oil and Gas Surface Facilities				
Thompson Creek Natural Environment Area	3,326	3,326	3,326	3,326
Frying Pan, Roaring Fork, Eagle, Crystal, and Colorado River Corridors	21,218	21,218	21,218	21,218
Rifle Mountain Park and Rifle Fish Hatchery	1,360	1,360	1,360	1,360
Hack Lake Recreation Area	3,456	3,456	3,456	3,456
Blue Hill Archaeological District	4,200	4,200	4,200	4,200
Municipal Watersheds	5,858	5,858	5,858	5,858
Glenwood Springs Debris Flow Hazard Zones	7,126	7,126	7,126	7,126
Total	25,904	33,560	25,904	42,344
Percent of Resource Area—federal and federal mineral/private surface	3	4	3	6
Closed to Mineral Sales				
Suitable Wilderness	10,755	30,630	10,755	340
Thompson Creek Natural Environment Area	4,286	4,286	4,286	4,286
Hack Lake Recreation Area	3,456	3,456	3,456	3,456
Deep Creek Recreation Area	2,470	2,470	2,470	2,470
Frying Pan Recreation Sites	50	50	50	50
Lower Colorado River	1,000	1,000	1,000	1,000
Total	15,041	40,992	17,561	11,552
Percent of Resource Area—federal and federal mineral/private surface	2	6	2	1

¹See Map 3-6 for closure locations.

²See Maps 3-6 and 3-7 for closure locations.

³See Maps 3-6 and 3-8 for closure locations.

⁴The minerals in this area are not available for disposal under BLM regulations.

of the land to be used for farming and ranching. All alternatives are consistent with these land use plans.

The Garfield County Comprehensive Plan (May 1981) zoned the Colorado River *industrial* from New Castle to Rifle to accommodate gravel extraction and to ensure the protection of areas of significant aggregate sand and gravel deposits from conflicting development. The Preferred Alternative would allow development of sand and gravel on public land within the river corridor only if that development were consistent with the management objectives of the area. These objectives relate to the protection of important riparian wildlife and rec-

reational values. Therefore, potential exists for conflict with the Garfield County Comprehensive Plan.

Effects

Continuation of Current Management Alternative. Existing demand for mineral exploration and development would continue to be met. Current restrictions on mineral exploration and development have little effect on the minerals industry because other areas currently provide an adequate supply to meet demand.

Resource Protection, Economic Development, and Preferred Alternatives. Closing additional

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acres to mineral location, oil and gas leasing, and mineral sales (Table 3-3) under the Continuation of Current Management, Resource Protection, Economic Development and Preferred Alternatives would reduce by a like amount the number of acres available for exploration and development. These reductions would adversely affect the minerals industry in the long term. However, other valuable resources such as wilderness, recreation, public water reserves, municipal watersheds, water quality, and scenery would be protected.

AQUATIC HABITAT MANAGEMENT

Management emphasis on fish in the resource area is primarily for the various trout species such as Colorado River cutthroat, brook and rainbow trout; however, many other cold and warm water, game and nongame fish species exist and would benefit from the proposed actions.

Objectives

Continuation of Current Management Alternative. To improve aquatic habitat of streams on the Naval Oil Shale Reserve and maintain existing aquatic conditions of remaining streams and lakes on public land that have minimum streamflow allocations.

Resource Protection Alternative. To maintain or upgrade the aquatic habitat of all streams and lakes on public land to an average to excellent condition.

Economic Development Alternative. To increase fish production and recreational fishing use on existing or potential fishing streams having more than one-half mile of continuous flow across public

land and on lakes surrounded by at least 40 acres of public land.

Preferred Alternative. To increase fish production and recreational fishing use on streams having more than one-half mile of continuous flow across public land and on lakes surrounded by at least 40 acres of public land. (All streams and lakes must have existing or easily obtainable public access and either an existing or potential fishery to qualify for management.)

Proposed Management Actions

Under all alternatives, aquatic habitat of streams and lakes identified on Map 3-10 would be monitored or improved. Appendix K lists those streams and lakes that would be monitored or improved under each alternative, and Appendix A lists management actions that could be used to improve fisheries. The streams and lakes on public land not recommended for improvement would be monitored for changes in aquatic conditions. Those found to be in a declining condition would be improved as funding and manpower became available.

As shown in Appendix K, under the Resource Protection, Economic Development, and Preferred Alternatives, areas of critical environmental concern (ACECs) would be designated and managed to protect the Colorado River cutthroat trout and razorback (humpback) sucker (Map 3-28). These alternatives also propose that the Colorado Division of Wildlife file for minimum streamflow or pool levels for streams and lakes proposed for management where filings do not currently exist. Table 3-4 summarizes the actions proposed under each alternative.

New access to support aquatic habitat management would be acquired under the Economic Development Alternative whereas none would be acquired under the other alternatives.

TABLE 3-4. SUMMARY OF AQUATIC WILDLIFE PROPOSED MANAGEMENT ACTIONS

Proposed Management Actions	CCMA	RPA	EDA	PA
Miles of stream identified for improvement.....	15.5	90.0	89.6	80.2
Miles of stream identified for monitoring.....	120.1	45.8	46.0	75.4
Number of lakes identified for improvement.....	0	3	3	2
Number of lakes identified for monitoring.....	5	2	2	3
Miles of stream designated as ACECs for Colorado River cutthroat trout.....	0	34.5	34.5	31.9
Number of lakes designated as ACECs for Colorado River cutthroat trout.....	0	1	1	1
Miles of stream designated as ACECs for razorback sucker.....	0	1.0	1.0	0
Miles of stream identified for minimum streamflow filings.....	0	43.0	43.0	11.0
Number of lakes identified for minimum pool level filings.....	0	5	5	2
Miles of stream made available to public use by acquiring legal access.....	0	0	42.7	124.8

¹Access acquired through other resource programs.

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Support

Under all alternatives, close coordination with the Colorado Division of Wildlife would be required for habitat improvement, fish stocking, minimum streamflow and pool level filings, fish reintroduction, and stream monitoring. Aid in project funding would also be sought. Engineering support would be required prior to project construction. Fire management support would be needed for management of natural fire in meeting the resource objectives and for the protection of unique and fragile aquatic habitat areas.

Implementation

Streams on the Naval Oil Shale Reserve would be improved for the state threatened Colorado River cutthroat trout as outlined in the BLM *Naval Oil Shale Reserve Aquatic Habitat Management Plan*. Management of the streams on the Naval Oil Shale Reserve would not preclude the development of oil shale. Additional aquatic habitat management plans might be written on some of the remaining lakes and streams. A monitoring plan would be developed, placing priorities on those streams to be monitored. ACEC designations would become final upon approval of the resource management plan.

Consistency

All alternatives are consistent with the Colorado Division of Wildlife's goals for aquatic habitat management (Colorado Division of Wildlife 1977).

Effects

Continuation of Current Management, Resource Protection, Economic Development, and Preferred Alternatives. The aquatic habitat of streams on the Naval Oil Shale Reserve would be improved to support reintroductions of the Colorado River cutthroat trout listed as threatened within Colorado. Increasing populations of these threatened species would help to perpetuate them.

Resource Protection, Economic Development, and Preferred Alternatives. Aquatic habitats of streams and lakes listed in Appendix K would be improved. Improvements in water quality and recreational fishing on these streams would be commensurate with improvements in aquatic habitat. These improvements would be long term and significant to local users.

TERRESTRIAL HABITAT MANAGEMENT

Objectives

Continuation of Current Management and Preferred Alternatives. To provide sufficient animal-unit months (AUMs) of wildlife forage to maintain existing big game numbers (this would require 45,602 AUMs of forage). To improve existing wildlife habitat conditions and wildlife species diversity.

Resource Protection and Economic Development Alternatives. To provide sufficient AUMs of wildlife forage to meet 1988 Colorado Division of Wildlife big game population goals. This would require 58,342 AUMs of forage. To improve wildlife conditions and wildlife species diversity. (Note: All forage allocations are expressed in cattle AUMs.)

Proposed Management Actions

Under all alternatives, based on the objectives and methodology explained in Appendix F, approximately 50 percent of the existing forage would be allocated to big game and livestock. (Appendix F, Table F-2 shows the allocation by allotment.) The remaining 50 percent would be reserved as habitat for other game and nongame species and other nonconsumptive uses. To meet the resource objectives, vegetation would be manipulated over a 10-year period to increase forage for big game.

Under the Preferred Alternative livestock grazing would be prohibited in certain areas (Map 3-13) during big game crucial use periods to reduce conflicts between big game and livestock.

Table 3-5 shows actions proposed for terrestrial habitat management.

Under all alternatives except the Continuation of Current Management Alternative, habitat would be made available for reintroductions of various wildlife species; several areas would be identified for cooperative management with the Colorado Division of Wildlife; water sources would be developed where they are currently lacking; and some crucial winter range would be limited to off-road vehicle use. Locations of these specific recommendations are shown on Maps 3-11, 3-12, and 3-13. Legal access for hunting on public land would be acquired as shown on Maps 3-39, 3-40, and 3-41.

Support

Under all alternatives, fire management support would be needed for the planning and implementation of prescribed fire and the management of natu-

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TABLE 3-5. SUMMARY OF TERRESTRIAL WILDLIFE PROPOSED MANAGEMENT ACTIONS

Action	CCMA	RPA	EDA	PA
Initial allocation of existing forage (AUMs)	39,672	47,173	39,496	36,157
Acres of vegetation manipulated to increase wildlife forage over a 10-year period	1,000	23,411	18,197	18,440
Expected increases in forage (AUMs)	350	7,558	6,580	6,184
Total projected allocation (AUMs)	40,022	54,731	46,076	42,341
Acres of crucial big game winter range closed to off-road vehicle use (see Maps 3-35, 3-36, and 3-37)	0	75,463	56,868	75,463
Acres of habitat proposed for cooperative management with Colorado Division of Wildlife (Maps 3-11, 3-12, and 3-13)	0	62,170	58,820	62,170
Legal access acquired into several tracts of public land	no	yes	yes	yes

ral fire in meeting wildlife resource objectives. U. S. Forest Service and Colorado Division of Wildlife support would be needed for design, engineering, and implementation of habitat improvement projects.

Under the Resource Protection, Economic Development, and Preferred Alternatives, Colorado Division of Wildlife support would be needed for reintroductions, project funding, and cooperative management of public and state lands. U. S. Forest Service cooperation would be needed for implementation of some prescribed burns.

Implementation

Under all alternatives, habitat management plans would be written for selected areas of wildlife habitat. Sensitive habitat such as crucial winter range would be monitored for habitat condition changes and needed improvements. (See Appendix F for allocation, implementation, and monitoring methodology.) Colorado Division of Wildlife cooperation would be needed for habitat management plan development, project implementation, and habitat monitoring. Existing cooperative agreements between the Glenwood Springs Resource Area and Colorado Division of Wildlife are available for review in the Glenwood Springs Resource Area office.

Consistency

None of the alternatives would meet 1988 Colorado Division of Wildlife populations goals which would require 58,324 AUMs of forage from public land. Local plans and policies do not specifically address wildlife.

Effects

Vegetation manipulation proposed to increase big game forage would result in the following long-term increases and decreases in big game populations.

Continuation of Current Management Alternative, 12 percent decrease, primarily in the King Mountain Capability Unit; Resource Protection Alternative, 20 percent increase throughout the resource area; Economic Development Alternative, 1 percent increase throughout the resource area; Preferred Alternative, 7 percent decrease throughout the resource area.

Increases and decreases in hunting success and economic returns to local economies would be commensurate with increases and decreases in big game populations.

Wildlife conditions and species diversity would improve throughout the resource area.

LIVESTOCK GRAZING MANAGEMENT

In addition to the four primary alternatives (Continuation of Current Management, Resource Protection, Economic Development, and Preferred), two subalternatives were considered for the management of livestock grazing. They are No Grazing and No Action. These two alternatives are required by BLM for all livestock grazing environmental impact statements.

No Grazing Alternative

The No Grazing Alternative would require the elimination of livestock grazing from the public land in the resource area. Livestock would be phased out over a 5-year period following adoption of this alternative and new range improvements for livestock management would not be undertaken. Some existing facilities might be removed if they conflicted with wildlife or other resource values. Additional fencing of private land might be necessary to control movement of livestock to public land. These costs would be borne by the operators involved.

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No Action Alternative

The No Action Alternative would require freezing the range management program at this point in time. Eight existing allotment management plans (AMPs) would continue to operate, but no new ones would be developed. There would be no new range improvement projects. Maintenance of existing improvements would continue. The reduction in animal-unit months (AUMs) proposed under the Continuation of Current Management Alternative to get livestock down to estimated stocking rates would not occur.

Objectives

Continuation of Current Management Alternative. To provide sufficient AUMs of livestock forage to accommodate *existing livestock use*. (Existing livestock use is defined in the Glossary.) This would require 37,709 AUMs of forage.

Resource Protection and Economic Development Alternatives. To provide sufficient AUMs of livestock forage to accommodate *total livestock preference* (Total livestock preference is defined in the Glossary.) This would require 73,868 AUMs of forage.

Preferred Alternative. To provide sufficient AUMs of livestock forage to accommodate *active livestock preference*. (Active livestock preference is defined in the Glossary.) This would require 56,301 AUMs of forage.

Proposed Management Actions

Level of Management. In 1980, the BLM made a preliminary aggregation of allotments that could

be managed intensively, either alone or in combination with adjacent allotments. Following is a listing by capability unit of those allotments. Asterisks indicate the allotment is presently being managed under an AMP. (Allotment boundaries are shown on Map 3-14.)

Garfield Capability Unit—8009, 8017, 8018, 8026, 8039, 8046, 8105*, 8106, 8107, 8213*, 8218, 8219, 8220, 8221, 8222*, 8908*, 8909, 8910*

Roaring Fork Capability Unit—8334, 8335, 8336, 8341, 8342

Eagle-Vail Capability Unit—8501, 8502, 8504, 8506, 8734*

Castle Peak Capability Unit— 8601*, 8606, 8616, 8619, 8620, 8639, 8641, 8642*, 8643*, 8730*, 8731*, 8732*, 8733*, 8735*

King Mountain Capability Unit—8506

The allotments identified for intensive management would be the same under all alternatives. The criteria used to select the allotments were (1) size and land status (was there enough public land to have two or more pastures large enough to be economically feasible); (2) elevation, topography, and vegetation (were these similar enough to allow each pasture to be ready to use at approximately the same time); and (3) production potential (was there potential to increase forage).

Forage Allocation. Under all alternatives except No Grazing, livestock grazing would continue and existing forage would be allocated as shown in Table 3-6. Under the Continuation of Current Management, Resource Protection, Economic Development, and Preferred Alternatives, vegetation would be manipulated to increase forage. The additional forage would then be allocated to livestock (Table 3-6). Appendix F, Table F-1, shows allocations by allotment.

TABLE 3-6. SUMMARY OF LIVESTOCK FORAGE ALLOCATION

(in AUMs)

Allocation	CCMA	RPA	EDA	PA	No Action Alternative	No Grazing Alternative
Existing use.....	37,709	37,709	37,709	37,709	37,709	37,709
Initial allocation.....	26,443	31,399	38,388	38,726	37,709	0
Expected increase from vegetation manipulation.....	7,734	25,486	25,070	12,998	0	0
Projected allocation—existing plus expected increases.....	34,177	56,885	63,458	51,724	37,709	0
Additional forage from unallotted allotments.....	753	468	1,408	756	0	0

Facilities such as springs, reservoirs, fences, corals, and livestock trails would be constructed where necessary to control and distribute livestock. Table 3-7 shows the number of projects associated with a typical 5,000-acre allotment.

These figures are based on averages of the eight existing allotment management plans in the resource area. They are for a complete allotment

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TABLE 3-7. TYPICAL ALLOTMENT RANGE IMPROVEMENT PROJECTS

Fence (miles)	Cattleguard	Corral	Stocktrail (miles)	Reservoir	Spring	Pipe-line (miles)	Vegetation Manipulation (acres)	Seeding (acres)
10	1	1	.25	5	5	.75	400	100

management plan and do not differentiate between existing and proposed improvements. Most allotment boundaries are shared with adjacent allotments and are presently fenced. Total miles of fence would depend on number of pastures and natural barriers. Water developments would depend on availability and distribution of springs and potential reservoir sites. Cattleguards would be used on well-travelled roads. Stock trails to aid in livestock movement would be needed wherever dense vegetation or steep slopes exist.

Vegetation manipulation would occur only on suitable sites where a need for additional forage exists. Proposed acreages for vegetation manipulation by alternatives are as follows: Continuation of Current Management—19,139 acres in 89 allotments; Resource Protection—51,952 acres in 134 allotments; Economic Development—52,426 acres in 128 allotments; Preferred—29,800 acres in 113 allotments. Appendix A lists vegetation manipulation techniques and range improvement facilities; Appendix F discusses methodology for forage allocation.

The 24 unallotted allotments (Table F-3, Appendix F) would have AUMs, as listed in Table 3-6, that could be used by livestock. These allotments would be made available for livestock use under the Economic Development and Preferred Alternatives but not the Continuation of Current Management and Resource Protection Alternatives.

Support

Under all alternatives except No Grazing, support from engineering and fire management would be required for project layout, design, and implementation. The U. S. Forest Service and Colorado Division of Wildlife would be consulted on projects of mutual benefit, especially prescribed burns. Water rights would have to be secured for all water developments.

Implementation

Following completion of the resource management plan, a rangeland program summary would be issued to summarize grazing levels reached as a result of planning and consultation. It would also include a categorization of allotments to help estab-

lish priorities for achieving cost effective improvement of rangeland condition and production and a proposed schedule for the issuance of grazing decisions. Appendix F contains an explanation of categorization. The rangeland program summary would describe site-specific grazing use adjustment decisions where known. It would also describe the studies and actions that would be needed to make these decisions where specifics are unknown.

Presently, information is unavailable to make reasonable estimates of numbers or units of range management facilities such as fences, springs, and reservoirs. After categorizing allotments, allotment management plans would be prepared. Allotment management plans would include benefit/cost analysis and environmental assessment of specific facilities and management actions. Vegetation manipulation acreage as displayed in proposed management actions was determined from range site potential and soil suitability and adjusted according to the goal for the alternative. Final determination of each project would be made as part of an allotment management plan.

Consistency

Allowing livestock grazing on public land is consistent with the counties' and state's concerns for maintaining a varied economic base.

Effects

Vegetation manipulations proposed to increase livestock forage would result in the following long-term increases and decreases in livestock forage: Continuation of Current Management Alternative, 10 percent decrease; Resource Protection Alternative, 50 percent increase; Economic Development Alternative, 68 percent increase; and Preferred Alternative, 37 percent increase.

These increases and decreases are totals for the entire resource area. Therefore, even though forage would increase under the Resource Protection, Economic Development, and Preferred Alternatives, it would still decrease in several allotments in the King Mountain Capability Unit (see Table F-1, Appendix F). These same allotments would be sig-

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nificantly reduced under the Continuation of Current Management Alternative.

FOREST MANAGEMENT

Objective

The objective is the same under all alternatives: To manage all productive forest land and woodland to meet timber and fuelwood demand and maintain stand productivity.

Proposed Management Actions

Under all alternatives, productive forest land and woodland would be identified as suitable and unsuitable for management. Maps 3-15, 3-16, 3-17, and 3-18 show locations of forest land suitable for management. All forest land would be protected from insects and disease. Practices that would be used in managing the suitable forest land are listed in Appendix A.

Under the Continuation of Current Management and Preferred Alternatives, only one harvest level would be identified; however, locations and species managed would be different:

Under the Continuation of Current Management Alternative *only slopes under 40 percent supporting commercial species* would be managed.

Under the Preferred Alternative, *all slopes supporting commercial productive forest land species* in five forest management units (King Mountain,

Black Mountain, Castle Peak, Seven Hermits and Naval Oil Shale) would be managed. Outside the five forest management units, *only slopes under 40 percent supporting commercial productive forest land and commercial woodland species* would be managed throughout the resource area.

Major commercial species include lodgepole pine, Engelmann spruce, Douglas-fir, and ponderosa pine (productive forest land) and pinyon and juniper (woodland).

Under the Resource Protection and Economic Development Alternatives, two harvest levels would be identified. *Slopes under 40 percent supporting commercial species* would be managed under harvest level 1 whereas *all slopes supporting all species* would be managed under harvest level 2. Additional species identified for harvest under harvest level 2 include aspen and subalpine fir (productive forest land).

Two harvest levels were not considered under Continuation of Current Management and Preferred Alternatives because logging slopes over 40 percent requires logging techniques not available in the region. Techniques such as high lead logging are generally used in higher value coastal timber. The timber in the resource area, under current market conditions, will not support high cost logging techniques.

Table 3-8 shows the acreage identified as suitable and unsuitable under each alternative.

Multiple-use restrictions prohibiting the harvesting of both productive forest land and woodland are shown in Table 3-9 through 3-15.

TABLE 3-8. SUMMARY OF FOREST PROPOSED MANAGEMENT ACTIONS

Proposed Actions	CCMA (com- mercial species only)	RPA		EDA		PA (com- mercial species only)
		Slopes Under 40 Percent (commer- cial species only)	All slopes (all species)	Slopes Under 40 Percent (commer- cial species only)	All slopes (all species)	
Productive Forest Land						
Acre suitable for management.....	17,800	7,715	40,370	17,350	62,675	17,905
Acre unsuitable for management (based on multiple-use re- strictions).....	52,650	10,625	30,080	450	7,775	52,545
Annual allowable harvest level (million board feet).....	1.75	0.7	4.0	1.7	6.3	1.8
Woodland						
Acre suitable for management.....	61,560	45,130	91,680	61,150	152,675	58,555
Acre unsuitable for management (based on multiple-use re- strictions).....	127,940	16,430	97,820	410	36,825	130,945
Potential annual allowable harvest level (cords).....	3,720	2,650	4,330	3,695	7,950	3,535

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TABLE 3-9. PRODUCTIVE FOREST LAND MULTIPLE-USE RESTRICTIONS—CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE

Reason Unsuitable for Harvest	Acres*
Streamside protection.....	2,383
Topography—rough terrain.....	29,877
Research—natural areas.....	1,203
Aspen-alpine fir noncommercial.....	19,187
Total.....	52,650

*These acreages are from the 1973 forest inventory. The multiple-use restrictions identified by this inventory are based on plot information and are not directly related to specific sites or capability units.

TABLE 3-10. WOODLAND HARVEST RESTRICTIONS—CONTINUATION OF CURRENT MANAGEMENT

Capability Unit	Acres	Reason Unsuitable For Harvest
Garfield.....	65,235	Poor stocking, erosive soils, slopes over 40%
Roaring Fork.....	10,490	Poor stocking, erosive soils, slopes over 40%
Eagle-Vail.....	11,495	Poor stocking, erosive soils, slopes over 40%
Castle Peak.....	26,225	Poor stocking, erosive soils, slopes over 40%
King Mountain.....	14,465	Poor stocking, erosive soils, slopes over 40%
Total.....	127,940	

Note: Restrictions placed on woodland management base result from inventory criteria established in 1979 inventory. Restrictions were management-related and not necessarily or directly based on multiple-use considerations.

TABLE 3-11. PRODUCTIVE FOREST LAND AND WOODLAND MULTIPLE-USE RESTRICTIONS—HARVEST LEVEL 1—RESOURCE PROTECTION ALTERNATIVE

Capability Unit	Acres	Reason Unsuitable for Harvest
Garfield.....	1,510	Highly erosive soils, debris flow hazard zone, possible threatened and endangered fish habitat, municipal watersheds, recreational non-motorized zone.
Roaring Fork.....	220	Eagle Mountain WSA, Thompson Creek Natural Environment Area
Eagle-Vail.....	4,845	Highly erosive soils
Castle Peak.....	11,240	Highly erosive soils, Bull Gulch ACEC (scenic values), Castle Peak and Bull Gulch WSA
King Mountain.....	9,240	Highly erosive soils, Deep Creek ACEC (scenic values), Blue Hill ACEC (cultural values)
Total.....	27,055	

TABLE 3-12. PRODUCTIVE FOREST LAND AND WOODLAND MULTIPLE-USE RESTRICTIONS—HARVEST LEVEL 2—RESOURCE PROTECTION ALTERNATIVE

Capability Unit	Acres	Reason Unsuitable for Harvest
Garfield.....	48,800	Highly erosive soils, debris flow hazard zones, possible threatened and endangered fish habitat, municipal watersheds, recreational non-motorized zone
Roaring Fork.....	8,200	Highly erosive soils, recreational non-motorized zone, Thompson Creek Natural Environment Area, debris flow hazard zones; Eagle Mountain WSA
Eagle-Vail.....	18,240	Highly erosive soils
Castle Peak.....	36,925	Highly erosive soils, Bull Gulch ACEC (scenic values), Castle Peak and Bull Gulch WSAs
King Mountain.....	15,737	Highly erosive soils, Deep Creek ACEC (scenic values), Blue Hill ACEC (cultural values)
Total.....	127,900	

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TABLE 3-13. PRODUCTIVE FOREST LAND AND WOODLAND MULTIPLE-USE RESTRICTIONS—HARVEST LEVEL 1—ECONOMIC DEVELOPMENT ALTERNATIVE

Capability Unit	Acres	Reason Unsuitable for Harvest
Garfield	310	Water quality, municipal watershed, highly erosive soils, debris flow hazard zone
Roaring Fork	40	Debris flow hazard zone

TABLE 3-13. PRODUCTIVE FOREST LAND AND WOODLAND MULTIPLE-USE RESTRICTIONS—HARVEST LEVEL 1—ECONOMIC DEVELOPMENT ALTERNATIVE—Continued

Capability Unit	Acres	Reason Unsuitable for Harvest
Eagle-Vail	0	Bull Gulch WSA
Castle Peak.....	510	
King Mountain..	0	
Total	860	

TABLE 3-14. PRODUCTIVE FOREST LAND AND WOODLAND MULTIPLE-USE RESTRICTIONS—HARVEST LEVEL 2—ECONOMIC DEVELOPMENT ALTERNATIVE

Capability Unit	Acres	Reason Unsuitable for Harvest
Garfield	12,984	Highly erosive soils, municipal watersheds, water quality Debris flow hazard zones
Roaring Fork	1,163	
Eagle-Vail	10,792	
Castle Peak.....	12,609	
King Mountain.....	7,050	
Total	44,600	

TABLE 3-15. PRODUCTIVE FOREST LAND AND WOODLAND MULTIPLE-USE RESTRICTIONS—PREFERRED ALTERNATIVE

Capability Unit	Acres	Reason Unsuitable for Harvest
Garfield	82,345	Municipal watersheds, debris flow hazard zone, highly erosive soils, recreational non-motorized zones Debris flow hazard zones, Thompson Creek Natural Environment Area, Eagle Mountain WSA, highly erosive soils Highly erosive soils, Bull Gulch scenic area, highly erosive soils Hack Lake WSA and recreational non-motorized zone, Deep Creek ACEC, highly erosive soils
Roaring Fork	14,015	
Eagle-Vail	16,895	
Castle Peak.....	40,685	
King Mountain.....	29,550	
Total	183,490	

Aquisition of legal access to public land would be needed to open areas to forest land management (see Transportation Map 3-39).

Support

Under all alternatives, cadastral survey and engineering support would be needed to help design and lay out timber sales. Fire management support would be needed for management of natural fire in meeting forest management resource objectives.

Implementation

Under all alternatives, forest management plans and environmental assessments would be prepared for suitable forest land.

Consistency

Harvesting forest products is consistent with other agencies, particularly the U. S. Forest Service. The demand for sawtimber products is presently low. Demand for fuelwood, particularly pinyon-juniper, is increasing annually. Providing forest products on a sustained yield basis is also consistent with current national policies and objectives.

Effects

Continuation of Current Management and Preferred Alternatives. Based on current and projected market demands, the proposed allowable harvest for productive forest land would provide sufficient volumes of timber to satisfy the local timber 30 industry and provide another option for timber

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sources. The allowable harvest for woodland would supply most fuelwood demands.

Resource Protection Alternative. Harvest level 1 would not likely meet all demands for sawtimber and fuelwood and would somewhat limit the options for timber sources in the region. Harvest level 2 would likely be in excess of demands for sawtimber resulting in unsold timber sales. Demands for fuelwood would probably absorb the high woodland harvest level and provide economic benefits to the resource area.

Economic Development Alternative. Harvest level 1 would meet most demands for sawtimber and fuelwood in the resource area and provide another source for timber other than the U. S. Forest Service. Harvest level 2 would greatly exceed current and projected demands for sawtimber and would result in unsold timber sales. Woodland harvest levels would likely be absorbed by the fuelwood industry generating additional income for the area.

RECREATION RESOURCE MANAGEMENT

Objectives

Continuation of Current Management Alternative. To maintain existing developed recreation sites and manage recreation use in intensive use areas.

Resource Protection Alternative. To manage recreation resources to protect fragile and unique resource values, reduce the impacts of recreational use on recreation resources, provide for visitor

safety, and maintain existing and proposed recreation sites.

Economic Development Alternative. To manage recreation resources to accommodate existing and projected recreational use.

Preferred Alternative. To provide recreational opportunities while reducing the impacts of recreational use on fragile and unique resource values and provide for visitor safety.

Proposed Management Actions

Recreation opportunity spectrum (ROS) management classes would be adopted under each alternative. The objective of the ROS is to provide users with opportunities for a variety of recreational activities (hunting, fishing) in a variety of settings (wilderness, campground) for a desired experience (primitive, urban). For example, fishing a lake in a wilderness is a much different experience than fishing a lake near a city. Appendix E explains the ROS system.

The ROS system describes six classes ranging from urban to primitive. Each class provides objectives that guide the type of management actions that could be allowed within a class. Each class also indicates the type of setting one could expect to find in the area.

Maps 3-19, 3-20, 3-21, and 3-22 show the differences in classes under each alternative, and Table 3-17 compares the acreage within each class. The ROS class changes in the Resource Protection, Economic Development, and Preferred Alternatives are proposed to be consistent with other management actions such as timber harvesting and vegetation manipulations, which would alter the settings.

TABLE 3-16. SUMMARY OF RECREATION OPPORTUNITY SPECTRUM (ROS) CLASSES

ROS Class	CCMA		RPA		EDA		PA	
	Acres	Per- cent of Total	Acres	Per- cent of Total	Acres	Per- cent of Total	Acres	Per- cent of Total
Primitive.....	722	.1	722	.1	722	.1	722	.1
Semi-primitive non-motorized.....	34,385	6.1	34,385	6.1	12,995	2.3	15,110	2.7
Semi-primitive motorized.....	314,075	55.5	228,774	40.4	240,021	42.5	279,411	49.4
Roaded natural.....	183,168	32.4	268,469	47.5	278,612	49.2	237,107	41.9
Semi-urban.....	33,045	5.8	33,045	5.8	33,045	5.8	33,045	5.8
Urban.....	647	.1	647	.1	647	.1	647	.1

Existing recreational facilities would be maintained under all alternatives. Map 3-23 shows the locations of existing recreational facilities.

New designations and facilities would be added under the Resource Protection, Economic Development, and Preferred Alternatives (Table 3-17).

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Maps 3-24, 3-25, and 3-26 show the locations of these proposed facilities.

TABLE 3-17. PROPOSED DESIGNATIONS AND RECREATIONAL FACILITIES

Designation, Facility, or Service	Existing (CCMA)	Existing and Proposed		
		RPA	EDA	PA
Number of developed sites (campgrounds, overlooks, highway rest stops).....	4	5	5	5
Number of undeveloped recreation sites.....	1			
Number of developed river access sites.....	3	4	8	7
Number of undeveloped river access sites.....	1			
Number of trails.....	2	3	5	5
Number of trailheads.....	2	3	12	6
Permit program for commercial and competitive floatboating use.....	yes	yes	yes	yes
Number of primitive recreation sites.....		9	11	7
Number of snowmobile parking areas.....		2	4	4
Fishing parking areas.....			1	
Number of acres designated as recreation lands.....		23,207	16,500	
(Castle Peak).....		(6,707)		
(Bull Gulch).....		(10,214)	(10,214)	
(Dotsero Crater).....		(360)	(360)	
(Hack Lake).....		(3,456)	(3,456)	
(Deep Creek).....		(2,470)	(2,470)	
Number of acres identified as recreation management areas.....				16,140
(Bull Gulch).....				(10,214)
(Hack Lake).....				(3,456)
(Deep Creek).....				(2,470)
Thompson Creek Natural Environment Area.....	4,286	4,286	4,286	4,286
Upper Colorado River special recreation management area.....	no	yes	yes	yes
Acquisition of private land (approximate location).....		Twin Bridges.....	Twin Bridges and Burns.....	Twin Bridges and Burns.....
Number (and acres) of off-road vehicle use areas.....			2 (5,870 acres).....	1
Number of interpretive overlooks.....			2	1

¹Acreeage not yet determined.

Under the Continuation of Current Management Alternative, new legal access would not be acquired to open public land to public use. Recreation areas currently closed to mineral location, mineral sales, and oil and gas surface facilities (Map 3-6) would remain closed.

Under the Resource Protection, Economic Development, and Preferred Alternatives, 50 acres in the Frying Pan Recreation Sites would be closed to mineral sales; 2,470 acres in Deep Creek would be closed to oil and gas leasing, mineral sales, and mineral location (Maps 3-7 and 3-8); and 3,956 acres would be closed to mineral sales and oil and gas surface facilities in Hack Lake (Maps 3-7 and 3-8). These new proposals would be additions to the acreage presently closed (Map 3-6). Legal access would be acquired under the Economic Development and Preferred Alternatives to open public land to public use as shown on Maps 3-40 and 3-41.

Under the Preferred Alternative, Bull Gulch, Hack Lake, and Deep Creek would not be designated as recreation lands but would be identified as recreation management areas. Specific recommendations would be made to manage these areas.

Support

Fire support would be needed under all alternatives for managing natural fire in meeting recreation resource objectives and the protection of unique and fragile recreation resources.

Under the Resource Protection, Economic Development, and Preferred Alternatives, cooperative agreements would be developed with the Colorado Division of Parks and Recreation for the development and maintenance of proposed trails and snowmobile parking areas. Engineering would be required for design and construction of recreational

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facilities. Cadastral survey and appraisal would be necessary for acquisition of private land.

Under the Economic Development and Preferred Alternatives, a cooperative agreement would be developed with the owner of the property near Sheep Gulch to use the area as a river access site.

Implementation

Under the Resource Protection, Economic Development, and Preferred Alternatives, proposed new projects and management actions would be evaluated for consistency with ROS management objectives. Recreation management plans would be prepared for special recreation management areas and designated recreation lands following completion of the resource management plan. Site plans would be prepared for new facility developments.

Consistency

Specific management of recreation resources on public land in the resource area is not addressed in the *State Comprehensive Outdoor Recreation Plan* or in the plans and policies of other agencies or local governments. However, the management objectives of all alternatives appear to be consistent with general language in the plans that discuss the importance of recreation.

Effects

Continuation of Current Management Alternative. Existing settings would be maintained. Deterioration of existing recreational facilities would be prevented through maintenance. Future recreation demands would not be met, however.

Resource Protection Alternative. Existing settings would be maintained in most areas. Deterioration of existing and proposed facilities would be prevented through maintenance. The additional facilities proposed would accommodate existing use and help prevent resource degradation in high use areas.

Economic Development Alternative. Existing settings would be maintained in most areas. Maintenance would prevent deterioration of existing and proposed facilities. Both existing and future recreation demands would be met.

Preferred Alternative. Existing settings would be maintained in most areas. Maintenance would prevent deterioration of existing and proposed recreational facilities. Both existing and future recreation demands would be met, and fragile resource values would be protected.

CULTURAL RESOURCE MANAGEMENT

Objectives

Continuation of Current Management Alternative. To prevent cultural resource loss or damage.

Resource Protection, Economic Development, and Preferred Alternatives. To protect the cultural and historical values in the resource area from accidental or intentional destruction and give special protection to high value cultural resource sites.

Proposed Management Actions

Under the Continuation of Current Management Alternative, projects would be inventoried for cultural resources prior to project approval as required by law and policy. Measures would be taken to protect any cultural resources found.

Under the Resource Protection, Economic Development, and Preferred Alternatives, approximately 4,178 acres known as the Blue Hill Archaeological District would be nominated for designation on the *National Register of Historic Places* and would be designated as an area of critical environmental concern (ACEC). Selected sites identified as having high value for management would be actively managed as outlined in the Glenwood Springs Cultural Resource Management Guide. The remaining sites would be managed as prescribed by law and policy to protect cultural resource values.

Project areas would be inventoried for cultural resources prior to project approval. Measures would be taken to protect any cultural resources found.

Support

Fire management would be needed under all but the Continuation of Current Management Alternative for management of natural fire in meeting cultural resource objectives.

Implementation

Under all alternatives, cultural resource clearances would be required for each project prior to construction or development.

Under the Resource Protection, Economic Development, and Preferred Alternatives, high-value sites would be managed as outlined in a cultural resource management guide.

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Consistency

Local plans and policies do not specifically address cultural resources. However, the Resource Protection, Economic Development, and Preferred Alternatives are consistent with the State Historic Preservation Officer's plan for management of cultural resources.

Effects

Continuation of Current Management, Resource Protection, Economic Development, and Preferred Alternatives. Inventory of project sites prior to project approval would continue to protect cultural resources from destruction.

Resource Protection, Economic Development, and Preferred Alternatives. New information about past civilizations would be obtained from managing the Blue Hill Archaeological District and other high value sites. Protection from natural or man-caused deterioration would be provided to these sites through special protective measures.

PALEONTOLOGICAL RESOURCE MANAGEMENT

Objectives, Proposed Management Actions, Support, Implementation, and Consistency would be the same under all alternatives.

Objective

To manage the cultural resource program as required by law and policy to protect significant paleontological values.

Proposed Management Actions

Projects would be inventoried for paleontological resources in areas of high paleontological values prior to project approval. Measures would be taken to protect any paleontological resources found.

Support

No support would be required.

Implementation

In areas requiring inventory, a survey would be conducted prior to approval of projects involving surface disturbance.

Consistency

This management approach is consistent with existing law and policy. Local land use plans or policies do not address paleontological resources.

Effects

Continuation of Current Management, Resource Protection, Economic Development, and Preferred Alternatives. Inventory of project sites prior to project approval would continue to protect paleontological resources from destruction.

WILDERNESS MANAGEMENT

Objective

The objective under all alternatives would be to determine the suitability or unsuitability of wilderness study areas (WSA) for wilderness designation.

Proposed Management Actions

The BLM is required by the *Federal Land Policy and Management Act of 1976* to recommend WSAs as suitable or unsuitable for designation as wilderness. Therefore, suitability recommendations must be made under all alternatives, including the Continuation of Current Management Alternative.

To satisfy the requirements of BLM's Wilderness Study Policy, an all wilderness option; a no wilderness option; and, when appropriate a partial wilderness option were analyzed for each WSA under each alternative. These analyses describe the impacts of each option on wilderness and on other resource values. From these analyses, a preliminary recommendation of suitability or unsuitability for wilderness designation was made for each WSA under each alternative. The preliminary recommendations are described in this section.

The analyses are in the *Wilderness Suitability Analysis*, which has been published as a technical supplement and is available upon request from the Glenwood Springs Resource Area office.

Map 3-27 shows the identified WSAs and the suitability recommendations. Table 3-18 shows the acreage in each WSA that would be recommended as suitable and unsuitable for wilderness designation. These recommendations are preliminary and, therefore, could change during administrative review. These recommendations would become final only if adopted by the Secretary of the Interior and the President.

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TABLE 3-18. SUMMARY OF WILDERNESS PROPOSED MANAGEMENT ACTIONS
(in acres)

Wilderness Study Area	CCMA		RPA		EDA		PA	
	S ¹	NS ²	S ¹	NS ²	S ¹	NS ²	S ¹	NS ²
	Eagle Mountain ³	330	0	330	0	330	0	330	0
Hack Lake ⁴	10	3,350	3,360	0	10	3,350	10	3,350
Bull Gulch.....	10,415	4,585	15,000	0	10,415	4,585	0	15,000
Castle Peak.....	0	11,490	11,940	0	0	11,940	0	11,940
Total.....	10,755	19,875	30,630	0	10,755	19,875	340	30,290

¹S—Suitable.

²NS—Nonsuitable.

³Would be added to the existing Maroon Bells-Snowmass Wilderness administered by the U. S. Forest Service.

⁴Would be added to the existing Flat Tops Wilderness administered by the U. S. Forest Service.

Administration of the Eagle Mountain WSA and the preliminarily suitable portion of Hack Lake WSA would be recommended for transfer to the U. S. Forest Service upon designation as wilderness.

Support

Mineral surveys by the U. S. Geological Survey and the U. S. Bureau of Mines would be required for WSAs recommended as preliminarily suitable for wilderness designation as requested by the BLM Director. Fire management support would be needed for management of natural fire in meeting the resource objective and for the protection of unique and fragile resources.

Implementation

Following the completion of the resource management plan, a wilderness study report identifying the wilderness suitability or nonsuitability recommendations for each WSA will be prepared and submitted to Congress. Appendix D explains the procedures and roles involved in the wilderness reporting process. The wilderness study report will be accompanied by a separate final environmental impact statement on the wilderness portion of the plan. This draft environmental impact statement serves as the draft for both the final environmental impact statement on the resource management plan and the final wilderness environmental impact statement. Only Congress has the authority to add an area to the National Wilderness Preservation System.

Consistency

Both Pitkin County and the White River National Forest support a suitable recommendation for the

Eagle Mountain WSA. The White River National Forest supports a suitable recommendation for only about 10 acres of the Hack Lake WSA above the rim of the Flat Tops. Garfield and Eagle Counties have no written policies concerning wilderness designation.

Effects

Continuation of Current Management, Resource Protection, Economic Development, and Preferred Alternatives. Wilderness values would be preserved on the acres recommended as suitable for wilderness designation.

Opportunities to develop and use other resources such as minerals and forest products would be lost on the acreage recommended as suitable for wilderness designation. These losses would be insignificant under the Continuation of Current Management, Economic Development, and Preferred Alternatives as the other resources present are not commercially valuable. However, losses under the Resource Protection Alternative would be significant as Castle Peak contains valuable forest products.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN (ACECs)

Areas of critical environmental concern would not be designated under the Continuation of Current Management Alternative. Therefore, the following descriptions are for the Resource Protection, Economic Development, and Preferred Alternatives only.

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Objective

The objective would be the same under all alternatives except Continuation of Current Management: To designate areas where special management is needed to protect important historic, cultural, and scenic values; fish and wildlife resources; other natural systems; or human life and property from natural hazards.

Proposed Management Actions

Map 3-28 shows locations of areas, streams, and a lake that would be designated as ACECs. Table 3-19 lists each area and gives the reason for each designation.

TABLE 3-19. SUMMARY OF AREAS OF CRITICAL ENVIRONMENTAL CONCERN (ACEC) DESIGNATIONS

Name and Reason for Designation	RPA	EDA	PA
Areas (in acres)			
Blue Hill Archaeological District (cultural resources)			
Glenwood Springs Debris Flow Hazard Zone (mud and debris flow).....	4,178	4,178	4,178
Thompson Creek (scenic values).....	6,675	6,675	6,675
Bull Gulch (scenic values).....	2,918	2,918	2,918
Deep Creek (scenic values).....	6,714	6,714	6,714
Total Acres.....	2,470	2,470	2,470
Streams (in stream miles)			
Red Dirt Creek (Colorado River cutthroat trout)			
Abrams Creek (Colorado River cutthroat trout).....	1.0	1.0	1.0
Mitchell Creek (Colorado River cutthroat trout).....	1.9	1.9	1.9
Keyser Creek (Colorado River cutthroat trout).....	0.8	0.8	0.8
East Canyon Creek (Colorado River cutthroat trout).....	0.9	0.9	
Possum Creek (Colorado River cutthroat trout).....	1.7	1.7	
Second Anvil Creek (Colorado River cutthroat trout).....	4.7	4.7	4.7
East Middle Fork, Parachute Creek (Colorado River cutthroat trout).....	1.5	1.5	1.5
Northwater Creek (Colorado River cutthroat trout).....	1.2	1.2	1.2
East Fork, Parachute Creek (Colorado River cutthroat trout).....	4.2	4.2	4.2
Trapper Creek (Colorado River cutthroat trout).....	6.4	6.4	6.4
First Water Gulch (Colorado River cutthroat trout).....	5.7	5.7	5.7
JQS Gulch (Colorado River cutthroat trout).....	0.6	0.6	0.6
First Anvil Creek (Colorado River cutthroat trout).....	1.4	1.4	1.4
Colorado River West (razorback sucker)	2.5	2.5	2.5
Total stream miles	1.0	1.0	
Lakes (in surface acres)			
Hack Lake (Colorado River cutthroat trout).....	35.5	35.5	31.9
	2.0	2.0	2.0

Support

Engineering support would be needed to implement specific recommendations. Fire support would be needed to protect unique and fragile resource values.

Consistency

Refer to the Cultural Resource, Visual Resource, and Wildlife Habitat Management sections for discussions on consistency.

Implementation

Management of the ACECs would be prescribed in site-specific resource plans following completion of the resource management plan. However, designations would become final upon formal approval of the resource management plan.

Effects

Continuation of Current Management Alternative. Cultural values in the Blue Hill Archaeological District would not be protected through ACEC designation. Therefore, information about the past cultures using that area could be lost. Mud and debris flow would continue to be a problem in Glenwood Springs; scenic values in Thompson Creek, Bull Gulch, and Deep creek would not be protected; and Colorado River cutthroat trout would not be protected in 14 streams and 1 lake. The razorback

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sucker would not be protected in the Colorado River west.

Mud and debris flow in Glenwood Springs is a serious problem. Therefore, not managing the debris flow hazard zone would be significant. The Colorado River cutthroat trout and the razorback sucker are both listed in Colorado as threatened species.

Resource Protection, Economic Development, and Preferred Alternatives. By protecting the areas, streams, and lakes as proposed, impacts described under the Continuation of Current Management would be reduced or eliminated. These benefits would be long term and significant.

VISUAL RESOURCE MANAGEMENT

Objectives

Continuation of Current Management Alternative. To *maintain existing* visual quality throughout the resource area.

Resource Protection Alternative and Economic Development Alternative. To *maintain or improve* existing visual quality throughout the resource area and protect high-value visual resource areas.

Preferred Alternative. To *maintain* existing visual quality throughout the resource area and protect unique and fragile resource values.

Proposed Management Actions

Visual resource management classes would be designated as shown on Maps 3-29, 3-30, and 3-31, and visual resources would be managed by the objectives for each class. (Visual resource management classes are defined in the Glossary.) Table 3-20 shows the approximate acreage within each class by alternative.

TABLE 3-20. SUMMARY OF VISUAL RESOURCES MANAGEMENT CLASSES

Class	CCMA		RPA		EDA		PA	
	Acres	Per- cent of Re- source Area	Acres	Per- cent of Re- source Area	Acres	Per- cent of Re- source Area	Acres	Per- cent of Re- source Area
Class I	0	0	12,102	2	12,102	2	0	0
Class II	283,091	50	270,989	48	216,917	38	237,759	42
Class III	105,962	18	105,962	18	180,034	28	149,929	26
Class IV	175,325	31	175,498	31	175,498	31	176,690	31
Class V	1,664	1	1,491	1	1,491	1	1,664	1

Visual resource management classes range from Class I, which would provide full protection for the visual resource, to Class V, which includes areas so badly impacted and disturbed that the sites require rehabilitation. Visual resource management classes are designed to establish objectives that outline the amount of disturbance an area can tolerate before it no longer meets the objectives of that class.

Under the Resource Protection, Economic Development, and Preferred Alternatives, Deep Creek and Bull Gulch would be designated as areas of **critical environmental concern (ACECs)**. Thompson Creek would also be designated as an ACEC but only under the Resource Protection and Economic Development Alternatives. Under the Resource Protection and Economic Development Alternatives, these three areas would be managed

under visual resource management Class I objectives. Under the Continuation of Current Management and Preferred Alternatives, the areas would be managed under Class II objectives.

Under the Economic Development and Preferred Alternatives, some Class II areas would be changed to Class III to allow resource management actions such as timber harvesting and vegetation manipulation to occur. Under the Preferred Alternative, some Class III areas would be changed to Class IV to be consistent with developments on adjacent private lands.

Under the Resource Protection and Economic Development Alternatives, visual intrusions would be rehabilitated to improve the areas' visual qualities. A visual intrusion is a site or area that is highly

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disturbed and very noticeable. The types of intrusions identified for management include dump sites, old fire scars, communication sites, and off-road vehicle areas.

Under the Continuation of Current Management and Preferred Alternatives, no specific visual intrusions would be identified for rehabilitation.

Support

Fire management support would be needed under all alternatives for management of natural fire in meeting the resource objective and for the protection of unique and fragile resources.

Implementation

Proposed projects would be evaluated for consistency with visual resource management objectives.

A management plan would be prepared for each ACEC. Management plans would prescribe visual resource management objectives for each area and identify constraints on proposed projects and activities within these areas.

Rehabilitation of dump sites would require removal of trash, scarifying, and seeding. An off-road vehicle designation limiting motorized use to designated roads and trails would be necessary for successful revegetation in two areas (see Off-Road Vehicle Management section). Rehabilitation of communication sites would require either cooperative agreements with the permittees or the addition of stipulations to the right-of-way grants upon renewal.

Consistency

The proposed management actions are consistent with local land use plans and policies that place value on the preservation of open space and scenic quality except for the changes from Class II to Class III within the viewsheds of Interstate 70 and Colorado Highway 131 under the Economic Development Alternative. These changes are inconsistent with the Eagle County Master Plan, which states "Particular attention should be given to preserving scenic and recreation amenities adjacent to transportation corridors, resource centers, and other development areas."

Effects

Continuation of Current Management Alternative. Existing visual quality would be maintained

through establishment of visual resource management classes.

Resource Protection and Economic Development Alternatives. Visual quality would be maintained through the establishment of visual resource management classes. High scenic values would be maintained in Thompson Creek, Bull Gulch, and Deep Creek through special management proposals.

Preferred Alternative. Visual quality would be maintained through the establishment of visual resource management classes. Unique and fragile resource values would be maintained in Bull Gulch and Deep Creek through special management proposals.

LAND TENURE ADJUSTMENTS

Objectives

Continuation of Current Management Alternative. To process all proposals for land acquisition and disposal on a case-by-case basis.

Resource Protection, Economic Development, and Preferred Alternatives. To increase the overall efficiency and effectiveness of public land management by identifying land that should be retained in public ownership and land that should be disposed of.

Proposed Management Actions

Under the Continuation of Current Management Alternative, land tenure proposals would be processed and analyzed as they are received.

Under the Resource Protection, Economic Development, and Preferred Alternatives, two land tenure management zones would be identified: retention and disposal (Maps 3-32, 3-33, and 3-34). The retention zones would include that land where it would be in the best interest of the public to retain and manage public land. Within the retention zones, public land suitable for cooperative management would be identified. Public land identified for cooperative management would be more efficiently managed in conjunction with other governmental agencies.

Under the Resource Protection, Economic Development, and Preferred Alternatives, the disposal zones would include public land where it would be in the best interest of the public to dispose of public land to (1) increase management efficiency; (2) make land available for more intensive use; and (3) serve the national interest. Under the Preferred

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Alternative, public land would be identified with a preference for disposal by public sale or with a preference for disposal by exchange. Public land parcels in the disposal zone that meet the considerations for disposal (Appendix G, Disposal Zone Considerations) would be identified for public sale.

Public land parcels in the disposal zone that meet the considerations for disposal but have greater potential for management of resource values would be given priority for disposal through exchange. Table 3-21 shows the acres identified under each zone.

TABLE 3-21. SUMMARY OF LAND TENURE ADJUSTMENTS

(in acres)

Zone	RPA	EDA	PA
Retention Zone	556,487	528,492	542,797
(Public Land Management)	(494,317)	(469,672)	(486,537)
(Cooperative Management)	(62,170)	(58,820)	(56,260)
Disposal Zone	9,555	37,550	23,245

*Eleven thousand twenty-five acres (11,025) would be given high priority for disposal through public sales and 12,220 acres would be given high priority for disposal through exchange.

Appendix G shows the considerations used to identify retention and disposal zones.

Support

Support would be needed under all alternatives for conducting cadastral surveys and appraisal reports to locate and estimate the value of public land.

Implementation

Under the Continuation of Current Management Alternative, environmental assessments and land reports would be prepared for all proposals. Proposals determined to be in the public interest would be approved.

Under the Resource Protection, Economic Development, and Preferred Alternatives, existing and future proposals to buy, sell, or exchange public land would be evaluated using considerations presented in Appendix G and the zones displayed on Maps 3-32, 3-33, and 3-34. Environmental assessments and land reports would be prepared for existing and future proposals following resource management plan approval.

Consistency

Coordinating and conferring with affected state and local governments would continue prior to the final decisions on disposal.

The concept of identifying areas for retention, disposal, and cooperative management under the Resource Protection, Economic Development, and Preferred Alternatives is supported by the affected

counties. However, the acreage of public land identified for disposal under the Economic Development Alternative is generally in excess of the desires of each affected county. Close coordination and consultation with affected counties would be made to establish priorities and methods of disposal to minimize adverse impacts.

Effects

Continuation of Current Management Alternative. Guidance would not be available for processing land tenure proposals. This would continue to cause problems in processing.

Resource Protection Alternative. A program would exist to guide land tenure adjustment proposals. Disposal of 9,555 acres would result in a significant loss of crucial big game winter range on 6,790 acres in the resource area. Losses of forest land and grazing privileges would also occur but would be insignificant. Administrative efficiency would improve.

Economic Development Alternative. A program would exist to guide land tenure adjustment proposals in the resource area. Disposal of 37,550 acres of public land would have a significant adverse impact on big game through loss of 27,500 acres of crucial winter range. Less significant losses of products and livestock forage would also occur. Administrative efficiency would be substantially improved.

Preferred Alternative. A program would exist to guide land tenure adjustment proposals. Disposal of 23,245 acres of public land would have a significant adverse impact on big game through the loss of 14,730 acres of crucial winter range. Loss of forest products and livestock forage would also occur but

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would be insignificant. Administrative efficiency would be substantially improved.

OFF-ROAD VEHICLE MANAGEMENT

Objectives

Continuation of Current Management Alternative. To provide maximum off-road vehicle (ORV) opportunities throughout the resource area.

Resource Protection and Preferred Alternatives. To protect fragile and unique resource values from damage by ORV use.

Economic Development Alternative. To provide ORV opportunities while protecting fragile and unique resource values.

Proposed Management Actions

Under the Continuation of Current Management Alternative, all public land in the resource area would be designated open to ORV use except for

10,755 acres in the Eagle Mountain, Hack Lake, and Bull Gulch Wilderness Study Areas that would be closed to all motorized use upon wilderness designation by Congress. (ORV designations are defined in the Glossary.)

Under the Resource Protection, Economic Development, and Preferred Alternatives, fragile and unique resources would be protected from damage by motorized vehicle use to greater and lesser extents. Some areas would be designated closed to all motorized vehicles. Others would be designated limited to certain types of motorized vehicle use or to certain seasons of use.

Under the Economic Development Alternative, two areas would be identified for intensive use. Under the Preferred Alternative, an intensive use area would be identified at a later date in the Parachute/Battlement Mesa area if a suitable location could be identified.

Maps 3-35, 3-36, and 3-37 show the locations of the designations. Table 3-22 shows the acreage within each category. The designations would be in effect year-round except for the seasonal limitations described in Table 3-23.

TABLE 3-22. SUMMARY OF OFF-ROAD VEHICLE DESIGNATIONS

Designation	RPA		EDA		PA	
	Acre	Percent of Resource Area	Acre	Percent of Resource Area	Acre	Percent of Resource Area
Closed	42,345	7	20,426	4	20,426	4
Limited ¹	118,086	21	99,917	17	152,001	27
Open	405,611	72	445,699	79	393,615	69
Intensive Use	0	0	25,870	² 1	³ unknown	³ unknown

Note: Closures and limitations would not apply to federal, state, and local law enforcement officers; members of organized rescue or fire-fighting forces in the performance of official duties, or persons with a permit specifically authorizing the otherwise prohibited use.

¹Includes existing roads and trails, designated roads and trails, and seasonal limitations.

²Within open designation.

³Location not known at this time.

Support

No support would be needed.

Implementation

An implementation plan would be prepared for ORV designations. Notices would be published and designations would be described in the *Federal Register* and local newspapers. Maps showing the

designations would be printed and made available to the public. Where necessary, signs would be posted for closed and limited areas to delineate the restricted areas and explain the specific restrictions.

Consistency

The White River National Forest is presently preparing a land use plan. What ORV designations will be made in the White River plan is unknown. Other local land use plans do not address ORV travel.

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TABLE 3-23. OFF-ROAD VEHICLE SEASONAL LIMITATIONS

Area Number ¹	Limitation	Dates of Limitations	RPA	EDA	PA
1	Limited to snowmobiles operating on snow.	12/1 to 3/15	X	X	X
2	Limited to snowmobiles operating on the existing road along Prince Creek.	12/1 to 4/30	X	X	X
2	All motorized vehicle travel limited to existing roads and trails.	5/1 to 6/1	X	X	X
3	Closed to all motorized vehicle use.	1/1 to 4/30	X	X	X
3	All motorized vehicle travel limited to existing roads and trails.	5/1 to 12/31	X	X	X
4	Closed to all motorized vehicle use.	1/1 to 4/31	X	X	X
5	Closed to all motorized vehicle travel except for snowmobiles operating on snow on the existing roads along Dry Creek and Battlement Creek.	1/1 to 4/30	X	.....	X
5	All motorized vehicle travel limited to existing roads and trails.	5/1 to 12/31	X	.....	X

¹Numbers correspond to numbered areas on Maps 3-35, 3-36, and 3-37.

Effects

Continuation of Current Management Alternative. Fragile resources in areas of high ORV use would continue to be damaged from recreational ORV use.

Resource Protection, Economic Development, and Preferred Alternatives. In areas closed or limited to ORV use, fragile and unique resource values would be protected. Closures in all alternatives are less than 10 percent of the total public land in the resource area; therefore, there would be an insignificant adverse impact on ORV use opportunities. Designating areas for intensive ORV use would provide ORV users areas in which to recreate.

TRANSPORTATION MANAGEMENT

Objectives

Continuation of Current Management, Resource Protection, Economic Development, and Preferred Alternatives. To provide access to public land in support of the management objectives of other resources.

Proposed Management Actions

Under the Continuation of Current Management Alternative, no new roads or trails would be added on public land. Easements for public access occasionally would be acquired where needed for managing resources.

Under the Resource Protection, Economic Development, and Preferred Alternatives, additional miles of road and trail would be provided for public

access. Easements for public access would also be identified. These new access recommendations are in support of other resource programs such as recreation, wildlife, fishery, forestry, and livestock grazing management.

Locations of existing and additional roads and trails and areas identified for easement acquisition are shown on Maps 3-39, 3-40, and 3-41. Table 3-24 lists acres and number of easements under each alternative.

TABLE 3-24. SUMMARY OF ROADS AND TRAILS PROPOSED ON PUBLIC LAND

Proposed Action	CCMA	RPA	EDA	PA
Miles of roads.....	217	220	300	260
Miles of trails.....	8	23	50	48
Areas identified for easement acquisition.....		36	52	50

Support

No specific support would be identified for present programs under the Continuation of Current Management Alternative. Cadastral survey for boundary determination and corner identification would be necessary to accurately plot easement locations under the Resource Protection, Economic Development, and Preferred Alternatives.

Implementation

Under the Continuation of Current Management Alternative, roads would continue to be maintained on a sporadic basis for specific resource needs.

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Easements for public access occasionally would be acquired where needed for specific resource needs.

Under the Resource Protection, Economic Development, and Preferred Alternatives, a route analysis including a field review of all roads within the area would be made to determine preferred road locations before acquiring easements or constructing roads. Transportation routes shown on Maps 3-39, 3-40, and 3-41 are approximate locations only. A maintenance schedule would be developed for all roads on public land. Maps with route locations would be made available to the public.

Consistency

U. S. Forest Service and Colorado Division of Wildlife programs require public access across public land. Since the Continuation of Current Management Alternative fails to provide access to many blocks of public land, it is not consistent with the U. S. Forest Service and Colorado Division of Wildlife transportation plans.

Proposed roads and trails under the other alternatives are consistent with the transportation plans of Eagle, Garfield, and Pitkin Counties, and the White River National Forest.

Effects

Continuation of Current Management Alternative. Resource programs which require additional access to accomplish resource objectives as defined in this alternative would be adversely affected. Examples include recreation resource management and forest management.

Resource Protection Alternative. Several new areas would have legal access benefitting the management objectives of many resource programs.

Economic Development and Preferred Alternatives. A significant amount of new legal access would be provided to nearly all large blocks of public land. These would provide significant beneficial impacts to resource programs relying on legal access to accomplish management objectives.

UTILITY AND COMMUNICATION FACILITY MANAGEMENT

Objectives

Continuation of Current Management Alternative. To respond to requests for utility and communication facility authorizations on a case-by-case basis.

Resource Protection, Economic Development, and Preferred Alternatives. To respond, in a timely manner, to requests for utility and communication facility authorizations on public land while considering environmental, social, economic, and interagency concerns.

Proposed Management Actions

Under the Continuation of Current Management Alternative, all proposals to construct utility and communication facilities within the resource area would be considered as they are received.

Under the Resource Protection, Economic Development, and Preferred Alternatives, suitable, sensitive, and unsuitable zones for utility and communication facility development would be designated as shown on Maps 3-42, 3-43, and 3-44. Table 3-25 lists the acres under each alternative that would be suitable, sensitive, and unsuitable for electric transmission and distribution lines and related facilities, pipelines and related facilities, and communication facilities. Table 3-26 shows the resource values that contributed to designation of these zones.

TABLE 3-25. SUMMARY OF UTILITY AND COMMUNICATION FACILITY DESIGNATIONS

(in acres)

Designation	RPA	EDA	PA
Suitable.....	434,427	462,523	458,249
Sensitive ¹	67,988	48,196	85,110
Unsuitable ²	63,627	55,323	22,673
Temporarily Unsuitable ³	See Map 3- 44.	See Map 3- 43.	See Map 3- 44

¹Does not include sensitive viewshed acreage shown in Visual Resource Management section.

²Does not include public land along the Colorado river where location of public land is in question.

³Acreage represents lands along the lower Colorado River that are currently under survey to determine correct land status. Once status is determined, unsuitable acreage will be adjusted.

Support

Engineering support would be needed under all alternatives for design analysis of proposals. Appraisal support would be needed for valuation of rights-of-way.

Implementation

Under the Continuation of Current Management Alternative, proposals would be processed on a case-by-case basis considering fragile, unique, or restrictive resource values as part of preapplication

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TABLE 3-26. RESOURCES CONTRIBUTING TO IDENTIFICATION OF MANAGEMENT ZONES FOR UTILITY AND COMMUNICATION FACILITIES

Symbol on Map	Value Present	Designation ¹		
		RPA	EDA	PA
Wildlife				
BE/BH	Bald eagle/blue heron high-use areas, (nest, perch, and roost trees)	U	U	U
SG	Sage grouse strutting grounds	U	S	S
SG	Sage grouse winter-use and brood areas	S	U	S
EC	Elk calving areas	U	U	S
P	Peregrine falcon reintroduction areas (proposed)	U	U	U
R	Raptor concentration areas	S	U	S
AH	Aquatic habitat	S	S	S
B	Riparian areas (not shown on map)	S	S	S
B	Bighorn sheep reintroduction areas (proposed)	S		
Recreation				
SPNM	Primitive and semi-primitive non-motorized areas	S	S	S
RS	Recreation sites (existing and proposed)	U	U	U
SRMA	Special recreation management areas	S	S	S
NEA	Thompson Creek Natural Environmental Area (proposed)	S	S	U
PNV	Primitive and natural values			U
Wilderness				
WSA	Wilderness study areas identified preliminarily suitable for wilderness (Portions recommended unsuitable for wilderness consideration are designated sensitive but will be managed under BLM's <i>Interim Management Policy and Guidelines for Lands Under Wilderness Review</i> , December 1979.) U		U	U
Hydrology				
GDF	Glenwood Springs severe debris flow hazard zone (proposed area of critical environmental concern)	U	U	S
MW	Municipal watersheds	U	U	S
	Flood plains (not shown on map)	S	S	S
	Wetlands (not shown on map)	S	S	S
Visual				
	Sensitive viewsheds (consult the Visual Resource Management Map 3-31)			S
Cultural Values				
BHAD	Blue Hill Archaeological District			S

¹Designations: U—unsuitable; S—sensitive.

meetings. Proposals that would cause unacceptable adverse impacts that could not be mitigated would be rejected.

Under the Resource Protection, Economic Development, and Preferred Alternatives, applications for land use authorizations would be compared with the zones and then processed on a case-by-case basis as outlined in BLM regulations. All approved authorizations would include stipulations to mitigate impacts associated with their authorization and development.

Applications within unsuitable zones would be rejected, except where valid existing rights require granting of authorization.

Applications in sensitive areas would be considered if mitigation measures could reduce the potential impacts of the project on the identified sensitive resource. In most cases, applicants would be encouraged to seek alternate locations when available.

In all zones, use of current corridors or upgrading of existing facilities would be encouraged.

Consistency

By coordinating and conferring with affected local governments as part of the authorization process, consistency with their plans would continue to be attempted under the Continuation of Current Management Alternative.

The concept of identifying sensitive and unsuitable zones under the Resource Protection, Economic Development, and Preferred Alternatives has received support from each of the affected counties. Most utility companies also support this concept.

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Effects

Continuation of Current Management Alternative. Because areas would not be identified as sensitive and unsuitable, utility companies would continue to submit proposals in unsuitable and sensitive areas only to have their proposals rejected or modified later. This practice causes delays and increases processing costs.

Resource Protection, Economic Development, and Preferred Alternatives. Identification of zones as unsuitable, sensitive, and suitable for consideration would help utility companies design proposals for land use authorizations. This practice would reduce processing costs and increase efficiency. Those resource values present in the unsuitable and sensitive zones (Table 3-26) would be protected from damage by utility companies.

FIRE MANAGEMENT

Objectives

Continuation of Current Management Alternative. To minimize total resource losses, suppression costs, rehabilitation costs, and environmental damage.

Resource Protection, Economic Development, and Preferred Alternatives. To reduce losses, complement resource management objectives, and sustain the productivity of the biological systems.

Proposed Management Actions

Under the Continuation of Current Management Alternative, all fires would be suppressed using existing fire-fighting forces.

Under the Resource Protection, Economic Development, and Preferred Alternatives, three zones would be designated within the resource area for management of wildfire—fire exclusion, fire management, and fire suppression.

In fire exclusion zones, immediate actions would be taken to suppress all wildfires to protect resource values.

In fire management zones, wildfire could be used as a management tool to maintain natural ecosystems or manipulate vegetation types. Controlled burns and any other burning would comply with BLM Manual Section 7723, *Air Quality Maintenance Requirements* (see Appendix B). Within this zone detrimental and beneficial impacts of fire would be considered. Those anticipated impacts and the burning conditions would be used to determine suppression techniques used to control the burning.

In fire suppression zones, actions would be taken to contain wildfire. Should a fire escape suppression ability, it would be managed to minimize environmental damage and rehabilitation cost. Approximate locations of these zones are shown on Maps 3-44, 3-45, and 3-46. Table 3-27 shows the number of acres within each zone.

TABLE 3-27. SUMMARY OF PROPOSED MANAGEMENT ZONES

(in acres)

Zone	RPA	EDA	PA
Fire Exclusion Zone.....	90,240	120,320	73,380
Fire Management Zone.....	122,420	95,180	179,840
(Vegetation Manipulation Area).....	(79,540)	(79,540)	(156,540)
(Ecosystem Maintenance Area).....	(42,880)	(16,640)	(23,300)
Fire Suppression Zone.....	353,382	349,542	312,822

Support

Support would be needed from the U. S. Forest Service, Colorado State Forest, BLM's Western Slope Fire Operation's Office, and local fire districts for presuppression and suppression planning and equipment.

Implementation

Under the Continuation of Current Management Alternative, available firefighters and equipment would be used to suppress initial outbreaks. Additional firefighters and equipment would be called in from other districts or agencies to help fight fires uncontrolled by 10 a.m. the day following the outbreak. The additional suppression actions taken would be determined by the fire management officer and area manager.

HOW THE PREFERRED ALTERNATIVE WAS SELECTED

Under the Resource Protection, Economic Development, and Preferred Alternatives, fire management plans would be written for geographic areas following completion of the resource management plan. Specific boundaries and fire prescriptions would be identified at that time to meet the objectives of the management zone and resource values within that zone.

Consistency

All Alternatives are consistent with U. S. Forest Service and BLM policies. The Resource Protection, Economic Development, and Preferred Alternatives were discussed with the Colorado State Forest Service and the fire chiefs from the fire protection districts within the resource area and were favorably received.

Effects

Continuation of Current Management Alternative. Because fire would not be used to manage vegetation, time and money would be spent fighting fires that could actually be beneficial to wildlife, livestock, and water yield. Resources that could be harmed by fire such as timber would continue to be protected.

Resource Protection, Economic Development, and Preferred Alternatives. By specifying where fire is wanted and unwanted, time and money would not be spent fighting beneficial fires. Moreover, some resources would benefit from fire.

HOW THE PREFERRED ALTERNATIVE WAS SELECTED

The Preferred Alternative was selected by a team composed of the district manager, assistant district manager, area manager, team leader, and appropriate team specialists. It was reviewed by the State Director.

The Preferred Alternative was selected based on (1) issues raised throughout the planning process, (2) public input received at meetings, workshops, and in response to newsletters, (3) a set of decision criteria, and (4) the environmental analysis developed on the previously-formulated alternatives. The following discussion explains the general rationale for the management levels selected in the Preferred Alternative.

WATER QUALITY MANAGEMENT

Based on public input, the most serious known water quality problems appear to be in the vicinity of the Milk and Alkali Creek drainages, which flow into the Eagle River. Degradation of fisheries in the Eagle River has high public interest. Management of this area could improve the river's water quality.

WATER YIELD MANAGEMENT

Availability of water in this region is an issue of wide concern. Under the Preferred Alternative, vegetation manipulations proposed for livestock grazing, wildlife habitat, and timber harvesting incorporate techniques to increase water yield. Because water increases would be greater in aspen stands than in other vegetation types, only aspen was proposed for treatment specifically for increasing water yield.

CRITICAL WATERSHED AREAS

The protection of critical watersheds (erosion hazard zones, municipal watersheds, and debris flow hazard zones) is both of local and federal concern. These fragile areas were given special management emphasis in the Preferred Alternative.

MINERALS MANAGEMENT

The development of energy minerals is important to both the local economy and the nation. Therefore, the Preferred Alternative proposes the fewest additional restrictions on mineral activities while still protecting those fragile resources easily impacted by these developments. For example, this alternative includes the least acreage closed to oil and gas leasing and mineral location.

AQUATIC HABITAT MANAGEMENT

Aquatic habitat is improved generally to increase fish populations for recreational fishing and to protect or enhance threatened or endangered species. The Colorado Division of Wildlife supports fish programs on streams with good stream flows and concentrations of recreational use; therefore, only streams on public land now accessible or where access was proposed by other resource programs

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were identified for management. Management on several streams for threatened Colorado River cutthroat trout was also emphasized.

TERRESTRIAL HABITAT MANAGEMENT AND LIVESTOCK GRAZING MANAGEMENT

Livestock and wildlife are important in the resource area. They often compete for food on public land; therefore, BLM must allocate forage to ensure grazing levels do not exceed the estimated carrying capacity of the range.

Because ranchers feel *existing use* is too low and BLM feels *total preference* would be too high, *active preference* was selected as the objective for livestock grazing under the Preferred Alternative.

Existing use was selected as the objective for wildlife grazing because existing use seems more realistic than Colorado Division of Wildlife goals. The loss of habitat caused by industrial, commercial, and residential development in the area, and the total forage production available for both wildlife and livestock were considered in the selection process.

Expected decreases in animal numbers, as a result of insufficient forage production in individual allotments, were then prorated between big game and livestock. Expected increases in individual allotments on crucial winter ranges were allocated to meet existing big game requirements first. In the remainder of the resource area, forage increases were allocated to meet livestock active preference first.

FOREST MANAGEMENT

Management of forest land is an ongoing program in this resource area. To assure a continuous supply of forest products for available markets, annual allowable harvests for both sawtimber and fuelwood were established. Under the Preferred Alternative, the productive forest land allowable harvest was based on harvesting commercial species on all slopes within five forest management units and on harvesting commercial species only on slopes under 40 percent outside these units. Woodland allowable harvest was based on harvesting commercial species only on slopes under 40 percent.

RECREATION RESOURCE MANAGEMENT

Recreation is an important social and economic issue in this resource area. The Preferred Alternative was chosen to meet the existing and future recreational demands and provide the needed protection in high use areas to prevent resource degradation. Several areas were identified for management and protection because they contain unique or unusual, natural, scenic, or recreational values. Examples include Deep Creek, Bull Gulch and Thompson Creek.

CULTURAL RESOURCE MANAGEMENT

The general public does not consider management of cultural resources a major issue. However, many high value cultural sites are being lost through natural and man-caused actions. The Preferred Alternative was chosen to identify these high value sites and areas and recommend special management to protect them. The Blue Hill Archaeological area is identified for special management for these reasons. This is consistent with the BLM's role in managing cultural resources.

WILDERNESS MANAGEMENT

Wilderness is an important issue in the resource area. The Preferred Alternative recommends only 340 acres as preliminarily suitable for wilderness designation for the following reasons:

Castle Peak

The entire area was recommended as nonsuitable because commercially valuable timber and potential motorized recreation opportunities would be lost if designated as wilderness. The area is very similar to existing U. S. Forest Service wilderness areas and would add little to the diversity of the National Wilderness Preservation System.

Bull Gulch

The entire area was recommended as nonsuitable because other special management recommendations to protect visual, natural, and primitive recreational values were considered more appropriate for this area. This recommendation eliminates potential manageability problems that would result

SPECIFIC CRITERIA USED TO SELECT PREFERRED ALTERNATIVE

from wilderness management. In addition, this area would only add to the diversity of the National Wilderness Preservation System locally.

Hack Lake

The Hack Lake Wilderness Study Area (WSA) is less than 5,000 acres and therefore must be managed in conjunction with an existing wilderness area to qualify for designation. A small portion of Hack Lake (10 acres) was recommended because it is adjacent to the U. S. Forest Service Flat Tops Wilderness and could be managed as contiguous wilderness. The remainder of the WSA lies below the rim of the Flat Tops and was felt to be inconsistent with Congress's intent to maintain the Flat Tops Wilderness boundary above the rim.

Eagle Mountain

The Eagle Mountain WSA is less than 5,000 acres and, therefore, must be managed in conjunction with the U. S. Forest Service Maroon-Bells Snowmass Wilderness to qualify for designation. All of Eagle Mountain was recommended as suitable. It has essentially no resource conflicts and is consistent with U. S. Forest Service management of the Maroon Bells-Snowmass Wilderness.

VISUAL RESOURCE MANAGEMENT

Visual quality is of concern to most residents in the resource area. The Preferred Alternative was chosen to provide special emphasis to the scenic quality along the Interstate 70 and Highway 82 travel corridors. Two additional areas, Deep Creek and Bull Gulch, required special measures to protect their outstanding scenic quality.

LAND TENURE ADJUSTMENTS

The lands identified for disposal in the Preferred Alternative were chosen to provide for better management of the resource area. These lands generally are small scattered tracts that are difficult and inefficient to manage and in most cases do not have important resource values. Those lands with important resource values, but still felt to be of better use in private ownership were identified as priority for exchange rather than sale to help block up ownership in other public land areas. This approach is consistent with current national policies regarding the identification of lands for disposal.

The recommendations in the Preferred Alternative for off-road vehicle management, transportation management, utility and communications facility management, and fire management were all chosen to support the proposals and objectives of the other resource programs.

SPECIFIC CRITERIA USED TO SELECT PREFERRED ALTERNATIVE

Prior to selecting the Preferred Alternative, the BLM managers drafted 11 decision criteria to be used as considerations in selection of the proposed management actions. The 11 criteria were mailed for comment to over 1,000 federal, state, and local agencies, groups, and individuals interested in the resource management plan. Based on comments received, the 11 criteria were revised and condensed. Following are the condensed forms that were considered in selecting the Preferred Alternative. The order does not indicate priority.

1. **Recommendations should reflect a high degree of compatibility with the goals of other agencies.** The Preferred Alternative should agree as much as possible with the approved goals of state and local governments and other federal agencies, except as those goals conflict with the laws, regulations, and policies directly governing BLM management actions.
- Recommendations should protect fragile and unique resources.** Special attention will be directed toward municipal watersheds, endangered species' habitat, highly erosive soils, high quality scenic areas, and other fragile and unique resources.
3. **Recommendations should be sensitive to the expectations of the local populace regarding both the use of public land and the management of these lands and public issues and management concerns identified through the scoping process.** The local populace often has strong, but not necessarily uniform, feelings about natural resource issues. These feelings should be reflected in the Preferred Alternative.
4. **Recommendations should promote the stability and diversity of local and regional economies.** Recommendations affecting the supply and production of economic goods should take into account the current and expected demand for the good, its dependence

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- on public land, and its contribution to general economic conditions.
5. **Recommendations should be responsive to resource issues of national concern.** Issues that receive national attention, like energy production or the allocation of wilderness, will be dealt with according to the policies and directives of the BLM.
 6. **Recommendations should not irrevocably commit the BLM to actions that it may not be able to implement.** Selected recommendations will not overly restrict management's flexibility as to method, timing, or scale of proposed action. Recommendations will not commit BLM to roles normally assumed by other federal, state, or local governments.
 7. **Recommendations should not overly or unnecessarily restrict the public's use of**

public land. Restrictions on the use of public land will be placed where need is demonstrated or where required by law, regulation, or the physical limits of the land.

COMPARATIVE ANALYSIS

The comparative analysis section summarizes in tabular form the major actions and impacts resulting from each alternative. It is presented in a format that allows the reader to readily compare the actions and impacts associated with each alternative in a variety of ways dependent only upon the reader's interest.

TABLE 3-28. SUMMARY OF MAJOR ACTIONS AND IMPACTS

Continuation of Current Management Alternative	Resource Protection Alternative	Economic Development Alternative
<p>Air Quality</p> <p>If the State of Colorado reclassifies the areas recommended for wilderness designation, a change from Class II to Class I air quality standards would occur on 10,755 acres in three wilderness study areas (WSAs), protecting existing primitive values. This change would have no significant impact on other existing resource programs.</p> <p>Some significant short-term impacts on air quality could occur during implementation of vegetation manipulation projects, especially burning.</p> <p>Soils</p> <p>Insignificant short-term increases in erosion would result from vegetation manipulations to increase forage for livestock and wildlife and road construction for mineral development and timber harvesting.</p> <p>In the long-term, increased ground cover in vegetation manipulation areas would reduce erosion from existing conditions. Reclamation of roads used for timber and mineral development would also reduce erosion. Long-term adverse impacts would be expected from ORV use on soils with high erosion hazard.</p>	<p>If the State of Colorado reclassifies the areas recommended for wilderness designation, a change from Class II to Class I air quality standards would occur on 30,630 acres in four WSAs, protecting existing primitive values. This change would have no significant impact on other existing resource programs.</p> <p>Some significant short-term impacts on air quality could occur during implementation of vegetation manipulation projects, especially burning.</p> <p>Vegetation manipulations proposed by the water yield, range, and wildlife programs in the Garfield Capability Unit and the range and wildlife programs in the remainder of the resource area would result in short-term increases in erosion. Road construction in support of timber and mineral operations would also cause short-term erosion increases.</p> <p>Long-term reductions in erosion would be expected from increased ground cover in vegetation manipulation areas, from reclamation of roads, and from ORV restrictions on 149,000 acres ranging in erosion hazard from low to very high.</p>	<p>If the State of Colorado reclassifies the areas recommended for wilderness designation, a change from Class II to Class I air quality standards would occur on 10,755 acres in three WSAs, protecting existing primitive values. This change would have no significant impact on other existing resource programs.</p> <p>Some significant short-term impacts on air quality could occur during implementation of vegetation manipulation projects, especially burning.</p> <p>Vegetation manipulations proposed by the livestock, wildlife, and water yield programs and road construction to support timber and mineral operations throughout the resource area would increase erosion in the short term.</p> <p>In the long-term, reductions in erosion would result from increased ground cover in vegetation manipulation areas, from road reclamation and from ORV restrictions on 118,000 acres. Long-term increases in erosion would be expected in two intensive ORV use areas.</p>

COMPARATIVE ANALYSIS

Preferred Alternative	No Grazing Alternative	No Action Alternative
<p>Air Quality If the State of Colorado reclassifies the areas recommended for wilderness designation, a change from Class II to Class I air quality standards would occur on 340 acres in two WSAs protecting existing primitive values. This change would have no significant impact on other existing resource programs.</p> <p>Some significant short-term impacts on air quality could occur during implementation of vegetation manipulation projects, especially burning.</p> <p>Soils Vegetation manipulations proposed by water yield (in aspen areas) and range and wildlife programs would result in short-term increases in erosion. Road construction in support of timber and mineral operations would also increase erosion.</p> <p>Long-term decreases in erosion would be expected from increased ground cover in vegetation manipulation areas, road reclamation, and ORV restrictions on 166,000 acres. Long-term increases in erosion would be expected in one intense ORV use area.</p>	<p>No significant impacts.</p> <p>In the short and long term, vegetation cover would increase and soil infiltration, percolation and structure would improve. Soil erosion would be significantly less than existing erosion.</p>	<p>No significant impacts.</p> <p>In areas where stocking rate were in excess of carrying capacity, decreased ground cover and increased compaction would result in increased locally significant long-term erosion. Overall significance in the resource area is not known.</p>

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TABLE 3-28. SUMMARY OF MAJOR ACTIONS AND IMPACTS—Continued

Continuation of Current Management Alternative	Resource Protection Alternative	Economic Development Alternative
<p>Water Quality Existing water quality would be maintained by inclusion of mitigation measures in project designs and special measures incorporated into other activity programs. No improvement would occur in areas with existing water quality problems. Vegetation manipulation by range and wildlife programs would cause insignificant short-term increases in sediment and salinity. Road construction and mineral development would also result in some increased sediment and salinity until reclaimed or stabilized. Long-term reductions in sediment yield and salinity in vegetation manipulation areas would result from increased ground cover. Long-term adverse impacts on water quality would be expected from sediment and salinity increases resulting from ORV use in high erosion hazard areas.</p>	<p>Existing water quality would be maintained or improved (by inclusion of mitigation measures in project designs and special measures incorporated into other activity programs). In four areas with known water quality problems, conditions would probably improve. Short-term potentially significant increases in sediment could result in some watersheds in the Garfield Capability Unit if water yield and range and wildlife vegetation manipulations and timber and woodland harvest were conducted simultaneously. Short-term insignificant salinity increases would be expected concurrently. Long-term sediment reductions would be expected from increased cover in vegetation manipulation areas, road and mineral development reclamation or stabilization, and ORV limitations on 149,000 acres.</p>	<p>In the majority of the resource area, existing water quality would be maintained by inclusion of mitigation measures in project designs or improved through special measures incorporated into other activity programs. In four areas with known water quality problems, conditions would probably improve. Short-term potentially significant sediment increases could occur in some watersheds throughout the resource area if water yield, range, and wildlife vegetation manipulations and timber and woodland harvest were conducted simultaneously. Short-term insignificant salinity increases would be expected from vegetation manipulation, road construction, and mineral development. In the long-term, sediment and salinity reductions would be expected from increased ground cover in vegetation manipulation areas, from road and mineral rehabilitation and stabilization, and from ORV limitations on 118,000 acres. Sediment yield would increase in the long-term in areas designated for intensive ORV use.</p>
<p>Water Yield Water yield would increase by 750 to 3,100 acre-feet per year expected from timber harvesting and range and wildlife vegetation manipulations. These figures represent an increase of 1-3 percent over the existing yield from public land in the resource area.</p>	<p>Water yield would increase by 6,900 to 9,100 acre-feet per year from water yield treatments in the Garfield Capability Unit and timber harvest and range and wildlife vegetation manipulations throughout the resource area. These figures represent an increase of 6 to 9 percent over existing water yield on public land in the resource area.</p>	<p>Water yield would increase by 13,200 to 14,900 acre-feet per year from water yield treatments, timber harvesting, and range and wildlife vegetation manipulations throughout the resource area. These figures represent an increase of 12 to 14 percent over existing water yield from public land in the resource area.</p>
<p>Critical Watersheds Conditions in municipal watersheds and debris flow hazard zones would not change. Existing conditions would decline with continued ORV use.</p>	<p>Conditions in critical watersheds would be maintained by placing restrictions on other resource activities. Debris flow hazard conditions would improve by managing as area of critical environment concern (ACEC) and from recommendations in the Glenwood Springs debris flow study. Conditions on erosion hazard areas would improve in the long term by restrictions placed on ORV use.</p>	<p>Impacts in critical watersheds would be the same as those described under the Resource Protection Alternative.</p>
<p>Minerals Management Closing 106,797 acres to mineral location, 25,904 acres to oil and gas surface facility location, 63,715 acres to oil and gas leasing, and 15,041 acres to mineral sales would reduce by a like amount the number of acres available to mineral exploration and development. These reductions would adversely affect the minerals industry in the long term. However, other valuable resources such as wilderness, recreation, public water reserves, municipal watersheds, water quality, and scenery would be protected.</p>	<p>Closing 129,142 acres to mineral location, 33,560 acres to oil and gas surface facility location, 91,918 acres to oil and gas leasing, and 40,992 acres to mineral sales would reduce by a like amount the number of acres available to mineral exploration and development. These reductions would adversely affect the minerals industry in the long term. However, other valuable resources such as wilderness, recreation, public water reserves, municipal watersheds, water quality, and scenery would be protected.</p>	<p>Closing 106,267 acres to mineral location, 25,904 acres to oil and gas surface facility location, 72,043 acres to oil and gas leasing, and 17,561 acres to mineral sales would reduce by a like amount the number of acres available to mineral exploration and development. These reductions would adversely affect the minerals industry in the long term. However, other valuable resources such as wilderness, recreation, public water reserves, municipal watersheds, water quality, and scenery would be protected.</p>

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Preferred Alternative	No Grazing Alternative	No Action Alternative
<p>Water Quality In the majority of the resource area, existing water quality would be maintained or improved by inclusion of mitigation measures in project designs or improved through special measures incorporated into other activity programs. In two areas with known water quality problems, conditions would probably improve. Short-term insignificant sediment and salinity increases would be expected from vegetation manipulations, and timber and woodland harvesting, road construction, and mineral development. In the long-term, increased cover in vegetation manipulation areas, road and mineral development reclamation and stabilization, and ORV limitations on 166,000 acres would reduce sediment and salinity.</p>	<p>Insignificant overall long-term increase in water quality.</p>	<p>In allotments with reduced ground cover from overstocking, increased sediment yield would reduce quality significantly in the long-term.</p>
<p>Water Yield Water yield would increase by 7,200 to 9,900 acre-feet per year from water yield treatments in aspen areas, timber harvesting, and range and wildlife vegetation manipulations throughout the resource area. These figures represent an increase of 6 to 9 percent over existing water yield on public land in the resource area.</p>	<p>Water yield increases from livestock vegetation manipulations would be negated by not manipulating vegetation for livestock. Unknown increases would occur from increased ground cover and improved soil conditions retaining more water on site.</p>	<p>Water yield increases from livestock manipulation would be negated by not manipulating vegetation for livestock. Increased runoff on 128 overstocked allotments would result in higher peak flows with greater potential for flash flooding.</p>
<p>Critical Watersheds Conditions in debris flow hazard areas would improve by placing restrictions on other activities, by managing as an ACEC, and from recommendations in the Glenwood Springs debris flow study. Conditions in municipal watersheds would probably be maintained by placing restrictions on other activities. Conditions in erosion hazard areas would not improve because ORV use on existing roads and trails would continue.</p>	<p>Sediment in one portion of the Rifle Municipal Watershed would decrease by an insignificant amount. Increased ground cover would reduce peakflows and decrease water yield.</p>	<p>Sediment yield in portions of the Rifle Municipal Watershed would increase by an insignificant amount.</p>
<p>Mineral Management Closing 98,852 acres to mineral location, 42,344 acres to oil and gas surface facility location, 55,770 acres to oil and gas leasing, and 11,552 acres to mineral sales would reduce by a like amount the number of acres available to mineral exploration and development. These reductions would adversely affect the minerals industry in the long term. However, other valuable resources such as wilderness, recreation, public water reserves, municipal watersheds, water quality, and scenery would be protected.</p>	<p>No significant impacts.</p>	<p>No significant impacts.</p>

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TABLE 3-28. SUMMARY OF MAJOR ACTIONS AND IMPACTS—Continued

Continuation of Current Management Alternative	Resource Protection Alternative	Economic Development Alternative
<p>Aquatic Wildlife</p> <p>Fifteen and one-half (15.5) miles of aquatic habitat of the threatened Colorado River cutthroat trout would be improved on the Naval Oil Shale Reserve. Minor increases in water yield and long-term sedimentation decreases resulting from vegetation manipulation practices would benefit aquatic habitat, fish populations, and fishing opportunities.</p> <p>Overall insignificant short-term adverse impacts would result from increased sedimentation from vegetation manipulation projects.</p>	<p>Ninety miles (90) of stream habitat and 3 lakes, including 34.5 miles and 2 surface acres of threatened Colorado River cutthroat trout habitat, would improve. Increased water yield and long-term decreases in sediment resulting from vegetation manipulation practices would benefit aquatic habitat conditions.</p> <p>No additional stream habitat would become legally accessible.</p> <p>Overall insignificant short-term adverse impacts would result from increased sediment from vegetation manipulation projects. Short-term impacts would be most significant on 4 streams affecting 10.3 miles of aquatic habitat.</p>	<p>Ninety miles (90) of stream habitat and 3 lakes, including 34.5 miles and 2 surface acres of threatened Colorado River cutthroat trout habitat, would improve. Significant increases in water yield and long-term decreases in sediment from vegetation manipulation practices would improve aquatic habitat conditions.</p> <p>Forty-two (42) miles of stream habitat would become legally accessible, improving fishing and management opportunities.</p> <p>Overall insignificant short-term adverse impacts would result from increased sediment from vegetation manipulation projects. Short-term impacts would be most significant on 10 streams affecting 12.9 miles of aquatic habitat.</p>
<p>Terrestrial Wildlife</p> <p>Manipulating vegetation on 1,000 acres would improve habitat conditions for wildlife that prefer grasses to trees and shrubs.</p> <p>Initial forage allocations would result in a 13 percent decline in existing big game populations. Vegetation manipulations over the next 10 years to increase forage would result in a 12 percent decline in existing big game populations (the objective of this alternative). These numbers are 32 percent and 31 percent short, respectively, of meeting Colorado Division of Wildlife population goals.</p> <p>Case-by-case land disposals would result in an unknown loss of crucial big game winter range.</p> <p>Additional habitat lost from private land development over the next 10 years would result in an overall 20 percent decline in existing big game populations. This population level would be 31 percent short of meeting Colorado Division of Wildlife big game population goals.</p>	<p>Manipulating vegetation on 23,411 acres would improve habitat conditions for wildlife that prefer grasses to trees and shrubs.</p> <p>Introduction of bighorn sheep, sage and sharptail grouse, turkey, peregrine falcon, and river otter would increase or stabilize declining populations and increase hunting and viewing opportunities.</p> <p>Initial forage allocation would result in a 3 percent increase in existing big game populations. Vegetation manipulations over the next 10 years to increase forage would result in a 20 percent increase in existing big game populations. These numbers are 19 percent and 6 percent short, respectively, of meeting Colorado Division of Wildlife population goals (the objective of this alternative).</p> <p>Land disposals would result in a 3 percent loss of crucial big game winter range, significantly affecting local big game populations.</p> <p>Land disposals and additional habitat lost from private land development over the next 10 years would result in an overall 9 percent increase in existing big game populations. This population level would be 9 percent short of meeting Colorado Division of Wildlife big game goals.</p>	<p>Manipulating vegetation on 18,197 acres would improve habitat conditions for wildlife that prefer grasses to trees and shrubs.</p> <p>Introduction of sage and sharptail grouse, turkey, peregrine falcon, and river otter would increase or stabilize declining populations and increase hunting and viewing opportunities.</p> <p>Initial forage allocation would result in a 13 percent decline in existing big game populations. Vegetation manipulations over the next 10 years to increase forage would result in a 1 percent increase in existing big game populations. These numbers are 32 percent and 21 percent short, respectively, of meeting Colorado Division of Wildlife goals (the objective of this alternative).</p> <p>Land disposal would result in a 12 percent loss of crucial big game winter range, significantly affecting local big game populations.</p> <p>Land disposals and additional habitat lost from private land development over the next 10 years would result in an overall 19 percent decline in existing big game populations. This population level would be 13 percent short of meeting Colorado Division of Wildlife big game goals.</p>

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TABLE 3-28. SUMMARY OF MAJOR ACTIONS AND IMPACTS—Continued

Continuation of Current Management Alternative	Resource Protection Alternative	Economic Development Alternative
<p>Livestock Grazing Range condition and forage production would improve. The initial forage allocation of 26,443 AUMs would be 30 percent less than existing use. Vegetation manipulations on 89 allotments totalling 19,139 acres would increase livestock forage production by 7,734 AUMs and would allow a final allocation of 34,177 AUMs. This would be 10 percent less than existing use and 10 percent less than the goal of the alternative.</p> <p>Land disposals would result in an unknown loss of AUMs.</p>	<p>Range condition and forage production would improve. The initial forage allocation of 31,399 AUMs would be 17 percent less than existing use. Vegetation manipulations on 134 allotments totalling 51,952 acres would increase livestock forage production by 25,486 AUMs and would allow a final allocation of 56,885 AUMs. This would be 50 percent greater than existing use and 23 percent less than the goal of the alternative.</p> <p>Land disposals would adversely affect 29 allotments (1,026 AUMs). Hack Lake and Bull Gulch wilderness designation would adversely affect 18,360 acres in 3 allotments by limiting vegetation manipulation areas.</p>	<p>Range condition and forage production would improve. The initial forage allocation of 38,388 AUMs would be 2 percent greater than existing use. Vegetation manipulations on 128 allotments totalling 52,428 acres would increase livestock forage production by 25,070 AUMs and would allow a final allocation of 63,458 AUMs. This would be 68 percent greater than existing use and 14 percent less than the goal of the alternative.</p> <p>Land disposals would adversely affect 86 allotments (4,187 AUMs).</p>
<p>Vegetation Approximately 3,300 acres per year would be modified by various management actions resulting in short-term reduced ground cover and surface disturbance. Adverse impacts would be locally significant. In the long-term, ground cover would increase and impacts would be insignificant. Long-term overall changes in vegetation-type distribution would be insignificant because of the large diversity of vegetation throughout the resource area.</p>	<p>Approximately 10,500 acres per year would be modified by various management actions resulting in short-term reduced ground cover and surface disturbance. Adverse impacts would be locally significant. In the long-term, ground cover would increase and impacts would be insignificant. Long-term overall changes in vegetation-type distribution would be insignificant because of the large diversity of vegetation throughout the resource area.</p>	<p>Approximately 16,000 acres per year would be modified by various management actions resulting in short-term reduced ground cover and surface disturbance. Adverse impacts would be locally significant. In the long-term, ground cover would increase and impacts would be insignificant. Long-term overall changes in vegetation-type distribution would be insignificant because of the large diversity of vegetation throughout the resource area.</p>
<p>Forest Management Forest management on 17,800 acres of productive forest land and 61,580 acres of woodland would result in increased forest productivity, revenues, and stand health and vigor. The annual allowable harvest would be 1.75 million board feet and 3,720 cords.</p>	<p>Under harvest level 1, intensive forest management on 7,175 acres of productive forest land and 45,130 acres of woodland would result in small increases in forest productivity, revenues, and stand health and vigor. The annual allowable harvest would be 0.7 million board feet and 2,650 cords.</p> <p>Under harvest level 2, intensive forest management on 40,370 acres of productive forest land and 91,680 acres of woodland would result in significant increases in forest productivity, revenues, and stand health and vigor. The annual allowable harvest would be 4 million board feet and 4,330 cords.</p>	<p>Under harvest level 1, intensive forest management on 17,350 acres of productive forest land and 61,150 acres of woodland would result in increased forest productivity, revenues, and stand health and vigor. The annual allowable harvest would be 1.7 million board feet and 3,695 cords.</p> <p>Under harvest level 2, intensive forest management on 62,675 acres of productive forest land and 152,675 acres of woodland would result in larger increases in forest productivity, revenues, and stand health and vigor. The annual allowable harvest would be 6.3 million board feet and 7,950 cords.</p>
<p>Recreation Resources Existing recreational facilities would be maintained as would recreational values in Thompson Creek.</p> <p>Overall recreational use would not increase as additional provisions for public access would not be made. New facilities for accommodating future demand would not be developed. The most significant adverse impacts would occur along the upper Colorado River and other popular use areas from overuse and user dissatisfaction.</p>	<p>Existing recreational facilities would be maintained as would recreational values in Thompson Creek, Hack Lake, Bull Gulch, and Deep Creek. Thirteen (13) additional facilities would be developed to help accommodate existing demand. Providing public access to several areas with high recreational values would moderately increase use.</p>	<p>Existing recreational facilities would be maintained as would recreational values in Thompson Creek, Hack Lake, Bull Gulch, and Deep Creek. Thirty-seven (37) additional facilities would be developed to accommodate existing and future demand.</p> <p>Providing public access to several areas with high recreational values would moderately increase use.</p>

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Preferred Alternative	No Grazing Alternative	No Action Alternative
<p>Livestock Grazing Range condition and forage production would improve. The initial forage allocation of 38,726 AUMs would be 3 percent greater than the existing use. Vegetation manipulations on 113 allotments totalling 29,800 acres would increase livestock forage production by 12,998 AUMs and would allow a final allocation of 51,724 AUMs. This would be 37 percent greater than existing use and 8 percent less than the goal of the alternative.</p> <p>Land disposal would adversely affect 45 allotments (2,268 AUMs).</p> <p>An October 15 cut-off date would adversely affect 44 allotments, 8 of which would be affected by land tenure adjustments. A November 15 cut-off date would adversely affect 9 allotments.</p> <p>Vegetation Approximately 8,000 acres per year would be modified by various management actions resulting in short-term reduced ground cover and surface disturbance. Adverse impacts would be locally significant. In the long-term, ground cover would increase and impacts would be insignificant. Long-term overall changes in vegetation-type distribution would be insignificant because of the large diversity of vegetation throughout the resource area.</p> <p>Forest Management Intensive forest management on 17,905 acres of productive forest land and 58,555 acres of woodland would result in increased forest productivity, revenues, and stand health and vigor. The annual allowable harvest would be 1.8 million board feet and 3,535 cords.</p> <p>Recreation Resources Existing recreational facilities would be maintained as would recreational values in Thompson Creek, Hack Lake, Bull Gulch, and Deep Creek. Twenty-four (24) additional facilities would be developed to help accommodate existing and future demand. Providing public access to several areas with high recreational values would moderately increase recreational use.</p>	<p>Range condition and forage production would improve. Initial forage allocation would be zero; therefore, 168 permittees would no longer be able to graze livestock on public land.</p> <p>Vegetation would not be manipulated for livestock. Vegetation cover would increase through improved vigor and reproduction in the long term. Vegetation species composition would change in the long term, especially livestock forage species.</p> <p>No significant impacts.</p> <p>No significant impacts.</p>	<p>Range condition and forage production impacts would vary. Initial allocation of 37,709 AUMs would be 11,266 AUMs in excess of estimated grazing capacity on 128 allotments resulting in declining conditions and production. Conditions and production on the remaining allotments would remain static or improve. Some allotments would not be utilized to their potential.</p> <p>Vegetation would not be manipulated for livestock. Vegetation cover would decrease as plant vigor and reproduction declined on 128 overstocked allotments.</p> <p>No significant impacts.</p> <p>No significant impacts.</p>

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TABLE 3-28. SUMMARY OF MAJOR ACTIONS AND IMPACTS—Continued

Continuation of Current Management Alternative	Resource Protection Alternative	Economic Development Alternative
<p>Social and Economic</p> <p>This alternative would have the largest negative economic impact because of livestock and wildlife forage reductions. The shortfall in forage on crucial big game winter range could bring about an annual decline in personal income of almost \$2 million, as diminished deer and elk populations resulted in lower expenditures for wildlife-related recreation. This would be a significant reduction as most of the impact would be felt in the fall, a traditionally slow economic period. Livestock forage reductions would cause only a net reduction in annual personal income, but a number of individual ranchers could suffer significant adverse impacts.</p> <p>Forest land management proposals would cause more than a \$5000,000 increase in annual income, but net effect of all proposals would still be negative.</p>	<p>This alternative would have the greatest positive economic impact because of increased big game forage and increased timber and fuelwood sales. The higher level of forage availability would support large deer and elk populations which would, in turn, support increased expenditures for wildlife-related recreation. The expected annual increase in personal income of over \$1 million would be significant because most of its impact would be felt in the fall—a traditionally slow economic period. A further rise in personal income resulting from expanded forest product sales would offset the small net decline in income due to reduced livestock forage allocations. A number of ranchers could suffer significant adverse impacts, however. Perhaps as much as \$9.5 million in federal revenue would be generated by sale of public land.</p>	<p>The economic impact of this alternative would be slight. A shortfall in available big game forage would decrease annual personal income by about \$700,000. That could largely be offset by increased personal income of over \$500,000 brought about by expanded sales of forest products. Although these are insignificant portions of total area income, individuals reliant on public land forage, recreation expenditures, or timber and fuelwood production could be significantly affected. Sales of public land could generate perhaps \$15 million in federal revenue.</p>
<p>Cultural Resources</p> <p>Projects would be inventoried for cultural resources prior to project approval. Measures would be taken to protect any cultural resources found. New information would become available as a result of these inventories.</p>	<p>The Blue Hill Archaeological District and high-value sites would be protected. Projects would be inventoried for cultural resources prior to project approval. Measures would be taken to protect any cultural resources found. New information would become available as a result of these inventories.</p>	<p>The Blue Hill Archaeological District and high-value sites would be protected. Projects would be inventoried for cultural resources prior to project approval. Measures would be taken to protect any cultural resources found. New information would become available as a result of these inventories.</p>
<p>Paleontological Resources</p> <p>Projects would be inventoried for paleontological resources in high-value areas prior to project approval. Measures would be taken to protect any paleontological resources found. New paleontological information would become available as a result of these inventories.</p>	<p>Projects would be inventoried for paleontological resources in Class I areas prior to project approval. Measures would be taken to protect any paleontological resources found. New paleontological information would become available as a result of these inventories.</p>	<p>Projects would be inventoried for paleontological resources in Class I areas prior to project approval. Measures would be taken to protect any paleontological resources found. New paleontological information would become available as a result of these inventories.</p>
<p>Wilderness Values</p> <p>Wilderness values on 10,755 acres in three WSAs would be preserved. Wilderness values on 19,875 acres would be adversely affected by nondesignation.</p>	<p>All wilderness values on 30,630 acres would be preserved in the four WSAs.</p>	<p>Wilderness values on 10,755 acres in three WSAs would be preserved. Wilderness values on 19,875 acres would be adversely affected by nondesignation.</p>
<p>Areas of Critical Environmental Concern</p> <p>No ACECs would be designated under this alternative.</p>	<p>Five areas totalling 22,955 acres, 15 streams totalling 35.5 miles, and one lake of 2 surface acres would be designated as ACECs to protect fragile and unique resource values.</p>	<p>Five areas totalling 22,955 acres, 15 streams totalling 35.5 miles, and one lake of 2 surface acres would be designated as ACECs to protect fragile and unique resource values.</p>

COMPARATIVE ANALYSIS

Preferred Alternative	No Grazing Alternative	No Action Alternative
<p>Social and Economic The net economic impact of this alternative would be negative and small. A drop in annual personal income of over \$1 million could be expected from the shortfall of available big game forage on public land. Some of that reduction would be offset by increased income brought about by expanded sales of timber and fuelwood. The income reduction associated with reduced wildlife-related recreation expenditures would be significant because it would largely occur in the fall—traditionally a slow economic period. Although the net change in livestock forage allocations would be minimal, several ranching operations could see significant changes in their net revenue. Sales of public land could generate perhaps \$10 to \$12 million in federal revenues.</p>	<p>The 168 permittees and lessees would lose an average 7 percent of their current forage usage and would see gross revenue decline by 6 percent. Direct and induced reduction in personal income would amount to about \$2 million, less than 1 percent of total area income. Most ranchers, however, would suffer individual severe reductions in net revenue (averaging \$8,000 per ranch) and a number would either go out of business or be forced to radically restructure their ranching operations.</p>	<p>The 128 allotments currently being grazed in excess of their capacity would eventually become less productive, and some economic losses would consequently be felt. Allotments being undergrazed represent an economically inefficient allocation of resources.</p>
<p>Cultural Resources The Blue Hill Archaeological District and high-value sites would be protected. Projects would be inventoried for cultural resources prior to project approval. Measures would be taken to protect any cultural resources found. New information would become available as a result of these inventories.</p>	<p>No significant impacts.</p>	<p>No significant impacts.</p>
<p>Paleontological Resources Projects would be inventoried for paleontological resources in Class I areas prior to project approval. Measures would be taken to protect any paleontological resources found. New paleontological information would become available as a result of these inventories.</p>	<p>No significant impacts.</p>	<p>No significant impacts.</p>
<p>Wilderness Values Wilderness values on 340 acres in two WSAs would be preserved. Wilderness values on 30,290 acres would be adversely affected by nondesignation. Thirteen thousand five hundred fifty (13,550) acres (primarily in Hack Lake and Bull Gulch) adversely affected would be managed to protect existing natural values but would not be designated as wilderness.</p>	<p>No significant impacts.</p>	<p>No significant impacts.</p>
<p>Areas of Critical Environmental Concern Five acres totalling 22,955 acres, 12 streams totalling 31.9 miles, and one lake of 2 surface acres would be designated as ACECs to protect fragile and unique resource values.</p>	<p>No significant impacts.</p>	<p>No significant impacts.</p>

ALTERNATIVES

TABLE 3-28. SUMMARY OF MAJOR ACTIONS AND IMPACTS—Continued

Continuation of Current Management Alternative	Resource Protection Alternative	Economic Development Alternative
<p>Visual Resources Existing visual quality would be maintained throughout the resource area.</p>	Existing visual quality would be maintained throughout the resource area. Cultural modifications would be rehabilitated, improving visual quality in specific areas. Three areas with high visual quality would be protected as ACECs.	Existing visual quality would be maintained on 90 percent of the resource area. Seven thousand seven hundred (7,700) acres within view of I-70 near Eagle/Wolcott would have reduced visual quality due to proposed vegetation manipulation projects. Cultural modifications would be rehabilitated, improving visual quality in specific areas. Three areas with high visual quality would be protected as ACECs.
<p>Land Tenure Adjustments All land tenure adjustments would be processed on a case-by-case basis as they are received.</p>	Two zones were identified to guide land tenure adjustments: disposal and retention. The acreage proposed in disposal zones totals 9,555 acres of mostly small isolated parcels.	Two zones were identified to guide land tenure adjustments in the resource area: disposal and retention. The acreage proposed in disposal zones totals 37,550 acres of both small and moderate-sized isolated parcels.
<p>Transportation No additional access or road maintenance would occur. This would result in continued declining road conditions and significant amounts of public land remaining inaccessible to the public. No ORV restrictions would occur, potentially threatening sensitive public land values.</p>	Approximately 3 miles of additional roads and 36 easements would improve public access. Road conditions would be improved on existing substandard roads. ORV restrictions on 160,431 acres would significantly protect sensitive resource values and insignificantly limit ORV opportunities.	Providing approximately 83 miles of additional roads and 52 easements would significantly improve public access. Road conditions would be improved on existing substandard roads. Most major public land tracts would be legally accessible. Restrictions on ORV use on 120,343 acres would protect sensitive resource values significantly and limit ORV opportunities insignificantly.
<p>Utility and Communication Facilities All proposals for utility and communication facilities would be processed on a case-by-case basis as they are received.</p>	Three classifications would be identified to guide the management of utility and communication facilities: unsuitable, sensitive, and suitable for consideration. Under this alternative, 63,627 acres would be identified as unsuitable for facilities, and 67,988 acres would be identified as sensitive to the location of facilities.	Three classifications would be identified to guide the management of utility and communications facilities: unsuitable, sensitive, and suitable for consideration. Under this alternative, 53,323 acres would be identified as unsuitable, and 48,196 acres would be identified as sensitive to the location of facilities.
<p>Fire Management All wildfires on public land would be suppressed using existing firefighting forces.</p>	Three classifications would be identified to guide the management of wildlife in the resource area: fire exclusion, fire management, and fire suppression. Management zones would provide direction in using fire as a management tool to help accomplish other resource objectives. Under this alternative, 90,240 acres would be identified in fire exclusion zones, 122,420 acres would be identified in fire management zones, and 353,392 acres would be included in fire suppression zones.	Three classifications would be identified to guide the management of wildlife in the resource area: fire exclusion, fire management, and fire suppression. Management zones would provide direction in using fire as a management tool to help accomplish other resource objectives. Under this alternative, 120,320 acres would be identified in fire exclusion zones, 96,180 acres would be identified in fire management zones, and 354,542 acres would be included in fire suppression zones.

COMPARATIVE ANALYSIS

Preferred Alternative	No Grazing Alternative	No Action Alternative
<p>Visual Resources Existing visual quality would be maintained on 92 percent of the resource area. Impact of visual quality changes would be low as they are not within major viewsheds. Two areas with high visual quality would be protected as ACECs.</p>	No significant impacts.	No significant impacts.
<p>Land Tenure Adjustments Two zones were identified to guide land tenure adjustments: disposal and retention. The acreage proposed in disposal zones totals 23,245 acres of both small and moderate-sized isolated parcels. Of this acreage, 12,220 acres would be given priority for exchange rather than sale.</p>	No significant impacts.	No significant impacts.
<p>Transportation Approximately 43 miles of additional roads and 50 easements would provide additional access to the most demanded public land areas. This would significantly improve use of public land. Road conditions would be improved on existing substandard roads. Restrictions on ORV use on 172,427 acres would protect sensitive resource values significantly and insignificant limit ORV opportunities.</p>	No significant impacts.	No significant impacts.
<p>Utility and Communication Facilities Three classifications would be identified to guide the management of utility and communications facilities: unsuitable, sensitive, and suitable for consideration. Under this alternative, 22,673 acres would be identified as unsuitable, and 65,110 acres would be identified as sensitive to the locations of facilities.</p>	No significant impacts.	No significant impacts.
<p>Fire Management Three classifications would be identified to guide the management of wildfire in the resource area: fire exclusion, fire management, and fire suppression. Management zones would provide direction in using fire as a management tool to help accomplish other resource objectives. Under this alternative, 73,360 acres would be identified as a fire exclusion zones, 179,840 acres would be identified in fire management zones, and 312,622 acres would be included in fire suppression zones.</p>	No significant impacts.	No significant impacts.

ALTERNATIVES

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Based on issues and management concerns identified in the beginning of the planning process, the team developed alternative themes:

- Resource Protection
- Resource Optimization
- Economic Development
- Continuation of Current Management
- Renewable Resource Emphasis
- Recreation Emphasis
- Energy Development

From this list, the team selected and analyzed the impacts of the alternatives presented in this environmental impact statement. The remaining alter-

natives were considered unreasonable given the time constraints, the team's ability to analyze, the plan costs, and were therefore eliminated from detailed study. Those analyzed in detail were considered to be the most appropriate and responsive to the issues identified.

In addition, No Grazing and No Action (which freezes grazing management at this point in time) Alternatives were considered as subalternatives for livestock grazing. These subalternatives are required by Colorado BLM for all grazing environmental impact statements in response to the National Resource Defense Council vs. Morton court judgement. The subalternatives were considered unrealistic to present in whole in this environmental impact statement; therefore, they were summarized in the Livestock Grazing section of Chapter 3. Impacts of each subalternative are compared in the Comparative Analysis section (Table 3-28).

Detailed analysis of each subalternative is available for review in the Glenwood Springs Resource Area office.

CHAPTER 4

AFFECTED ENVIRONMENT

INTRODUCTION

Chapter 4 is a general description of the resources that would be affected by the proposed management actions in Chapter 3. Detailed descriptions are available in the Glenwood Springs Resource Area office. Geology, topography, and noise would not be affected by the proposed management actions and are therefore not described in this environmental impact statement. Prime and unique farmlands also are not described because none exist on public land in the resource area.

SETTING

The Glenwood Springs Resource Area is located in west central Colorado. It is bordered on the north and east by the Bureau of Land Management (BLM) Craig District and White River National Forest, on the south by the White River and Grand Mesa National Forests and the BLM Grand Junction Resource Area, and on the west by the BLM Grand Junction Resource Area (Map 4-1).

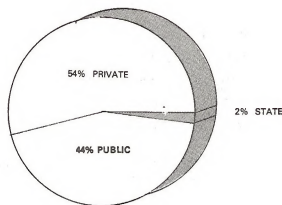
The area lies primarily within Garfield, Eagle, and Pitkin Counties with smaller parts in Routt and Mesa Counties. Approximately 1,280,000 acres of public, state, and private lands lie within the resource area boundaries. Figure 4-1 shows the acres and percentage of land within each ownership.

The BLM administers the minerals on all public land and approximately 206,290 acres underlying non-public land.

Because of the wide variations in elevation and topography within the resource area, the climate is extremely variable.

The Colorado River runs through the resource area and together with the Roaring Fork and Eagle Rivers provides the major drainage. Terrain is very rugged and is characterized by many high peaks, ridges, and side valleys. Mean annual temperature ranges from 40 degrees at Aspen to 47 degrees at Rifle. The growing season (at 32 degrees) varies between 70 days in Eagle to 138 days in Glenwood Springs, with much shorter growing seasons in the high mountains. Annual heating degree day totals

FIGURE 4-1



LAND OWNERSHIP
IN THE GLENWOOD SPRINGS RESOURCE AREA

average between 6795 and 8948, and annual cooling degree day totals average between 22 and 344. This information reflects only the stations with available data; the high mountains are much colder (Pedco 1982).

The relatively low annual average total precipitation ranges from 10.4 to 23.6 inches. Annual snowfall averages from 42 inches in Rifle to 140 inches in Aspen. The number of days with greater than 1 inch of snow on the ground averages annually between 48.3 to 217.2 days with an average April mountain snowpack depth of 24 to 58 inches (again showing the great variation between the lower western valleys and the higher mountains). Hail is relatively infrequent in this resource area; the highest annual average number of days of hail (5.8) occurs at Independence Pass (Pedco 1982).

Winds measured at Aspen and Rifle typify the channeling and mountain valley flows experienced in the resource area. In areas such as Aspen, Snowmass, and Eagle, nighttime cooling often leads to very stable air and inhibited mixing and transport in the valleys. Dispersion potential improves farther east and at the ridge and mountain tops, especially during winter-spring weather transition periods and summertime convective heating (Pedco 1982).

AFFECTED ENVIRONMENT

AIR QUALITY

The Glenwood Springs Resource Area lies within Colorado Air Quality Control Regions 11 and 12.

Four state-operated monitoring stations at Rifle, Glenwood Springs, Aspen, and Vail measure total suspended particulates within these regions (Table 4-1).

TABLE 4-1. SELECTED TOTAL SUSPENDED PARTICULATE DATA

(in micrograms per cubic meter)

Station/Period	Number of Observations	Annual Geometric Mean	First 24-hour Maximum	Second 24-hour Maximum
Aspen Courthouse				
1981.....	86	'80		'247
1980.....	89	'80		'260
1979.....	87	'86		'234
Eagle Courthouse				
1979.....	57	'94	210	'209
1978.....	45	'104	412	'218
Glenwood Springs Courthouse				
1981.....	83	63		'198
1980.....	88	68	203	'199
1979.....	85	57	188	'173
Grand Valley High School				
1978.....	51	'55	213	'208
1977.....	35	'52	334	'217
Naval Oil Shale Reserve				
6/81-9/81.....	14	'24	37	
6/80-9/80.....			30	
Rifle, Third Avenue				
1981.....	80	'99		'411
1980.....	69	'156	510	'479
1979.....	83	'128	694	'660
Vail, Medical Building				
1981.....	80	62		'231
1980.....	92	'75		'335
1979.....	67	'75	285	'223

Sources: Colorado Department of Health and TRW Energy Engineering Division, 1981.

'Violation of ambient air quality standards

*Insufficient data to determine reliable average

Of all the major cities in the resource area, only Glenwood Springs and Vail did not exceed annual and 24-hour primary standards for total suspended particulate concentrations in 1981. These cities did exceed the 24-hour secondary standards, however. Limited travel activity on unpaved roads and good air drainages probably account for the lower particulate levels at these sites.

Long winter seasons, seasonally low temperatures, dramatic influx of people during the ski season, heavy fireplace usage, heavy automobile traffic, extensive fuel consumption for space heating, and poor dispersion conditions accounted for high total suspended particulate levels in Aspen and Vail.

Fugitive road dust from the many unpaved roads, rural activity, active construction and development, and limited industrial and mining activity are probable particulate sources in Rifle. Since monitoring began in Rifle (1974), annual measurements have exceeded all particulate standards. Particulate levels remain high not only in the winter but also in the summer.

Fugitive road dust is probably the major particulate contributor in Eagle. Unlike Aspen and Vail particulate levels remain high even during the summer months.

Air quality in the resource area is likely to worsen as development in Aspen and Vail expands. The Colorado, Eagle, and Roaring Fork River Valleys

SOILS

will experience the heaviest development and also the worst air quality impacts, mostly due to wood-burning fireplaces in winter months and increased construction activities related to energy development.

Serious air quality impacts due to oil shale resource development in the Parachute Creek region have been predicted for the area around Rifle (BLM 1982). Although required construction and operation air quality permits should minimize impacts from industrial facilities, secondary impacts from regional growth will continue to be a problem.

Three Class I air quality areas are adjacent to public land in the Glenwood Springs Resource Area (Flat Tops, Eagles Nest, and Maroon Bells-Snowmass Wilderness Areas). All three areas are administered by the U. S. Forest Service, Region II. Limitations on the additional amount of pollution allowable in these areas from new major emitting facilities are strict. The BLM must consider these limitations when air quality impacts are anticipated from proposed actions. The remainder of the resource area is classified on a Class II air quality area, where similar but less stringent incremental pollution standards apply.

SOILS

Soils in the Glenwood Springs Resource Area are either residual, derived from sandstone and shale, or alluvial, derived from mixed alluvium. They have been grouped into 27 soil associations and are depicted on a map in the resource management plan documentation files in the Glenwood Springs Resource Area office. Soil information was obtained from third-order soil surveys done by the U. S. Soil Conservation Service since 1975. The final correlation of this soil inventory has been done in the past three years.

EROSION CONDITIONS

Erosion conditions on public land within the Glenwood Springs Resource Area are quite variable. Soil erosion condition classes of major geographic areas in the Glenwood Springs Resource Area are as follows.

Areas with low to moderately-low soil loss (18 percent of the resource area) are the Naval Oil Shale Reserve; upper Garfield, Baldy, Divide, Lake and Beaver Creek drainages; Roaring Fork and

Gypsum-Eagle Valleys; and the Missouri Heights, Cottonwood Pass, Monegar Ridge and King Mountain areas.

Areas with moderate to moderately-high soil loss (28 percent of the resource area) are the Parachute, Rifle, and Silt Valleys; the area north of Rifle and Silt between the Grand Hogback, including the lower Government Creek drainage; and the Divide Creek, Red Dirt Creek (Eagle County), Bull Gulch, Castle Creek, lower Eby Creek, and Alkali Creek drainages.

Areas with high to very high soil loss (54 percent of the resource area) are the Battlement, Flatiron, and Grand Mesas; Grand Hogback; Gypsum badlands near Dotsero, Gypsum, and Eagle; Red Dirt Creek drainage (Routt County); and the steep, southerly escarpments along the Naval Oil Shale Reserve.

Erosion condition classes range from low to very high (Map 4-2). Generally, the lower erosion condition classes occur on land adjacent to private lands and on upland benches and mesas. Low erosion condition classes occur where slopes are gentle with good ground cover. In most instances, land treatment practices could be applied to these areas without any significant impacts to the soil resource.

The higher erosion condition classes usually occur on the steeper mountain and valley sideslopes, alluvial fans, and ridgecrests where the soil lacks productive capacities.

Primary factors contributing to erosion, other than geologic erosion, are overgrazing (both domestic livestock and wildlife), off-road vehicle use, improper construction techniques, poor locations of roads, and mineral exploration/development.

Trends in erosion condition are improving as a result of improved management practices, such as allotment management plans, habitat management plans, and other activity plans.

SOIL PRODUCTIVITY

Soil productivity is the potential of a soil to produce vegetation. Productivity of soils within the Glenwood Springs Resource Area varies from low to high. Factors contributing to low productivity in soils include one or more of the following.

1. Low available water-holding capacity of the soil.
2. Low nutrient availability.
3. High erosion rates.
4. Excessive alkalinity or salt content.
5. Large percentage of cobbles and stones on the surface.

AFFECTED ENVIRONMENT

Usually, the lesser productive soils in the resource area are found in the dry valley bottoms at lower elevations (particularly the western third of the resource area), on steep mountain slopes and ridgetops, and on gypsum-derived soils surrounding the Gypsum-Eagle Valley.

WATER RESOURCES

The Glenwood Springs Resource Area lies entirely within the upper Colorado River Basin, an area of about 7,370 square miles. Approximately 900 square miles of the basin is public land managed by the Glenwood Springs Resource Area. Five major subbasins—the upper Colorado, lower Colorado, Eagle and Roaring Fork Rivers, and Parachute Creek—lie partly within the resource area (Map 4-3).

SURFACE WATER

Quantity

Annual precipitation in the resource area ranges from less than 12 to more than 30 inches with the majority of the resource area averaging 20 inches or less. Water yield ranges from a low of less than 0.1 inch of runoff along the Colorado River in the western portion of the resource area to as much as 20 inches in the high elevation areas such as Black and King Mountains, Castle and Sunlight Peaks, and Hack Lake. The average runoff from public land in the resource area is 2 inches or less.

Table 4-2 shows the average annual water yield for each of the subbasins. The annual water yield from public land in the resource area averages about 109,000 acre-feet. This represents 4.2 percent of the yield of the entire Colorado River Basin above DeBeque (near the western boundary of the resource area).

Table 4-3 shows the range in precipitation and runoff of the vegetation zones in the resource area.

Peak flows on the major tributaries typically occur during May and June in response to spring snowmelt while low flows occur during the winter when surface runoff is minimal. Intense summer thunderstorms are often responsible for peak flows on the smaller tributaries and are the cause of locally

TABLE 4-2. ANNUAL WATER YIELD IN THE GLENWOOD SPRINGS RESOURCE AREA

Subbasin	Total Area (square miles)	Public Land (square miles)	Annual Water Yield	
			Total Area (acre-feet)	Public Land (acre-feet)
Upper Colorado River.....	3,450	250	1,103,800	28,350
Eagle River.....	944	165	407,200	17,050
Roaring Fork River.....	1,451	65	829,600	12,400
Lower Colorado River.....	1,327	323	248,220	42,600
Parachute Creek.....	198	74	23,180	9,100
Total.....	7,370	877	2,612,000	109,500

¹Average flow subsequent to transmountain diversion through Charles H. Boustead Tunnel

TABLE 4-3. WATER-YIELDING VEGETATION ZONES ON PUBLIC LAND IN THE GLENWOOD SPRINGS RESOURCE AREA

Vegetation Type	Acres	Annual Rainfall (inches)	Annual Water Yield (inches)
Semi-desert shrub.....	86,526	8-20	< 1-4
Pinyon-Juniper.....	209,541	12-18	< 1-3
Mountain Brush.....	166,897	16-24	1-6
Aspen.....	36,402	20-40	up to 20
Conifer.....	34,408	28-30	12-15
Grass/Meadows.....	32,628	25-40	3-15
Total.....	566,042		

Sources: Hibbert 1979; BLM 1979.

severe flooding and debris flow problems at several sites within the resource area.

Quality

Water quality is monitored principally by the Colorado State Health Department and the U. S. Geological Survey. Much of the water quality information collected is not directly applicable to water originating on public land because many of the stations are located on major tributaries. Water quality at these stations is affected by national forest and private lands as well as public land.

Typically, water quality in headwater areas (many of which lie on national forest land) is good, meeting all federal water quality standards. In the lower reaches, however, one or more of the parameters such as sulfate, manganese, bacteria, or total dissolved solids may exceed drinking water standards.

WATER RESOURCES

TABLE 4-4. SALT LOAD IN THE GLENWOOD SPRINGS RESOURCE AREA SUBBASINS

Subbasin	Total Area (tons)	Public Land (tons)	Salt Concentration (mg/l)
Upper Colorado River	280,000	13,300	210
Eagle River.....	151,200	11,750	281
Roaring Fork River.....	308,100	3,150	263
Lower Colorado River.....	746,556	26,360	406
Parachute Creek.....	24,043	2,780	753
Total.....	1,510,000	57,340	1,913

Source: BLM 1981.

TABLE 4-5. SEDIMENT YIELD CONDITION CLASSES FOR PUBLIC LAND IN THE RESOURCE AREA

Condition Class	Tons/Acre/Year	Acres	Per-cent of Re-source Area
Very Low	< 0.28	41,000	7.1
Low	0.28-0.55	145,500	25.2
Moderate	0.56-1.40	214,000	37.1
High	1.40-2.80	147,000	25.5
Very High.....	2.80-8.40	29,000	5.0

Source: Adapted from *Sediment Yield Map for Colorado* published by the Colorado Land Use Commission (1974)

The major water quality problems associated with public land are salinity (mineral salts) and sediment. Table 4-4 shows the amount of salts that are derived from surface runoff in the subbasins annually and the amount contributed by public land.

Discharge from saline hot springs (three of which are located on public land) and seeps between Dotsero and New Castle add 500,000 tons of salts each year to the Colorado River and increase salinity by 140 milligrams per liter (mg/l) at Glenwood Springs (Ozga, Personnel Communication 1982). The salts in these hot springs, as well as all other salts entering the resource area's water bodies, are ultimately derived from the mineral assemblage of rocks and soils developed on those rocks which underly the major subbasins. Geologic formations which contribute most significantly to the salinity of the Colorado River Basin are sedimentary rocks of marine or lacustrine origin (such as Mancos Shale, Eagle Valley Evaporite and the Green River Formation) which contain highly soluble minerals that are easily leached by water passing over or through them (BLM 1978). Water quality measurements by the BLM on resource area streams have indicated salinities as high as 2500 mg/l for streams which pass through these formations. This is five times

the recommended drinking water standard of 500 mg/l.

Outcrops of one or more of these formations on public land occur in every subbasin. The Environmental Protection Agency estimates that 52 percent of the salt load entering the Colorado River in the upper basin originates from natural sources (diffuse and unidentified point sources) which include public land, national forest, national parks, Indian land, and private and state rangeland (BLM 1978). The salt load entering the resource area's water bodies from public land is estimated at 57,000 tons per year (BLM 1981).

Sediment in the resource area results from sheet or rill erosion and channel erosion. Both are significant sources of sediment. Map 4-5 indicates sediment yield condition classes in the resource area. Acres of public land in each condition class are indicated in Table 4-5.

Most sheet erosion problems occur in areas where ground cover is scarce. Channel erosion, the other major source of sediment, results from erosion of banks along perennial and intermittent streams and from gully formation. Channel stability along perennial streams is rated fair or poor in most of the resource area. Gully formation is also a problem, particularly in low rainfall areas subject to high intensity thunderstorms and where soils are derived from saline geologic strata.

GROUND WATER RESOURCES

Quantity

Most public land watersheds in the resource area produce little direct surface runoff. However, they provide important ground water recharge and discharge areas. These recharge and discharge areas contribute significantly to baseflow, particularly during low flow conditions in the fall and winter. Table 4-6 indicates the ground water contributions to selected streams and rivers in or near the resource area.

Minimal development of the resource area's ground water resources has occurred except in the Roaring Fork Basin, where extensive municipal development is occurring, and in agricultural areas of the lower Colorado River subbasin. In other areas, sparse human habitation, poor ground water quality, and generally adequate surface water supplies have precluded extensive ground water development. Physical and hydrologic characteristics and locations of major aquifers underlying the resource area are indicated in Appendix I. While vast supplies of water exist in some of these aquifers, the

AFFECTED ENVIRONMENT

TABLE 4-6. GROUND WATER CONTRIBUTION TO FLOW OF SELECTED STREAMS IN THE RESOURCE AREA

Station	Number of Years of Record	Ground Water Discharge	
		Percent of Total Stream-flow	Average Annual (cubic feet per second)
Piney River near State Bridge.....	22	22	16
Rock Creek near Toponos.....	14	29	9
Brush Creek near Eagle.....	16	50	22
Eagle River below Gypsum.....	20	34	193
Crystal River above Avalanche Creek.....	9	22	63
Thompson Creek near Carbondale.....	13	15	6
Cattle Creek near Carbondale.....	10	27	4
East Rifle Creek near Rifle.....	15	86	35
Beaver Creek near Rifle.....	14	23	1

Source: Boettcher 1972

most extensively developed are the valley fill deposits which occur in most of the stream valleys in the area. These deposits are typically in close hydraulic contact with the adjacent surface streams and periodically are recharged by or discharged to these streams depending on whether stream flows are high or low (BLM 1978). Other major formations with the potential to produce water of usable quantity and quality within the resource area include the Dakota Sandstone, the Mesa Verde Group, and the upper levels of the Green River, Maroon Weber, and Basalt Formations.

Quality

Ground water salinity is generally higher than surface water salinity because the slower moving ground water has longer contact with the soluble minerals. Consequently, ground water contributes significantly to the natural salinity of streams in the resource area (BLM 1978). As an example, the Eagle River, which receives 34 percent of its annual discharge from ground water inflow, receives 58 percent of its annual salt load from that ground water inflow (BLM 1978).

Geologic formations that produce highly saline ground water in the resource area include the Mancos Shale, Eagle Valley Evaporite and Green River Formation (Appendix I). The valley fill deposits generally yield less saline water than other ground water sources because the alluvium is generally highly permeable and most of the highly soluble minerals that it may have contained have been leached (BLM 1978).

WATER USE

BLM management programs require water for livestock and wildlife. The location of water sources influence livestock distribution which affects the intensity of vegetation use. The BLM has developed about 190 springs and has constructed 161 stock reservoirs and 17 watersavers to provide water for livestock and wildlife. The BLM has also constructed approximately 200 retention dams (erosion control structures) which provide temporary water storage following storms. Estimated livestock and big-game water consumption on public land in each subbasin is indicated in Table 4-7.

TABLE 4-7. LIVESTOCK AND BIG GAME WATER CONSUMPTION ON PUBLIC LAND IN THE RESOURCE AREA

Subbasin	Annual Water Consumption (acre-feet)
Upper Colorado River	32.7
Eagle River	34.8
Roaring Fork River	18.7
Lower Colorado River	55.0
Parachute Creek	9.3
Total	150.5

Source: BLM 1981.

MINERALS

MINERALS

The resource area contains 566,000 acres of public land and 211,292 acres of federally-reserved minerals with private ownership. Currently, 481,079 acres of public land in the resource area are open to mineral entry. For administrative purposes, mineral entry on public lands is divided into three broad categories: (1) leasables, (2) locatables, and (3) salables.

LEASABLES

Oil and Gas

The federal government owns the federal oil and gas reserves underlying approximately 790,000 acres of public and private lands with federal minerals. Presently, 460,400 acres overlying federal minerals are under lease. The BLM averages from 15 to 20 applications for permits to drill annually. Approximately 40 wells are currently producing.

Coal

Only the Grand Hogback coal field is considered economically feasible to mine using present technology. The amount of coal in the Grand Hogback is estimated at approximately 1.6 billion tons. This estimate is based on surface outcrops and geologic inference rather than on specific inventory data, assuming a depth of 3,000 feet. Specific inventory information from U. S. Geological Survey and Minerals Management Service will not be available until after land use planning is completed. The U. S. Geological Survey will then delineate tracts for the regional coal team—a team composed of federal, state and local governments. The team will rank the tracts and decide whether or not to include them in the 1986 Uinta-Southwest coal sale.

Only one federal coal lease, totaling 120 acres, is present within the resource area boundaries. It is located in the Harvey Gap area and is presently inactive. While other mines exist within the resource area, the coal deposits within those mines are privately owned.

Two active coal companies are located within the White River National Forest—Mid-Continent Resources and Snowmass Coal Company. Mid-Continent controls seven federal leases totaling 5,310 acres, and Snowmass has two federal leases totaling 4,960 acres.

Oil Shale

Although vast amounts of oil shale exist within the western half of the Glenwood Springs Resource Area, the BLM is responsible for administering the oil shale reserves underlying only approximately 28,900 acres of public and private lands with federal minerals. The total reserves underlying this land are estimated at 7.5 billion barrels. At the present time, the BLM is not considering leasing of this oil shale.

Geothermal

Geothermal features exist at Dotsero, Glenwood Springs, Penny (Avalanche), South Canyon, and Conundrum. Approximately 254 square miles within the resource area boundaries—primarily administered by BLM, have been identified as prospectively valuable for geothermal energy. This approximation is based largely on the existing geothermal features such as hot springs.

No federal geothermal leases have been issued on public lands to date; however, three applications have been filed in the South Canyon and Glenwood hot springs areas.

Potassium

Potassium occurs in the Eagle Valley near the towns of Gypsum, Eagle, and Avon and near the mouth of Cattle Creek in the Roaring Fork Valley. Approximately 130,000 acres in the resource area have been identified as potentially valuable for potassium. Potassium has never been mined commercially within the resource area. However, in the Eagle-Gypsum area, two prospecting permits are pending.

LOCATABLES

Locatable minerals in the resource area include metals (gold, silver, lead, and copper) and non-metals (gypsum, limestone, uranium, and vanadium). Except for those areas presently closed to locatables (Map 3-6), all federal and private lands with federal minerals are open to prospecting and mining. Based on present inventories, most metals have only recreational value.

Non-metals have commercial value. Commercial production of limestone was about 30,000 tons from public land in 1980. In the next few years, commercial production on public land is expected to reach 400,000 tons per year. The limestone is

AFFECTED ENVIRONMENT

primarily exposed along stream and river corridors between the Grand Hogback and Dotsero. Numerous inactive gypsum claims are located near Eagle and Gypsum.

SALABLES

Salables include moss rock, scoria, sand and gravel, top soil, and fill dirt. Salables activity is primarily limited to small commercial sales for products used in the commercial and residential construction industries. Salables are expected to increase as the construction industry and its ancillary activities increase.

At present, areas suitable for salable mineral extraction have not been identified within the resource area. Therefore, requests for these minerals are considered in all areas that have not been closed to mineral entry.

The sand and gravel on the Colorado River west of the Grand Hogback have been found to be unsuitable for concrete aggregate by the State Highway Department and most construction firms. The sand and gravel have been contaminated by the oil shale.

AQUATIC WILDLIFE

Sixty-four streams and 5 lakes support fish in the resource area. The aquatic and riparian habitat of portions of 56 streams (totaling 126 miles) and 5 lakes is managed by the BLM. In addition, 9 streams (9.7 miles of public land frontage) that do not presently support a fishery have potential for introducing a fishery.

The most productive fisheries occur in the Colorado, Roaring Fork, Eagle, Frying Pan, Piney, and Crystal Rivers, which make up about 32 percent of the total public land stream frontage providing an existing fishery. In comparison to the total miles of rivers and streams in the resource area, a relatively minor amount occurs on public land.

Most tributary streams sustain a self-perpetuating fishery or are stocked regularly by the Colorado Division of Wildlife. Some of these streams provide spawning areas for fish that come from the rivers to spawn. All lakes and reservoirs that provide fisheries have been stocked at some time. Approximately 14 streams and 3 lakes on public land are regularly stocked by the Colorado Division of Wildlife.

Two species presently listed by the State of Colorado as threatened occur in public streams.

They are the Colorado River cutthroat trout *Salmo clarki pleuriticus* (8 public streams and 1 lake) and the razorback sucker *Xyrauchen texanus* (Colorado River below Rulison) (U. S. Fish and Wildlife Service 1981).

During the summers of 1975 through 1979, 112.9 miles of public streams were inventoried for fish habitat, channel stability, and fish presence. A numerical rating system was used to compare stream conditions and percent of optimal habitat based on nine habitat attributes. This rating system numerically evaluated bottom composition, pool quality, riffle quality, pool to riffle ratio, stream canopy, bank cover, bank stability, percent of bare ground, and presence and size of beaver ponds. Using this method, 11.7 miles of streams were rated in excellent condition; 20.1 miles, in above average condition; 24.1 miles, in average condition; 49.2 miles, in below average condition; and 7.8 miles, in poor condition.

Table 4-8 lists the streams or stream segments that would be affected by proposals in this environmental impact statement and shows existing condition and trend. Aquatic condition is based on the numerical rating system used for the inventory. Trend is based on the fishery biologists' judgments and evaluations made from the inventory narratives.

TABLE 4-8. AFFECTED STREAMS AND LAKES

Number ^a	Name	Aquatic Condition Rating ^b	Trend ^c
1	Cedar Creek	71	D
2	Rock Creek	71	S
3	Egeria Creek	87	S
4	Deep Creek	87	S
5	Cabin Creek*	81	D-S
6	Sunnyside Creek	82	S-D
7	Willow Creek	29	I
8	Hack Lake	Good	S
9	Sheep Creek, West Fork	46	S
10	Sheep Creek	54	S
11	Sweetwater Creek	85	S
12	Derby Creek	58	S
13	Horse Lake	Good	S
14	Red Dirt Creek	32	S
15	Upper Colorado River	-----	S
16	Piney River	98	S
17	Castle Creek	43	I-S
18	Edges Lake	Fair	D
19	Catamount Creek*	54	S
20	Norman Creek*	81	D
21	Eagle River	89	S
22	Frost Creek*	73	S
23	Salt Creek	72	D-S
24	Cottonwood Creek	60	D
25	Abrams Creek	43	S
26	Prince Creek	88	I
27	Thompson Creek	80	S
28	Thomas Creek	90	D-S
29	Crystal River	85	S
30	Sopris Creek West	80	I-S

TERRESTRIAL WILDLIFE

TABLE 4-8. AFFECTED STREAMS AND LAKES—
Continued

Number ¹	Name	Aquatic Condition Rating ²	Trend ³
31	Sopris Creek East	59	S
32	Snowmass Creek	69	S
33	Red Canyon Creek*	73	S
34	Frying Pan River	87	S
35	Coulter Creek West*	46	S-D
36	Cattle Creek	65	S-D
37	Fourmile Creek	70	S
38	Thompson Creek North	59	S
39	Threemile Creek	56	S
40	Roaring Fork River	82	S
41	Mesa Creek*	66	D
42	Mitchell Creek	78	S
43	Colorado River	.....	S-D
44	Rifle Creek	100	S
45	Elk Creek Main	68	S
46	Harris Gulch	.....	S
47	Butler Creek	59	S
48	Rifle Creek Middle	72	S
49	George Creek	80	D-S
50	Rifle Creek East	98	S
51	Piceance Creek	56	S
52	Harris Reservoir	Good	I-S
53	Elk Creek East	81	S
54	Keyser Creek	106	S
55	Dry Possum Creek*	77	S
56	Canyon Creek East	90	S
57	Possum Creek	76	S
58	Canyon Creek	52	S
59	Colorado River	.....	S
60	Wallace Creek North	71	S
61	Wallace Creek	93	S
62	Battlement Creek	83	S
63	Cache Creek	66	S
64	Baldy Creek*	55	I
65	Garfield Creek	53	D
66	Second Anvil Creek	.....	D
67	Parachute Creek, East Middle Fork	.....	D-S
68	Northwater Creek	.....	D-S
69	Parachute Creek, East Fork	.....	D-S
70	Trapper Creek	.....	D
71	Fravert Reservoir	Fair	I
72	JQS Gulch	.....	D-S
73	First Water Gulch	.....	D-S
74	First Anvil Creek	.....	D-S
75	Lower Colorado River	.....	D-S

¹This number corresponds to the number shown on Map 3-10.
²Rating: 113 to 94 = excellent; 94 to 98 = above average; 78 to 62 = average; 62 to 46 = below average; below 46 = poor

³Trend: I = increasing; D = decreasing; S = stable

of wildlife species. Land developers, oil companies, recreationists, water users, ranchers, and farmers are competing with wildlife for use of this habitat. This trend is expected to accelerate in the future as the nation's population grows and the demand for more energy and recreational facilities increases.

Wildlife species are generally associated with one or more specific types of habitat. Therefore, in this environmental impact statement, wildlife habitat has been divided into five generalized groupings—grassland, broadleaf tree-riparian, mountain shrub, semi-desert shrub, and conifer (forest and woodland). The Resource Area Profile lists wildlife species associated with the various habitat types. The Existing Management Situation and associated overlays discuss and display major wildlife species found in the resource area and their population conditions. These documents are on file and available for review in the Glenwood Springs Resource Area office.

Grassland

The grassland habitat makes up only a small percentage of the resource area acreage. It provides spring and summer food for deer and elk, food or cover for many small game and nongame species such as sagebrush vole, coyote, sage grouse, blue grouse, mountain bluebird, and various raptors.

Broadleaf Tree-Riparian

Aspen stands (7 percent of the resource area) and riparian-related species such as cottonwood, willow, grass and forb (less than 1 percent of the resource area) make up this habitat type.

Aspen stands provide summer food and cover for deer and elk and nesting habitat for various birds. Riparian-related vegetation provides essential food, cover, and nesting habitat for many aquatic and semi-aquatic wildlife species such as the bald eagle, great blue heron, beaver, and various waterfowl as well as other nongame species, especially songbirds. Although insignificant in overall acreage, it is used at some time during their life cycle by about 272 or 75 percent of the wildlife species thought to occur in the resource area.

Most riparian habitat in the resource area occurs on private land along the Colorado, Roaring Fork, and Eagle Rivers and their tributaries. The most important of this habitat occurs along the Colorado River from Glenwood Springs west to the resource area boundary. Throughout the resource area, riparian habitat has been severely impacted by road construction, gravel extraction, water diversions,

TERRESTRIAL WILDLIFE

HABITAT AND RELATED SPECIES

Wildlife habitat in the resource area provides food, cover, water, and living space for a diversity

AFFECTED ENVIRONMENT

and livestock grazing. Proposed water impoundments may have significant impacts in the future.

Mountain Shrub

The mountain shrub habitat, composed primarily of oakbrush and service berry, makes up about 20 percent of the resource area. It is important as winter range for elk and mule deer and also is used by mountain lion, black bear, wild turkey, and band-tailed pigeon as well as nongame species, especially songbirds. This habitat is currently being lost to housing development.

Semi-Desert Shrub

The semi-desert shrub habitat is composed of sagebrush, greasewood, and saltbrush. Sagebrush makes up 27 percent of the resource area, but greasewood and saltbrush are relatively insignificant in size.

Sage grouse and sage and brewers sparrows are almost completely dependent upon sagebrush, and mule deer and elk depend upon it for food, especially during the winter months. Sage grouse are found primarily in the Castle Peak and King Mountain Capability Units; however, some also occur in the Eagle-Vail Capability Unit. Other wildlife species commonly associated with sagebrush are the cottontail rabbit, coyote, bobcat, and sagebrush vole. Presently, the major activity causing the loss of sagebrush is housing development.

Conifer

The conifer habitat is made up of two distinct habitat types—conifer forest (spruce-fir) and conifer woodland (pinyon-juniper). The conifer forest and conifer woodland make up about 6 percent and 39 percent of the resource area, respectively. The conifer forest provides shelter and some food during the summer months for deer and elk; it also provides food, cover, and nesting habitat for such species as blue grouse, flammulated owl, northern three-toed woodpecker, Williamson's sapsucker, snowshoe hare, southern red-backed vole, black bear, bobcat, and pika.

The conifer woodland habitat provides very important winter cover and food for mule deer and elk and is also extensively used by mountain lion. Other associated species include the band-tailed pigeon, pinyon jay, plain titmouse, bush-tit, black-throated gray warbler, desert cottontail, pinyon mouse, and ringtail.

Changes occurring in the conifer habitats include fuelwood cutting, timber harvesting, and pine beetle

infestations. In some cases, these changes are beneficial to wildlife. Detrimental changes include housing development.

BIG GAME

Because mule deer and elk are of significant economical importance in the resource area, they are discussed separately in this environmental impact statement.

Mule Deer

Mule deer populations in the resource area are generally healthy and are estimated at 65,000 animals (5-year population modeling estimate developed in 1981 with the aid of the Colorado Division of Wildlife). This estimate is down from the 1963 Colorado Division of Wildlife estimate of 81,000 animals. Habitat loss in the resource area has probably contributed to this downward trend.

The 1988 mule deer population goal for the resource area is for 85,000 animals—a 31 percent increase.

In the resource area, quality and quantity of winter habitat appear to limit the size of the mule deer herds. Based on browse condition transects established by the BLM in the early 1970s, only about half the available winter range is in satisfactory condition—25 percent in the Garfield Capability Unit, between 50 to 75 percent in the Roaring Fork and Eagle-Vail units, and less than 50 percent in the King Mountain and Castle Peak units.

Of the estimated 1,342 square miles of deer winter range in the resource area, 750 square miles are considered to be crucial deer winter range. Map 4-5 shows the location of the crucial winter range. Of these 750 square miles, 400 (53 percent) are managed by the BLM. Based on county zoning in 1979, 60 to 83 square miles of the crucial winter range on private land (8 to 11 percent of the total) could be lost to development in the next 10 years. Assuming a total development of zoned areas on private land, crucial deer winter range managed by the BLM would be required to support 47 percent more mule deer by 1988 if Colorado Division of Wildlife goals are to be met. To compensate for habitat loss on private land, an 11 percent increase in animals on public land is needed over the next 10 years to meet current population demand.

In the Castle Peak and Eagle-Vail Capability Units, a major migration route falls within the crucial winter range. It serves an estimated 3,500 mule deer (the second largest migratory herd in the

LIVESTOCK GRAZING

state) that move from summer range in the Gore Mountain Range to winter range in the Gypsum and Eagle areas.

Elk

Elk populations have increased from 8,200 to 13,000 in the past 20 years—an increase of 58 percent. The Colorado Division of Wildlife goal is to hold this level until 1988.

Of the estimated 993 square miles of elk winter range in the resource area, 435 square miles are crucial elk winter range (Map 4-5). Of these 435 square miles, 200 (46 percent) are managed by BLM. Based on 1979 county zoning, 22 to 35 square miles of the privately-owned crucial elk winter range (5 to 8 percent of the total) could be lost to development during the next 10 years. If this happens, it means that if current elk populations in the resource area are to be maintained, elk populations on BLM-managed crucial winter range will have to increase by a like amount.

THREATENED AND ENDANGERED SPECIES

The bald eagle and peregrine falcon (presently on state and federal endangered species lists) and the great blue heron (a species of high federal interest) are known to occur on public land.

The Colorado, Eagle, and Roaring Fork Rivers provide suitable habitat for the bald eagle and the great blue heron. The most important of this habitat occurs along the Colorado River from New Castle west to the resource area boundary. Much of this habitat is being lost to such things as gravel pits, highway construction, and industrial and housing development. The bald eagle and great blue heron are especially vulnerable to this type of development because cottonwood trees that provide the needed resting, perching, roosting, and hunting sites along the river are often removed during development. These species are also particularly sensitive to human activities.

During the years of 1978-80, a minimum of 35 bald eagles were thought to winter in the resource area. Three historic bald eagle nests are located in the resource area, two of which occur on public land. In 1980, a fourth nest was built on private land east of Rifle and one of the historic nests west of Rifle was reconstructed. The new nest was destroyed by wind and the reconstructed nest was later abandoned. Disturbance from a nearby gravel pit newly reopened for the year could have contributed to the abandonment.

Several isolated sightings of peregrine falcons have been reported in this area; however, no active nests have been located to date. A number of known historic nest sites exist, and several potential nesting sites for peregrine falcon reintroduction have been identified on public land.

Approximately six (15 percent) of the known active heron nest sites in Colorado occur along the Colorado River within the resource area with a majority of this use occurring from New Castle west to the resource area boundary.

LIVESTOCK GRAZING

The Glenwood Springs Resource Area has 253 grazing allotments presently authorized for livestock use. Two hundred eleven allotments have one permittee per allotment, and 42 common-use allotments have 2 or more permittees per allotment. Three kinds of livestock are authorized to use these allotments. Table F-3, Appendix F, shows livestock authorizations for each allotment in the resource area. Table 4-9 shows the number of allotments in each use.

TABLE 4-9. LIVESTOCK USE

Kind of Stock	Number of Allotments	Percent of Total
Cattle.....	205	81
Sheep.....	29	12
Cattle and Sheep.....	11	4
Horse.....	5	2
Cattle and Horse.....	2	1
Sheep and Horse.....	1	> 1
Total.....	253	100

One hundred seventy-five ranchers are authorized to graze livestock within these allotments. The average cattle rancher runs approximately 300 cows and the average sheep rancher runs approximately 1,600 sheep on public land during a season. During 1980, a total of 12,022 cattle, 7,843 sheep and 27 horses were authorized to graze in the resource area.

Eight allotment management plans (AMPs) are presently in place in the resource area. One of these, the Horn AMP, covers seven allotments. Table 4-10 shows existing AMPs and allotments.

There are also 24 established allotments with no licensed livestock use. The permittee either relinquished his grazing preference or the BLM can-

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TABLE 4-10. ALLOTMENT MANAGEMENT PLANS

AMP	Allotment Numbers
East Divide.....	8105
Vulcan.....	8213
Upper Garfield.....	8222
J.Q.S.....	8908
East Fork.....	8910
Horn.....	8601, 8730, 8731, 8732, 8733, 8734, 8735
Trall Gulch.....	8642
Blowout.....	8643

called the preference in these unallotted allotments. These allotments are currently used only by wildlife.

Cattle typically graze on public land during the spring (May 15 to June 30) while enroute to the higher elevation national forest land where they graze during the summer (July 1 to September 30). In fall (October 1 to October 30), the cattle are moved back to public land as the livestock operators begin to move back to their private property for the winter season (November 1 to May 14). In several locations such as Castle Peak, Naval Oil Shale Reserve, and those allotments bordering the White River National Forest, cattle graze on public land during the spring, summer, and fall (Table F-3, Appendix F).

Sheep typically graze on public land in the spring (March 1 to July 1) while enroute to the national forest's summer range. They are moved in the fall (September) back to either public land, private property or desert rangeland west of the resource area until the following spring. The Naval Oil Shale Reserve supports some summer sheep grazing (Table F-3, Appendix F).

A resource area inventory of range sites conducted in 1979 using the Soil Conservation Service's ecological range condition classes (Soil Conservation Service 1976) shows that 9 percent of the rangeland is considered in good condition, 59 percent is in fair condition, and 32 percent is in poor condition (BLM 1979). It should be noted that ecological range condition is a classification system that groups plant communities according to the degree of successional change from the presumed climax plant community. This classification is not necessarily synonymous with particular use value. For example, fair ecological condition may represent good livestock forage condition (burned area where brush component is modified to a grass forb component).

Trend is the direction of change in range condition and indicates whether the range is improving, deteriorating or remaining about the same. Accurate vegetation trend can only be obtained by observing vegetation changes over several years. We do not currently have this data; however, indications are that substantial portions of the resource area are in static and downward trend. Factors contributing to this trend are continued heavy use by both livestock and wildlife of preferred plants and control of fire which results in undesirable woody plants such as oakbrush and pinyon-juniper replacing the preferred plants.

The economic forces resulting in a general national decline in the livestock industry and increase in land values accelerated in the resource area by rapid development of energy and recreation resources, have led to a downward trend in the viability of the local livestock industry. Overall, livestock grazing is not highly important to the regional economy but is critical to the livelihood of those operators who actually remain in the livestock business.

VEGETATION

TERRESTRIAL VEGETATION

The resource area lies within two physiographic regions—the Southern Rocky Mountains and the Colorado Plateau. The major physical or biogeographical barriers of the two physiographic regions greatly influence both plant and animal distribution on a regional level. Within a specific area, the types and amounts of vegetation present are determined by precipitation, elevation, topography, exposure, soil type, and man's action. Generally, plant cover and production increase as precipitation and temperatures increase.

Table 4-11 lists the vegetation types and subtypes found in the Glenwood Springs Resource Area. Locations of these vegetation types and subtypes are shown on Map 4-6.

Present forage production is estimated to be 96,666 based on a 1979 inventory.

RIPARIAN VEGETATION

Riparian vegetation is found along perennial streams and some intermittent streams, lakes, springs and reservoirs for all or most of the year.

FORESTRY

TABLE 4-11. VEGETATION TYPES AND SUB-TYPES OF GLENWOOD SPRINGS RESOURCE AREA

Type	Acreage	Subtype
Grass and Grasslike.....	32,628	Short, mid and tall grass; sedge; and rush
Semi-Desert Shrub.....	86,526	Black greasewood; winterfat; shadscale; mat, fourwing, and other saltbush; big, low, black and other sagebrush; and rabbitbrush
Mountain Shrub.....	166,897	Mountain mahogany, bitterbrush, oakbrush, serviceberry, mixed mountain shrub, willows, alder, and other shrubs
Broadleaf Trees.....	36,042	Willows, red alder, aspen, cottonwood, and other broadleaf
Conifer (Forest).....	34,408	Douglas fir; Englemann spruce-subalpine fir; and ponderosa and lodgepole pine
Conifer (Woodland).....	209,541	Pinyon pine and juniper
Total.....	566,042	

Source: BLM 1979.

Riparian vegetation occurs in bands or zones along and around these water sources, often referred to as riparian zones. These zones in most cases occur in acreages too small to be delineated separately from the surrounding vegetation type. The more important riparian zones in the resource area are shown on Map 4-6.

THREATENED OR ENDANGERED SPECIES

Currently, only one plant in the resource area is listed as threatened—the Uinta Basin hookless cactus *Sclerocactus glaucus* (BLM Instruction Memorandum CSO-81-291 August 1981). This cactus is found on dry alkaline hills in the Colorado Plateau of western Colorado and eastern Utah. Its range in the resource area is roughly from Rulison west above the Colorado River. No known plant species within the resource area are listed as endangered.

Six plants, currently listed as sensitive in BLM Instruction Memorandum CSO-81-291, occur in the resource area. These are Barneby's columbine *Aquilegia barnebyi* found near Rifle Falls, sedge fescue *Festuca dasyclada* found on the Roan Plateau, Wetherill's milkvetch *Astragalus wetherillii*

found from Rulison west along the Colorado River and phacelia *Phacelia submutica* found south of Debeque, milkvetch *Astragalus lutosus* found north-east of Debeque, and beardtongue *Penstemon harringtonii* found west of McCoy.

FORESTRY

PRODUCTIVE FOREST LAND

The resource area has approximately 70,450 acres of productive forest land that supports lodgepole pine (16 percent), Englemann spruce-subalpine fir (25 percent), Douglas fir (5 percent), ponderosa pine (1 percent), and quaking aspen (53 percent). Sawtimber on productive forest land is usually harvested through advertised timber sales and commercial thinnings. An average of 400 acres are harvested annually.

Overall condition of the productive forest stands is difficult to gauge. The forest in general can be classed as healthy and mature with no major pest problems. As little commercial harvesting of stands has occurred, virtually no reforestation backlog exists.

About 9,500 acres of forest land are in a regeneration state and will be susceptible to damage by livestock grazing and wildlife browsing for the next 20 years.

Because of the poor market conditions existing in the region over the past several years, most timber sales have involved only commercial timber species on slopes less than 40 percent. Noncommercial species such as aspen and subalpine fir and slopes over 40 percent are currently considered uneconomical to manage.

WOODLAND

The resource area also supports approximately 189,485 acres of pinyon pine (50 percent) and juniper (50 percent) known as woodland. An estimated 75 acres of pinyon pine and juniper are harvested annually. Annual woodland harvest averages 1,000 cords of commercial fuelwood. The western portion of the resource area supports primarily a juniper type with the remaining area being a mixed pinyon-juniper type.

The woodland forest is typified by stands of all ages and condition but generally produces slow-

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growing mature stands. Black stain root rot has been found in several isolated stands.

RECREATION RESOURCES

The resource area is located in a region noted for its recreational opportunities. The resorts at Aspen and Vail, the eight designated wildernesses, the mountain scenery, excellent fishing, big-game hunting, and floatboating attract visitors from throughout the nation and characterize the region as a destination vacation area. In addition, major transportation corridors such as Interstate 70 allow for transient and spontaneous recreational use. These factors have produced a recreational industry that is a major component of the economy throughout most of the resource area. Demands for recreation are expected to increase, especially if rapid population growth from energy and ski area development in and near the resource area continues.

Distinct differences in the amount and types of recreational use exist between national forest and public lands. Presently, national forest land receives most of the use in the region, especially by nonlocal users, with skiing, hunting, fishing, backpacking, camping, and off-road vehicle driving the activities generating the most use. Public land generally receives less use. However, public land is important in providing floatboating and big-game hunting opportunities and in providing local residents with recreational opportunities close to the population centers of the resource area. The differences in use and use patterns occur largely because (1) some national forest areas such as Aspen and the Maroon Bells are nationally recognized whereas resources on public land are not well known and (2) national forest land is more easily accessible than public land that is scattered and has limited public access.

The activities that generate the most use on public land are floatboating, hunting, fishing, and off-road vehicle driving. Over 91,000 recreation days of floatboating occurred in the region in 1980, primarily on the Colorado and Roaring Fork Rivers but also on the Eagle and Crystal Rivers. Floatboating is economically important since about 73 percent of the 1980 use was through commercial companies. The upper Colorado River between Pumphouse and Dotsero (partially within the Kremmling Resource Area) is the most important river segment to the BLM because the greatest amount of public land is along this segment. This river segment receives the second largest amount of use (44,644 recreation days in 1980) of the ten major floatboat-

ing rivers in Colorado and generates 19 percent (approximately \$4,315,000) of the total whitewater boating expenditures in the state (about half of the expenditures in the region).

Big-game hunting is concentrated on Castle Peak, the Battlements, and the Naval Oil Shale Reserve, with lesser amounts of use occurring in the Hack Lake, Hardscrabble, Horse Mountain, and Divide Creek areas. Almost 41,000 visitor days of use occur annually on public land accounting for about 30 percent of the total expenditures associated with this activity in the area. Deer and elk are the most important species and attract 97 percent of the big-game hunting use.

Annual fishing use is estimated to be about 4,200 visitor days. Over 90 percent of this use is on the Eagle, Roaring Fork, Frying Pan, and upper Colorado Rivers. Of this amount, about half occurs on the upper Colorado River alone.

Information on the amount and extent of off-road vehicle driving use is difficult to estimate because the use is dispersed and also supplementary to other activities such as hunting. In addition, the majority of snowmobile use on public land is associated with access to higher elevations on national forest land. Combined four-wheel drive, motorcycle, and snowmobile use is estimated at 4,800 visitor-use days per year.

Other activities that have lesser amounts of use directly attributable to public land are camping, nature study and environmental education, and general sightseeing.

Public land in the resource area contains a number of recreationally significant areas and features. Thompson Creek, a proposed natural environment area, contains geological, ecological, and cultural resources that are well suited to environmental education. Deep Creek Canyon is noted for its scenic beauty and also has a significant concentration of caves. The upper Colorado River is the most intensively used area in the resource area and offers a wide variety of activities including floatboating, fishing, camping, picnicking, and sightseeing. Primitive types of recreation including hiking, backpacking, and camping are available in the Hack Lake, Bull Gulch, and Castle Peak areas. Geological features that have significant interpretive potentials include the Dotsero Crater, Sweetwater Fold, the oil shale formation in the Wasatch Formation, and the Grand Hogback.

Past BLM recreation planning methods focused primarily on recreational activities, especially amounts of use and use areas, and on recreational features such as geological sites. The BLM and U. S. Forest Service have adopted a new inventory, evaluation, and management system called the

SOCIAL AND ECONOMIC CONDITIONS

recreation opportunity spectrum (ROS). The premise of the ROS is that users demand not only a variety of recreational opportunities but also certain environments or settings in which to recreate. These settings have an influence on the activity, the recreational experience, and the satisfaction that is gained. For example, camping in a campground is totally different from camping in a remote area and would result in a different type of experience. The types of settings that exist in an area result from the physical character of the area, the managerial controls imposed on the visitor, and social interactions that affect the experience. The ROS defines a spectrum of settings ranging from primitive (such as a wilderness) to urban (such as a

city park). The supply and demand of both activities and settings must be analyzed to obtain the total picture of recreational opportunities. Existing settings in the resource area and in the White River National Forest have been inventoried and identified. Table 4-12 shows the approximate acreage of settings on public land by capability unit. In addition, information on visitors' preferences for settings associated with various activities has been obtained and indicates most users desire those settings that are natural in character, have few management restrictions, and have limited social contacts. In other words, most users prefer those settings that are most primitive in character.

TABLE 4-12. RECREATION OPPORTUNITY SPECTRUM SETTINGS

Capability Unit	Recreation Opportunity Spectrum Settings					
	Primitive	Semi-primitive Non-motorized	Semi-primitive Motorized	Roaded Natural	Semi-urban ¹	Urban
Garfield.....	0	11,136	106,886	108,152	11,561	174
Roaring Fork.....	0	3,709	27,411	24,579	8,178	372
Eagle-Vail.....	0	0	47,750	10,153	6,144	101
King Mountain.....	722	3,829	52,697	20,633	2,370	0
Castle Peak.....	0	15,711	79,331	19,751	4,792	0
Total.....	722	34,385	314,075	183,168	33,045	647

¹Also called rural

SOCIAL AND ECONOMIC CONDITIONS

POPULATION

The 1980 population of the three-county area (Eagle, Garfield, and Pitkin Counties) was just over

46,000—two and one-half times the 1960 population (Table 4-13). Most of the growth can be attributed to the development of a recreation and tourism industry in the area, particularly the emergence of Vail and Aspen as major ski resorts. Additional growth in recent years has been the result of exploration for and development of energy minerals. In addition to Aspen and Vail, other major population centers are Carbondale, Glenwood Springs, and Rifle.

TABLE 4-13. GLENWOOD SPRINGS RESOURCE AREA POPULATION

(1960 to 1980)

Place	1960	1970	1980	Percent Increase		
				1960-70	1970-80	1960-80
Eagle County.....	4,677	7,498	13,320	60	78	182
Garfield County.....	12,017	14,821	13,320	23	52	87
Pitkin County.....	2,381	6,185	10,388	160	67	334
Three-county Area Total.....	19,075	28,504	46,172	49	61	141
Colorado.....	1,753,947	2,209,596	2,888,834	26	31	65

Source: U. S. Department of Commerce, Bureau of the Census

AFFECTED ENVIRONMENT

Resident population figures understate the impact of people on the resource area. Studies in Eagle and Pitkin Counties indicate that the tourist population during the peak of the ski season is 12,000 in the Vail area and 18,000 in Pitkin County. These figures suggest a peak population of approximately 75,000 that must be accommodated by the area's services and facilities.

Ski area development is continuing with the development of the Beaver Creek resort in eastern Eagle County. Other planned developments include Adam's Rib, south of the town of Eagle, Little Annie and Burnt Mountain in Pitkin County, and the Rifle Ski Area in Garfield County. Oil shale related growth near Parachute was until recently causing rapid population increases between Silt and DeBeque. A new town, Battlement Mesa, was under construction. However, with the demise of the Colony project and several smaller oil shale projects, only the first stage of the Union Oil project is still underway. The future still holds the potential for oil shale projects by Exxon, Chevron, Mobil Oil, and other companies.

Even without development of the planned ski areas or the oil shale projects, population in the three-county area is expected to be 65,000 in the year 2000—a 40 percent increase. If those projects should come to be, the area's population in the year 2000 could be 83,000. The greater part of any additional growth would be near the towns of Eagle and Parachute or Rifle.

EMPLOYMENT AND INCOME

The economy of the Glenwood Springs Resource Area is dominated by businesses that serve the recreation and tourism industry—restaurants, motels, ski areas, and recreation equipment stores. Of the 47 largest employers in the areas in 1978, 16 were hotels or motels, 13 were restaurants, and 5 were ski areas. Only 4 firms were engaged in manufacturing or commodity production—2 coal companies, a gas production firm, and a sawmill that has since gone out of business. Agriculture represents a small and decreasing portion of the economy.

The economy is also characterized by a strong element of seasonality and a lack of diversity. Total employment in May is often 20 percent less than the January peak. Hunting activity provides some protection against a seasonal decline in the fall between the busier summer and winter seasons.

The retail trade and service industries are the largest employers in the resource area (Fig. 4-2).

Together they supplied jobs to 12,701 of the 25,424 employed workers in 1978, just 50 percent. Nationally, only 32 percent of all workers are employed in the retail trade and service sectors. A sign of the economy's lack of diversity is that the next largest categories of employees were the self-employed and government workers. Coal miners make up a significant portion of the work force in the Carbondale/Glenwood Springs area. Oil shale projects employed as many as 3,500 in early 1982. The recent slowdown of several oil shale projects has considerably reduced that figure.

Personal income by sector mirrors the pattern of employment with one major exception (Fig. 4-3). Almost 21 percent of the area's personal income is from dividends, interest, and rent. This is half again as much as the 14 percent nationally that is derived from these sources.

LIVESTOCK INDUSTRY

Although livestock production has been replaced as the major economic activity by recreation and tourism, it retains an important role in the area. In addition to the reliance placed on it by ranch families, livestock production gives the area the rural western character that attracts tourists. It is also viewed by some residents as an effective buffer between resort areas and energy development areas.

Of the more than 25,000 employed in the resource area in 1978, about 900 (3.5 percent) were employed in agriculture, primarily in ranching, either as proprietors or as hired labor. The number has been declining for some time and can be expected to continue to do so. Services and sales to ranches and ranch employees support employment of another 450 persons, 1.8 percent of the area's total employment.

Income generated directly by ranch ownership and labor amounted to just over \$7 million in 1978, 2 percent of the three-county area's total personal income. That \$7 million indirectly stimulated another \$3.5 million in income throughout the local economy.

Ranching's contribution to local public revenue is of the same magnitude. Agriculture property assessments in the 3 counties of \$12 million amount to 3.3 percent of total assessed value.

Currently, 168 ranch operators hold BLM grazing permits or leases. Their average use of public land forage has been 37,709 animal-unit months (AUMs), which amounts to about 7 percent of their total forage need (Table 4-14).

SOCIAL AND ECONOMIC CONDITIONS

FIGURE 4-2

EMPLOYMENT BY SECTOR

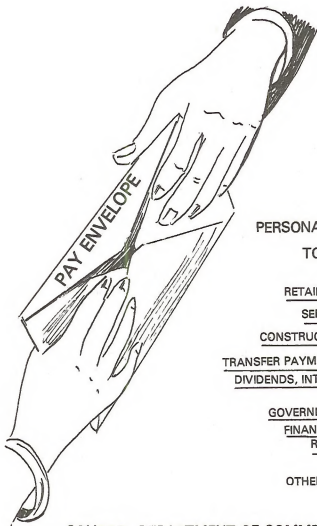
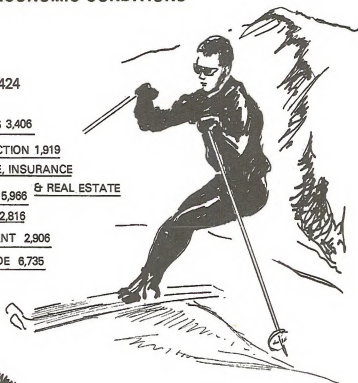
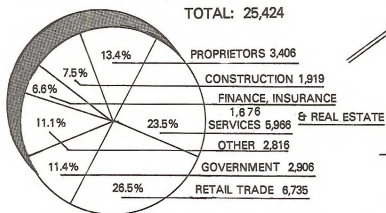
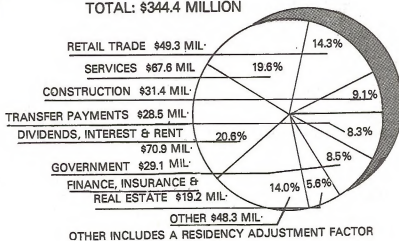


FIGURE 4-3

PERSONAL INCOME BY SOURCE

TOTAL: \$344.4 MILLION



SOURCE: DEPARTMENT OF COMMERCE, BUREAU OF ECONOMIC ANALYSIS
REGIONAL ECONOMIC INFORMATION SYSTEM APRIL 1980

AFFECTED ENVIRONMENT

TABLE 4-14. DEPENDENCY ON PUBLIC LAND FORAGE

Dependency (percent)	Number of Ranches
0-10.....	123
11-20.....	28
21-30.....	7
31-40.....	6
41-50.....	1
>50.....	3
Total.....	168

More than half of the ranches are relatively small (less than 450 head) with low or negative net revenues (Table 4-15). (The methodology used to

evaluate the economic performance of area ranches is described in Appendix J.)

TABLE 4-15. RANCH SIZE, PUBLIC LAND FORAGE AND INCOME

Model	Cattle	Sheep	Number of Ranches	Total BLM AUMs	Average BLM AUM use ¹	Gross Revenue (dollars)		Net Revenue (dollars)	
						Total	Average	Total	Average
I.....	≤ 149		68	5,920	87	1,590,452	23,389	-1,075,692	-15,819
II.....	150-449		47	8,560	182	2,505,617	53,311	-207,082	4,406
III.....	450-749		14	5,053	361	1,414,336	101,024	345,716	24,694
IV.....	750-1,999		12	8,598	717	2,788,080	232,340	185,436	15,453
V.....	≥ 2,000		2	1,772	886	1,383,934	691,967	509,144	254,572
VI.....	≤ 1,399	≤ 1,749	9	2,828	314	1,335,825	231,252	405,054	45,006
VII.....	≥ 1,400	≥ 1,750	4	1,169	292	925,008	739,734	1,055,132	263,783
VIII.....		0-6,000	12	3,809	317	8,876,808	148,425	629,628	52,469
Total.....			168	37,709	224	20,819,951	123,928	1,847,336	10,996

Source: Bartlett, E. T., R. G. Taylor, and J. R. McKean 1979. *Impacts of Federal Grazing on the Economy of Colorado Fort Collins*, Colorado State University.

Note: The methodology used to derive revenue estimates is described in Appendix J.

¹Average 5-year licensed use.

The estimated gross revenue of ranches with permits or leases is \$21 million which supports another 10.5 million in sales throughout the area's economy. The estimated net revenue of \$1.8 million supports additional local income of about \$10.9 million. Total net revenue masks the \$1.3 million negative net revenue for the two smallest ranch sizes.

LAND USE

The development of private land in the resource area reflects the historic pattern of agricultural settlement and, to a lesser extent, the presence of mineral resources. The primary determinant of the shifting land ownership pattern, from large agricultural land holdings to small residential lots, has been the growth of the commercial recreation in-

dustry. The potential for oil shale development has been a major factor in the rapid transition of land use in Garfield County from agricultural use to residential, commercial, and industrial development. Land speculation and housing construction have become major factors in the region's economy. Table 4-16 shows the current private land uses by county within the resource area.

Greater detail and more extensive discussion of the area's economy, social setting, and land uses can be found in the Social and Economic section of the Resource Area Profile and the Lands section of the Existing Management Situation. Both documents are on file and available for review in the Glenwood Springs Resource Area office.

CULTURAL RESOURCES

TABLE 4-16. LAND USES IN THE GLENWOOD SPRINGS RESOURCE AREA

(in acres)

County	Public Land	Private Land				Total
		Residential ¹	Industrial/Commercial ²	Agricultural (Intensive) ³	Grazing	
Garfield.....	274,120	42,094	11,026	61,002	285,763	674,005
Eagle.....	229,279	29,698	11,815	20,564	106,230	397,586
Pitkin.....	26,867	21,055	13,786	9,726	28,825	100,259
Routt.....	27,227	0	120	8,231	51,614	87,192
Mesa.....	8,228	0	0	2,560	8,716	19,505
Rio Blanco.....	320	0	0	0	639	959
Total.....	566,042	92,847	36,747	102,083	481,787	1,279,506

¹Includes all plotted subdivisions, approved and unapproved.

²Includes all commercial recreation sites.

³Includes irrigated pastureland, meadowland, and irrigated and non-irrigated cropland.

CULTURAL RESOURCES

ARCHAEOLOGICAL RESOURCES

Two percent (27,495 acres) of public land in the Glenwood Springs Resource Area has been inventoried for cultural resource occurrence. To date, 491 sites have been recorded. Thirty-four of these sites appear to be eligible for listing in the *National Register of Historic Places*.

Of the 491 recorded sites, 88 are high priority, 112 are moderate priority, and 235 are low priority sites. These priorities determine how a site should be managed. Site priorities indicate a site's potential for contributing data and explain its function or uniqueness.

Types of sites that have been located include lithic scatters, hunting sites, kill/butchering sites, hunting racks, quarry sites, temporary camps, extended camps, pit houses, wikiups, granaries, cists, process areas, burial sites, petroglyph-pictograph panels, trails, race tracks, vapor caves, and isolated artifacts.

These resources were used during the past 10,000 to 15,000 years by peoples of the Paleo-Indian stage, Desert Archaic and Fremont cultures, and the Ute Indians.

HISTORIC RESOURCES

Two hundred twenty-five (225) historic sites have been recorded within the resource area. However, only 82 sites, none of which are eligible for inclusion in the register, are located on public land.

Trails, forts, toll and wagon roads, hotels, resorts, bridges, homesteads, ranches, railroads, towns, mines, mills, and schools are the types of sites that have been recorded. These sites are associated with farming, ranching, mining, commerce, and exploration activities that occurred between the 19th and 20th centuries.

PALEONTOLOGICAL RESOURCES

Fossils occur in many geologic formations throughout the resource area. These formations have been classified to indicate the likelihood of significant (vertebrate fossils of scientific interest) fossil occurrence.

Class I. Areas that are known or are likely to produce abundant significant fossils that are vulnerable to surface-disturbing activities.

Class II. Areas that show evidence of fossils but are unlikely to produce abundant significant fossils.

Class III. Areas that are unlikely to produce fossils.

These classifications determine the procedures to be followed prior to the granting of a paleontological clearance to proceed with a project. Class I areas require a BLM survey prior to surface disturbance. Class II and Class III areas do not require surveys; however, mitigation measures are taken to protect any significant fossil finds.

The Wasatch Formation is the only Class I area in the resource area. It covers about 80,800 acres of outcrops in the Garfield Capability Unit. The Wasatch Formation is important because it is one of the few known geologic formations within west cen-

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tral Colorado where abundant vertebrate fossils are exposed on or near the earth's surface. Here fossils unique to the Rocky Mountain Region are exposed in five faunal zones within 5,500 feet of sediment. These fossils are scientifically important because the specimens occur as isolated fragments, rarely as whole skeletons, and, therefore, represent a very small population of a given taxonomic group. To recognize a species, more than one specimen is necessary for identification. The large sample size is necessary to determine the amount of natural variation within a species. To date, approximately 400 specimens representing 40 taxa have been found in each faunal zone. Most of the specimens are fragments (teeth, jaws, partial skulls, and limb bones) of early vertebrates. These specimens range from large (9 feet) hooved carnivorous mammals to small reptiles. Among the species are small early horses, rhinoceroses, birds, rare primates, and crocodiles.

WILDERNESS VALUES

In the BLM's intensive wilderness inventory, completed in November 1980, four units in the resource area were found to possess wilderness characteristics and were identified as wilderness study areas (WSAs). These areas were Eagle Mountain (CO-070-392), Hack Lake (CO-070-425), Bull Gulch (CO-070-430), and Castle Peak (CO-070-433). The decision to identify Castle Peak and not to identify Pisgah Mountain (CO-070-421) as a WSA was protested and subsequently appealed to the Interior Board of Land Appeals. In a ruling on November 17, 1981, the Interior Board of Land Appeals affirmed the BLM's decision on both units. Thus, the original four WSAs are the only units in the resource area still under wilderness review and under interim management to protect wilderness values.

The Eagle Mountain WSA (approximately 330 acres) is located northwest of Snowmass Village in Pitkin County. It is too small to be considered for wilderness designation by itself but could be added to the adjacent Maroon Bells-Snowmass Wilderness (174,329 acres) administered by the White River National Forest. The Eagle Mountain WSA possesses a high degree of naturalness but does not offer outstanding opportunities for solitude or primitive and unconfined recreation by itself. It is, however, a logical extension of the Maroon Bells-Snowmass Wilderness and, thus, shares the very high quality opportunities for both values present in the existing wilderness.

The Hack Lake WSA (approximately 3,360 acres) is located in Eagle and Garfield Counties about 15

miles northeast of Dotsero. It also is too small to be considered for wilderness by itself but could be added to the Flat Tops Wilderness, also administered by the White River National Forest. A few minor imprints of man exist within the WSA; however, a primeval character has been retained. The outstanding opportunities for solitude, primitive, and unconfined recreation available within the Hack Lake WSA are further enhanced by the opportunities provided in the adjoining 235,230 acres of existing wilderness. Hack Lake contains several special features, including wildlife, scenic, geological, ecological, and cultural values.

The Bull Gulch WSA (approximately 15,000 acres) is located along the Colorado River between Dotsero and McCoy in Eagle County. Only minor modifications of man that have a negligible influence on the overall high quality of naturalness exist within the Bull Gulch WSA. The vegetation and steep, rugged topography provide numerous opportunities for isolation and seclusion. Interesting geological formations, diverse terrain, a wide range of wildlife, and extreme ecological transition contribute to many high quality recreational opportunities and also provide supplemental values. This WSA is the only area with wilderness potential in the resource area that contains a land form/ecosystem type different from that in the existing wildernesses in the local region.

The Castle Peak WSA (approximately 11,940 acres) is located about 10 miles north of Eagle in Eagle County. Because of the distribution and screening of imprints of man, a visitor will perceive the Castle Peak WSA as being primarily natural but will be reminded that man is a frequent visitor. The dense forest that covers much of the WSA and the topography are barriers to sights and sounds inside and outside of the area. The diverse terrain and vegetation, numerous wildlife, the trail network, and geological and scenic features provide for a wide variety of recreational activities. The scenic and ecological features are supplemental values and include Castle Peak—the most prominent geologic feature in the WSA and the Eagle River Valley.

The study phase of the BLM's wilderness review process for these four WSAs is being accomplished through the resource management plan environmental impact statement process. This study evaluates the wilderness values along with other resource values to determine the most appropriate management and use of each WSA. After completion of the resource management plan, the preliminary recommendations on the suitability or unsuitability of each WSA for designation as wilderness will be compiled in a study report and submitted to the President and to Congress. Congress will make

VISUAL RESOURCES

the final decision as to whether or not each WSA will be designated as wilderness.

VISUAL RESOURCES

Visual resources are the combinations of landform, water, color, cultural, vegetative, and other features that characterize landscapes. To determine how the visual resources should be managed, the visual resource management program has been developed as a system for classifying and managing landscapes. This system, explained in BLM Manual 8400, places landscape units into visual re-

source management classes that indicate the overall significance of the visual environment and establish management objectives for determining the degree of acceptable visual change within a landscape (the classes are defined in the Glossary). The management objectives for an area are used to evaluate the visual compatibility of a proposed project and to determine if mitigation measures are needed to reduce or eliminate visual impacts. Tentative visual resource management classes have been identified within the resource area and are shown on Map 3-29. Table 4-17 shows the approximate acreage of public land in the tentative classes by capability unit. These classes will have to be analyzed and adopted through the resource management plan.

TABLE 4-17. TENTATIVE VISUAL RESOURCE MANAGEMENT CLASSES

(in acres)

Capability Unit	Tentative Visual Resource Management Classes				
	Class I (preservation)	Class II (retention)	Class III (partial retention)	Class IV (modification)	Class V (rehabilitation)
Garfield	0	98,691	49,702	87,752	1,664
Roaring Fork	0	43,862	11,758	8,509	0
Eagle-Vail	0	30,534	19,822	13,792	0
King Mountain	0	49,354	13,061	17,816	0
Castle Peak	0	60,630	11,599	47,356	0
Total	0	283,091	105,962	175,325	1,664

Three major visual components are inventoried and evaluated in the determination of visual resource management classes: scenic quality, visual sensitivity, and distance zones.

Scenic Quality

Scenic quality is defined as the degree of harmony, contrast, and variety that influences the overall impression of a landscape. The resource area contains a number of high quality scenic areas. Six areas—the Naval Oil Shale Reserve, Thompson Creek, Glenwood Canyon, Deep Creek Canyon, the Colorado River between State Bridge and Dotsero, and Bull Gulch—have exceptional visual value because of visual variety and harmony. Furthermore, the Thompson Creek, Deep Creek, and Bull Gulch areas contain scenic features that are relatively unique or rare within the physiographic region and qualify for consideration as areas of critical environmental concern for scenic values.

Cultural modifications can affect scenic quality by either complementing or detracting from the visual quality of a landscape. Of greatest concern are those modifications that have depreciated scenic quality such as power transmission lines, gravel pits, mines and associated developments, communication sites, off-road vehicle use areas, and dump sites. The visual impact of some of these modifications could be reduced through rehabilitation, but land ownership or the extent of some impacts precludes complete mitigation throughout the resource area.

Visual Sensitivity

Visual sensitivity is the degree of public concern toward scenic quality and toward existing or proposed visual change within a landscape. Sensitivity levels within the resource area are higher than what might normally be expected because of the comparatively high concern most public land users place upon the visual resources; the large volumes of traffic on Interstate 70 and Colorado Highways

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13, 82, 131, and 133; and the amount of tourism, including the destination resorts at Aspen and Vail. The Colorado, Eagle, Frying Pan, Roaring Fork, and Crystal River Valleys, Rifle Gap and Grassy Reservoirs, the Battlements, and the Roan Cliffs are included in the high sensitivity category.

Distance Zones

Distance zones refer to the distance from an observer to a landscape. This distance affects the observer's ability to detect individual landscape elements and changes. Because of the number of travel routes and use areas, much of the resource area is visually accessible, with a large percentage of these visible areas in the foreground/middle-ground distance zone. Since areas that are closer have a greater effect on the observer, these areas require the most attention in analyzing and mitigating visual impacts.

Summary

The combined effects of scenic quality, sensitivity, and visual accessibility in the resource area have resulted in a high percentage of tentative visual resource management classes with low tolerances for modification. Increasing pressure is being placed on the visual resources as a result of energy-related projects (and other developments) and the housing, utilities, and transportation needs associated with them. Yet, public concern is also increasing about protecting visual quality for open space and scenic backgrounds for residential purposes and for recreational uses.

TRANSPORTATION

ROADS

Travel along roads on public land is limited by road conditions and legal access. This situation makes travel across public land difficult for local residents and very difficult for visitors.

Approximately 830 miles of road are located on public land within the resource area. Of this total, approximately 26 miles are state and federal highways that would not be significantly affected by this environmental impact statement, 120 miles are claimed by counties, and 684 miles are BLM roads. Many of the roads on public land are accessible only by private roads crossing private land, and many of these private roads are closed to the public.

Most roads on public land are passable only during dry weather conditions. Of the 804 miles of BLM and county roads inventoried on public land, 508 miles are four-wheel drive roads, 240 miles require a high clearance vehicle, 36 miles are impassable, and 20 miles are suitable for passenger car. Very few roads across public land are regularly maintained.

Large areas of land north of Eagle and along the upper Colorado River between Dotsero and State Bridge are legally inaccessible to the public. Other important large areas of land without assured public access lie south of Gypsum, within the Roaring Fork Valley, adjacent to Battlement Mesa, and north of Silt and New Castle. In most of these areas, lack of public access also prohibits travel through public land to national forest land. Recently, several county roads have been successfully closed to the public by private landowners near major development areas. This trend is likely to continue.

Adequate public access is available to public land near Rifle Gap Reservoir, Gibson Gulch south of Silt, Dry Lake north of Gypsum, and the Naval Oil Shale Reserve.

WAYS AND TRAILS

Numerous ways and trails exist on public land. Presently, no trails are maintained, and most are inaccessible for public use.

CHAPTER 5

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

Chapter 5 discloses the environmental, social, and economic consequences of implementing the alternatives described in Chapter 3. It discusses only the resources that would be impacted by the alternatives. No impacts on geology, topography, noise, and prime and unique farmlands would result from management actions. A comparative summary of impacts by resource program is included at the end of Chapter 3.

ASSUMPTIONS AND GUIDELINES

For the purpose of analyzing the impacts of implementing each alternative, the following assumptions were made. Please note that assumptions were not made for all resource programs.

WATER QUALITY ASSUMPTIONS

1. In order to derive a sediment yield estimate, it was assumed that the amount of each vegetation type actually treated by the wildlife and livestock grazing programs would be equal to the proportion of the total acreage of each vegetation type within an allotment that is suitable for treatment.
2. No more than 10 percent or 40 acres (whichever is greater) of the areas proposed for vegetation manipulation within a watershed could be manipulated in any given year by wildlife, livestock grazing, and water yield programs.
3. Implementation of all range and wildlife manipulations would take 10 years.
4. Recreational use in wilderness study areas would increase.
5. To assess significance of sediment impacts, the Northwest Colorado Council of Governments 208 Plan recommendation for maximum allowable departures of stream suspended sediments was used. This is based on administrative criteria proposed by the U. S. Forest

Service (Rosgen et. at. 1977). The allowable departures in sediment yield were 25 percent for third and fourth order streams and 20 percent for fifth order streams. These departure levels apply to streams designated by the Colorado Department of Health, Water Quality Control Commission, as Aquatic Class 1 (cold water aquatic life) and Class 2 domestic water (requires treatment). If these departures were exceeded, the impact was considered significant.

6. Sediment yield is derived from sheet erosion and channel erosion. Channel erosion is generally a large source of sediment but is difficult to estimate. The analysis in this environmental impact statement is based on changes in sediment from sheet erosion only. These figures should be interpreted as indicating general magnitudes of impacts and as a basis of comparison between alternatives rather than as specific changes in sediment yield. Appendix H details the methodology used in generating sediment yield figures.
7. In the Resource Protection and Economic Development Alternatives, it was assumed that the mountain brush manipulated by range and wildlife programs would be included in the total suitable for water yield manipulations.
8. Water rights necessary for the construction of projects can be acquired.

WATER YIELD ASSUMPTIONS

1. No more than 10 percent or 40 acres (whichever is greater) of the areas proposed for vegetation manipulation within a watershed could be manipulated in any given year by wildlife, livestock grazing, and water yield programs.
2. Timber water yield analysis is based on an average volume of 6,700 board feet per acre of timber per year.
3. The range and wildlife mountain brush manipulation assumes that the proportion of mountain brush actually manipulated in an allotment and watershed is the same as the percentage of total mountain brush suitable for manipulation in the area.

ENVIRONMENTAL CONSEQUENCES

4. Only areas with stable soils, low to moderate erosion hazard, and precipitation of 15 inches or greater were considered suitable for calculating water yield increases from mountain brush conversions.
5. Only areas with stable soils greater than three feet deep, low to moderate erosion hazard, and precipitation of 15 inches or more annually were considered suitable for calculating water yield increases from sagebrush conversions.
6. Estimates for increases in water yield expected from the various vegetation types represent average increases expected in years of normal precipitation. Actual increases will vary by site condition and precipitation level.
2. Wildlife (mule deer and elk) existing use is based on the average of 5 years (1976-80).
3. No more than 10 percent or 40 acres (whichever is greater) of the areas proposed for vegetation manipulation within a watershed could be manipulated in any given year by wildlife, livestock grazing, and water yield programs.
4. All woodland occurs in big game winter range with the majority occurring in crucial winter range.
5. All productive forest land occurs in big game summer range.
6. Selective cutting would result in removal of 40 percent of the trees in a stand.

CRITICAL WATERSHED ASSUMPTIONS

1. Stipulations protecting critical watersheds from mineral exploration and development impacts would be included in mineral leases.
2. Fuelwood sales in the New Castle municipal watershed would be designed to avoid water quality impacts in the Continuation of Current Management Alternative.

MINERALS ASSUMPTIONS

All mineral rights would be reserved on land identified for disposal where valuable minerals can be identified.

AQUATIC WILDLIFE ASSUMPTIONS

1. Significant increases in sediment yield would adversely affect fisheries.
2. Upstream diversions would not dewater the streams upon which the aquatic wildlife rely or adequate water rights would be acquired to protect the fisheries resource.
3. To maintain increased water yields, vegetation regrowth would be controlled.
7. Loss of any crucial winter range causes a proportionate reduction in big game populations.
8. Colorado Division of Wildlife computerized population modeling program and base input data is correct.
9. BLM computerized forage allocation program and base input data is correct.
10. Long-term impacts occur over a 10-year period. Short-term impacts occur within a 5-year period.

TERRESTRIAL WILDLIFE ASSUMPTIONS

1. Wildlife introductions, reintroductions, and supplementations are all discussed as introductions.
11. The Colorado Division of Wildlife can successfully control big game populations on a game management unit basis.
12. All vegetation manipulation acreage proposed for the resource area could be accomplished within visual resource management guidelines.
13. All land identified in land tenure for disposal will lose its value as habitat for big game and this will occur over a 10-year period.
14. Productive forest land would be harvested on a 100 to 120-year rotation, woodland on a 230-year rotation, and aspen on a 70-year rotation.
15. There will be a loss in big game crucial winter range on private land. This loss would increase the big game forage demand on public land by approximately 8 percent over the next ten years if total big game populations are to be maintained. See Table 3-28, Chapter 3, Alternatives, and Chapter 4, Affected Environment.
16. Short-term areawide impacts were considered significant if forage would be 5 percent or more short of meeting existing big game populations.
17. Long-term areawide impacts from land tenure adjustments were considered significant if adjustments resulted in big game crucial winter range losses of 5 percent or more.

ASSUMPTIONS AND GUIDELINES

LIVESTOCK GRAZING ASSUMPTIONS

1. Assessment of vegetation-related impacts are based on expectations of near normal annual climate. Severe climate variations could drastically alter vegetation responses.
2. Vegetation manipulations would be implemented over a 10-year period.
3. All vegetation manipulation acreage proposed for allotments could be accomplished within visual resource management guidelines.
4. No more than 10 percent or 40 acres (whichever is greater) of the areas proposed for vegetation manipulation within a watershed could be manipulated in any given year by wildlife, livestock grazing, and water yield programs.
5. Implementation of no actions would be monitored and evaluated to adjust management as necessary based on increased data availability.
6. Livestock operators will have up to five years to adjust their ranching operations to coincide with any adjusted livestock use. Final levels of grazing use would be based on minimum forage use, actual use studies, apparent trend, and climate (see Appendix F).
7. The difference between projected and initial allocations is based on forage increases from vegetation manipulation projects by various resources. Whatever acreage is accomplished by fuelwood cutting or water yield projects, for instance, with forage accruing to livestock, would require that many fewer acres per allotment be accomplished by the livestock grazing program to meet objectives.
8. Water rights could be acquired to support grazing use.

VEGETATION ASSUMPTIONS

1. Near normal annual climate conditions were assumed. Severe variations could drastically alter anticipated vegetation responses.
2. Annual acreages harvested or manipulated are based on annual allowable cut for forest management and 10 percent or 40 acres (whichever is greater) of the areas proposed for vegetation manipulation within a watershed.

FORESTRY ASSUMPTIONS

1. Impacts of interim wilderness study area management will not be addressed. The impacts of interim wilderness study area management on forest management exceed those identified, since 18,000 acres of the forest land base will be excluded from management for at least 6 years.
2. Forest land products would be sold prior to disposing of public land.

RECREATION RESOURCES ASSUMPTIONS

1. Other than acquisition of legal access to public land, proposed management actions would not significantly affect the amount of visitor use or use trends. Thus, only the impacts of legal access acquisitions on visitor use will be discussed. It is further assumed that many changes in use would result from *displacement* of use from other areas in the region. These impacts are discussed in general terms under the assumption that all proposed legal access would be acquired. Because several resource programs have proposed legal access that would have cumulative impacts on recreation, all such acquisitions are discussed in the Impacts from Transportation Management and Cumulative Impacts on Recreation Resources sections.
2. Management actions or projects that have short-term impacts (3 to 5 years) exceeding the management objectives for a *recreation opportunity spectrum* (ROS) class were not considered significant as long as the actions or projects would conform to the management objectives in the long term (5 to 20 years) after implementation.
3. Because of the variety of ROS available in the White River National Forest, any proposed class changes on public land would have minimal effect on the supply and variety of classes in the region assuming the classes in the White River National Forest remain the same. Thus, only the impacts of class changes on public land are discussed.
4. Reductions of primitive and semi-primitive non-motorized ROS classes would have adverse impacts because inventory information shows most public land users prefer these types of settings. This preference information also indicates that reductions or increases of other

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- ROS classes cannot be termed as adverse or beneficial as long as sufficient supplies of each class are available to provide a variety of setting opportunities.
5. Changes in ROS classes would affect the settings and thus the recreational experience opportunities available in the areas where the changes occur (see Appendix E for the description of experience opportunities for each class). However, inventory information on setting preferences for the major activities that occur in the affected areas indicates the impacts of the changes on experience opportunities would be insignificant.

SOCIAL AND ECONOMIC CONDITIONS ASSUMPTIONS

Water Yield

Demand for water would continue to grow and to be in excess of water supply throughout the western United States.

Livestock Grazing

1. The initial forage allocations would be verified by a monitoring program.
2. Implementation of forage improvement projects would proceed on schedule with the results indicated by the potential forage allocation numbers.
3. The ranch models used in the economic evaluation of management proposals are accurate representations of actual ranching operations in the resource area (see Appendix J).

Terrestrial Wildlife

1. Proposed forage improvement would proceed on schedule with the results as indicated by the long-term big game forage availability numbers.
2. During the life of the plan, development of private land in the resource area would reduce crucial deer and elk winter ranges by about 8 percent. Crucial winter range on public land is the only alternative source of forage.
3. In the long term, there would be a directly proportional relationship between the forage available for big game on crucial winter range, big game population levels, and the amount of recreational use of big game.

4. Expenditures for wildlife-related recreation would be as specified in the Recreation and Wildlife portions of the Existing Management Situation (on file and available for review in the Glenwood Springs Resource Area office).

Forestry

1. Sufficient regional demand would exist to permit sale and harvest of 3 million board feet of timber from public land each year. An unlimited demand for fuelwood would continue.
2. Through the life of the plan, stumpage values would average \$25 per thousand board feet; commercial lumber prices would average \$350 per thousand board feet; and commercial fuelwood prices would average \$150 per cord.
3. Fuelwood sales would be split evenly between commercial cutters and the public.

Recreation Resources

Recreation demand would continue to grow through the life of the plan. BLM recreation management activity would not affect the growth of recreation use and thus none of the quantifiable economic impacts of greater recreation use would be attributable to BLM actions. Management efforts to accommodate increased use would improve the quality of the recreational experience with beneficial economic and social impacts but these cannot be measured.

Wilderness Values

Recreational use related to wilderness designation would not be additional use but use displaced from other wildernesses in the area. There would be no quantifiable economic impacts.

Land Tenure Management

Disposal of identified tracts of land would be dispersed over the life of the plan if necessary to diffuse adverse economic impacts.

WILDERNESS VALUES ASSUMPTIONS

1. In determining the suitability of each wilderness study area for wilderness designation, other resource recommendations were analyzed as though the BLM's Interim Management Policy and Guidelines for Lands Under Wilderness

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Review were not a factor. However, recommendations that do not conform to the interim management policy would be deferred until a non-designation decision by Congress releases a wilderness study area or portion thereof from the interim management restrictions.

2. The suitable and unsuitable recommendations for this resource management plan are preliminary and, therefore, could change during administrative review. These recommendations will become final only if adopted by the Secretary of the Interior and the President. The descriptions of impacts are based on the assumptions that the preliminary suitable or non-suitable recommendations for wilderness study areas would not be changed during the administrative review process and would be adopted by the Secretary of the Interior and the President and that the areas recommended as suitable would be designated as wilderness by Congress.

VISUAL RESOURCES ASSUMPTIONS

1. The objectives for each visual resource management (VRM) class describe the degree of modification allowed in the basic elements of the landscape. Any degradation of visual quality within the limits of a particular class is not considered significant.
2. The VRM program is a long-term management tool. Many projects would have short-term visual impacts (3 to five years) that may exceed the management objectives for a class. However, these impacts are not considered significant as long as the project would conform to the management objective in the long-term (5 to 20 years after implementation).
3. If all, or portions of, the four wilderness study areas are designated as wilderness by Congress, the areas would be managed under VRM Class I objectives. However, until designation would occur, the areas would be managed under the visual resource management objectives identified in each alternative, and it is the impacts of this management that will be addressed.
4. The Continuation of Current Management and Preferred Alternatives do not identify rehabilitation of specific sites, but state that rehabilitation may occur if opportunities arise. Since it is not known where or when rehabilitation may occur, the impacts of rehabilitation are not addressed in these two alternatives.

TRANSPORTATION ASSUMPTIONS

1. Acquiring road and trail easements to provide public access and access to develop and use natural resources would increase traffic on the transportation system. Increased traffic on the transportation system would require more maintenance on roads. As access was acquired and new roads were added to the system, total maintenance expenditures would increase.
2. Easement acquisition and road development and improvement would be spread out over the 10 to 20-year expected life of the resource management plan. By spreading out the development of the transportation system, impacts would be minor if at all. Improvement of the transportation system would provide better roads and access and would remove poor and hazardous roads from the system.
3. Impacts to transportation are limited to direct impacts on maintenance and use.

CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE IMPACTS

IMPACTS ON AIR QUALITY

Impacts from Proposed Management Actions

Short-term localized impacts to air quality would result from mechanical and burning vegetation manipulations. These impacts would be small in scale and dispersed throughout the resource area. These factors combined with stipulations for vegetation manipulations (Appendix B) would reduce the significance of the impacts. However, increased levels of air pollution are anticipated from regional growth and energy minerals development. Emissions from primary sources would be minimized through applicable policies, regulations, and statutes.

Cumulative Impacts on Air Quality

Cumulative impacts would be the same as those discussed under Impacts from Proposed Management Actions.

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IMPACTS ON SOILS

Impacts from Proposed Management Actions

Impacts from Minerals Management. Surface disturbance resulting from mine development and operation would cause short-term increases in soil erosion. Impacts would continue until rehabilitation measures were completed. Road construction would be one of the greatest impacts on soils from minerals management. The impacts of road construction on soils are discussed in the Impacts from Forest Management section.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Implementation of grazing systems would have long-term beneficial impacts on soils. Rest from grazing during critical growing periods would improve plant vigor, reproduction, and litter accumulation and increase the organic matter content in surface soils. This would cause beneficial changes in soil structure, permeability, and potentially the soil's productivity. Impacts from rest rotation grazing would be greater than from deferred rotation grazing because in the former system at least one pasture would be rested annually through the entire year whereas the latter would graze every pasture each year (see Appendix A for a description of grazing systems).

Mechanical vegetation manipulation would create localized short-term impacts to the soil resource. Disturbance caused by chaining, plowing, or discing the surface soils could increase permeability. Soil loss through wind and water erosion would increase until revegetation occurred. Compaction caused by mechanical equipment would be short-term and would not be significant.

Burning would cause localized short-term impacts to the soil's physical, chemical, and biological properties primarily through the loss of ground cover and litter accumulation. The severity of the impact would depend upon the fuel type and the intensity of the fire. Burning might decrease soil infiltration rates in some soils which would result in accelerated erosion and the removal of some nutrients mineralized by the fire. After burning, concentrations of calcium and magnesium could be greater in the surface soils and water-soluble potassium concentrates might be less. Total nitrogen could be lower in soils of the burned area, which would decrease soil productivity (BLM Grand Junction Grazing Environmental Impact Statement 1979). The overall effect on plant production would depend on the initial concentrations of these nutrients in the soils. This data is not known at present.

Loss of ground cover would increase evaporation rates from the soil (Shown, Lusby, and Branson 1972) resulting in reduced soil moisture content. This would retard seedling emergence and plant growth. Data are not available to predict the magnitude of these changes.

Soil erosion from wildlife and livestock vegetation manipulations would increase during the short term. Erosion would be greatest immediately following disturbance. It would decline rapidly with the establishment of new vegetation during the next two to three years and then decline at a slower rate. In the long term, erosion would be less than current losses. This would be due to better livestock distribution and increased ground cover. Potential changes in soil loss resulting from practices such as chaining, plowing, furrowing, brush beating, spraying, and burning are indicated in Table 5-1 for typical site conditions where treatments would be implemented.

TABLE 5-1. SOIL LOSS FROM MECHANICAL TREATMENT AND BURNING

(in tons per acre per year)

	Present Erosion		Short-Term Erosion		Long-Term Erosion	
	Mechanical Treatment	Burning	Mechanical Treatment	Burning	Mechanical Treatment	Burning
Sagebrush.....	2.8	4.2	3.4	15.4	2.1	3.9
Mountain Brush.....	2.3	3.4	3.2	15.4	1.3	2.8
Pinon-Juniper.....	3.4	5.0	3.8	11.7	3.4	5.0

The sediment yield impacts caused by range and wildlife treatments on approximately 20,400 acres of the three vegetation types mentioned above over

a 10-year period are discussed under Impacts on Water Quality in terms of sediment yield.

CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE IMPACTS

Impacts from Forest Management. The greatest impact to soils from forest management is the road construction associated with harvest operations. Clearing and grubbing exposes the soil surface to accelerated erosion by agents such as water, wind, and freeze-thaw cycles. Cuts and fills cause adverse impacts by altering the natural drainage from hillsides, exposing underlying soils to weathering actions, and removing lateral support for adjacent material, potentially causing slumps or landslides to occur. Blasting might cause fractures or settling of the soil and increased erosion. Depending on soil material, newly constructed fills having slopes greater than 2:1 or 3:1 are subject to

failure and thus might contribute to increased sedimentation until stabilized. Additional sediment yield from the sources of disturbance would shorten the useful life of downstream dams or other water diversion or retention structures.

The types of cutting practice selected can also affect soil conditions. Clearcutting results in the greatest increase in soil loss per acre and also increases the potential for landslides on noncohesive soils. Thinning and selection cutting leave most of the ground cover intact and result in minimal soil exposure. Changes in erosion from harvest practices on typical sites in the resource area are indicated in Table 5-2.

TABLE 5-2. EXPECTED SOIL EROSION FROM TIMBER HARVESTING

(in tons per acre per year)

	Present Erosion		Short-Term Erosion		Long-Term Erosion	
	Selective Cut Areas	Clear-cut Areas	Selective Cut Areas	Clear-cut Areas	Selective Cut Areas	Clear-cut Areas
Productive Forest Land Less than 40 percent slope.....	1.1	1.1	4.5	6.8	1.1	1.1
Woodland Less than 40 percent slope.....	6.8	6.8	11.3	13.2	5.7	5.7

The forest harvest of 1.7 million board feet of sawtimber and 3,720 cords of fuelwood annually would disturb 539 acres (if clearcut) and result in the loss of 3,260 tons of soil annually in the short term. In the long-term, increases in ground cover in woodland areas would be expected to reduce soil losses below existing conditions by 300 tons per year. If selective cutting is the method used for harvest, 1,346 acres of productive forest land and woodland would be disturbed resulting in a short-term soil loss of 5,320 tons per year. In the long term, soil loss would decrease below existing conditions by 740 tons per year. The significance of sediment yield resulting from harvesting is discussed under Impacts on Water Quality.

Impacts from Off-Road Vehicle Management. Off-road vehicle (ORV) use would reduce ground cover and cause soil compaction, both of which result in increased erosion. Continued ORV use on areas with sensitive soils (high erosion hazard) would deteriorate watershed conditions in areas identified as erosion hazard areas (see Map 3-5).

Impacts from Utility and Communication Facility Management. Soil impacts would depend on the type and extent of surface disturbance. Impacts would be short term pending successful reclamation.

Cumulative Impacts on Soils

Short-term increases in erosion would result from mechanical treatments and burning associated with livestock grazing, terrestrial habitat, and forest management practices. These impacts would probably not be significant. In the long term, increases in ground cover would reduce erosion below existing conditions. Except for road construction, short-term increases in soil loss would also result from soil disturbance associated with minerals, transportation, and utility and communication facility management. Road construction would be a major cause of erosion and impacts from this source would last until reclamation stipulations effectively stabilize these areas. Long-term increases in soil disturbance and erosion would be associated with ORV use particularly on soils with a high erosion hazard.

IMPACTS ON WATER QUALITY

Impacts from Proposed Management Actions

Impacts from Water Quality Management. Including measures in project proposals to mitigate water quality impacts would minimize water quality degradation in the short term and maintain existing

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quality in the long term. No actions would be taken to correct existing water quality problems.

Impacts from Minerals Management. Impacts would depend on the mining method and type of mineral mined. Potential short-term, generally insignificant salinity and sediment impacts would continue to occur from existing mineral developments. Spoil pile runoff would increase surface water salinity and sediment. A secondary source of these impacts would include improperly designed or rehabilitated roads, pipelines, and drill pads. Impacts would continue until soils were stabilized by revegetation or other land treatments such as water bars, generally accomplished during rehabilitations.

Impacts from Livestock Grazing and Terrestrial Habitat Management. Manipulating 20,400 acres of sagebrush, mountain brush, and pinyon-juniper to meet the forage requirements of wildlife and livestock would increase sediment yield by 450 to 11,000 tons per year during the 10-year implementation period. The range is dependent upon whether mechanical manipulation or burning would be the treatment method selected for implementation of vegetation manipulations. In the long term, ground cover on sagebrush and mountain brush manipulation areas would improve above existing cover conditions (see Impacts on Livestock Grazing) and in turn decrease sediment yield by 2,800 to 3,500 tons per year.

Burning as a management tool for implementing range and wildlife vegetation manipulations would cause several chemical reactions and nutrient losses that would adversely affect water quality (see Impacts on Soils). Short-term increases in salinity in local streams could be expected and the potential for algae blooms in stock ponds from increased phosphorous levels would exist. Impacts would probably not be significant, and concentrations of nutrients and salts would decrease rapidly as watershed conditions stabilized.

Livestock grazing management would not increase salinity if properly implemented. Excessive grazing resulting in reduced ground cover and increased compaction would increase runoff, erosion, and salinity. Implementation of allotment management plans could reduce salinity by increasing ground cover.

Livestock grazing management would cause little change in fecal coliform levels. The effects of an increase in livestock numbers should be offset by installation of range improvements which improve livestock distribution and by aquatic habitat improvements that protect riparian areas.

Impacts from Forest Management. Annual sediment yield resulting from harvesting 1.75 million board feet per year would range from 770 to 1,210

tons, depending upon whether timber were clear-cut, selective cut, or cut using a combination of the two harvest methods.

The sediment yield increase resulting from an annual fuelwood harvest of 3,720 cords would range from 860 to 1,520 tons, depending on the harvest method selected. Total sediment yield increases from productive forest land and woodland harvest would range from 1,630 ton per year from clearcutting to 2,730 tons per year from selective cutting. Sediment yield impacts per acre are greater from clearcutting than from selective cutting, but many more acres are disturbed by selective cutting. Consequently, the cumulative impacts from selective cutting are greater.

In the long term, cover conditions in disturbed woodland areas would increase above existing conditions. Increased cover would reduce sediment yield by 150 to 370 tons per year below existing conditions.

Impacts from Recreation Resource Management. Maintaining floatboating access areas would include maintaining sanitary facilities. This would continue to control the amount of bacteria entering surface waters, thereby maintaining existing water quality. The impact would be localized, beneficial, and long term.

Impacts from Wilderness Resource Management. Recreational activity would impact bacteriological quality of water. Increased recreational use in wilderness study areas would result in a corresponding increase in bacteria due to lack of established sanitary facilities. The impact would be dispersed throughout the wilderness study area and would be intermittent depending on recreational use patterns.

Impacts from Off-Road Vehicle Management. Off-road vehicle activity would decrease ground cover and reduce infiltration by compaction resulting in accelerated runoff and erosion. These impacts would probably increase gradually throughout the life of the plan.

Cumulative Impacts on Water Quality

The total increase in sediment yield would range from 2,100 to 13,600 tons per year. The greatest increase in sediment would occur immediately following disturbance. Sediment yield would decline rapidly during the next two to three years as vegetation became reestablished and rehabilitation measures took effect. Sediment concentration would decline more slowly thereafter. The figures mentioned above represent an increase in sediment yield for the resource area of 0.01 to 1 percent above the existing level and an increase of

CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE IMPACTS

less than 0.01 to 0.01 tons per acre per year which would not exceed allowable departures recommended in the draft Northwest Colorado Council of Government's 208 Plan. In the long term, sediment yield would be expected to decrease below existing conditions from range and wildlife manipulations (long-term reductions from fuelwood harvest would be more than offset by increases from new harvest areas). The long-term decrease of 2,800 to 3,600 tons per year represents less than 1 percent of the total existing sediment and less than 0.01 ton per acre per year and would not be significant.

IMPACTS ON WATER YIELD

Impacts from Proposed Management Actions

Impacts from Terrestrial Habitat and Livestock Grazing Management. Manipulating sagebrush and pinyon-juniper would have little effect on water yield. Sturgis (1975) indicates that sagebrush manipulation increases water yield only when soils are sufficiently deep that roots of replacement vegetation are above soil occupied by the deeper roots of sagebrush (generally greater than 3 feet deep), and where precipitation is sufficient to wet the soil throughout its profile. These conditions are met at very few sites within the resource area.

Similarly, a review by Gifford (1975) indicates that little change in water yield can be expected from pinyon-juniper manipulation. Mountain brush manipulation, however, can increase water yield by 1-3 inches of runoff per acre per year (Hibbert 1977). If mechanical treatment were selected as the method of vegetation manipulation, 4,487 acres of mountain brush would be converted. If burning was the selected method, then 18,131 acres would be converted to increase the forage available for livestock and wildlife. Water yield increases would range from 750 acre-feet per year from mechanical treatment to 3,000 acre-feet per year from burning. In mountain brush areas, information is lacking about the timing of water yield increases; however, Tew (1969) indicates that oakbrush eradication probably results in deep seepage which could ultimately appear as streamflow or recharge ground water. These increases would be short-lived (3 to 5 years) if shrub regrowth were not controlled.

Impacts from Forest Management. Maximum increases in water yield from timber harvesting in the Rocky Mountain subalpine forest would result when 40 percent of a timbered watershed is harvested in a series of openings less than eight tree heights in diameter (Leaf 1975). Increased water yield of one to three inches per acre would be expected. When timber harvest is conducted by se-

lective cutting of individual trees, increases in water yield are much less. Selective cutting resulting in the uniform removal of 50 percent of canopy cover density in low elevation, south aspect lodgepole pine would increase water yield by 1 inch of runoff per acre per year. The same treatment of spruce-fir on north aspect slopes would reduce water yield by 0.5 inches of runoff per acre per year (Leaf 1975). Water yield changes from harvesting 1.7 million board feet of sawtimber annually would range from no change through selective cutting to 112 acre-feet per year through a series of patch clearcuts. Increases from patch clearcuts would endure for up to 30 years.

Timber harvest would also affect runoff timing. In conifer areas, Leaf (1975) indicates that snowmelt in clearcut openings is more rapid than in the uncut forest. This accelerated melt causes streamflow to be higher on the rising limb of the hydrograph than before harvest cutting. If there is natural regulation in the form of deep porous soils, recession flows are not changed appreciably, and annual and daily peak flows are not significantly increased provided that the forest cover on no more than 50 percent of the watershed is removed in a system of small openings.

Cumulative Impacts on Water Yield

Water yield increases anticipated under this alternative would range from a low of 750 acre-feet per year, if range and wildlife manipulations were done by mechanical means only and timber were harvested by selective cutting, to a maximum of 3,100 acre-feet annually, if range and wildlife manipulations were conducted by burning and timber was harvested in a series of patch clearcuts. On the basis of an implementation schedule for range and wildlife vegetation manipulation projects of 10 percent per year, water yield would increase by 75 to 412 acre-feet per year until the maximums were reached. Water yield from forest management would continue to increase every year timber was harvested in small clearcuts. These water yield increases would continue as long as treatment areas were maintained to prevent regrowth of the original vegetation.

The low range water yield increase of 750 acre-feet per year represents an increase of less than 1 percent of the existing water yield generated from public land in the resource area and 5 percent of the total potential for increasing water yield on public land in the resource area. The high range water yield increase of 3,100 acre-feet represents 3 percent of existing water yield and 20 percent of the potential for increasing yield.

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The additional water would be of benefit to local water users, mostly in the spring, but would also provide some additional water during low flow periods due to seepage into ground water and reappearance as baseflow from ground water discharge. BLM programs such as aquatic habitat, livestock grazing, and wildlife would also benefit from the provision of additional water for stockponds and reservoirs and by potentially prolonging the discharge period of springs. The additional water, although insignificant on a regional basis, would also be of a general benefit to the Colorado River Basin whose existing supplies are overallocated and whose future development appears limited only by the availability of water.

IMPACTS ON CRITICAL WATERSHED AREAS (MUNICIPAL WATERSHEDS, DEBRIS FLOW HAZARD ZONES, AND EROSION HAZARD AREAS)

Impacts from Proposed Management Actions

Impacts from Management of Critical Watershed Areas. Review of new project proposals on a case-by-case basis with rejection of those which would adversely affect debris flow conditions would prevent the debris flow hazard from worsening. In addition, implementation of recommendations from the Glenwood Springs debris flow study which would be feasible to implement and apply to public land should result in some reduction in the debris flow hazard. Both would reduce the frequency and potential for damage to individuals and property from debris flow incidents.

Historically, livestock grazing on the public land portions of the watershed above Glenwood Springs has been at a light to moderate intensity level. The results of a review by Gifford and Hawkins (1978) indicate that grazing has an effect on infiltration but that the difference between light and moderate grazing is statistically insignificant while heavy grazing causes a distinct reduction in infiltration which is different from that of light to moderate grazing. Any increase in the existing grazing intensity level could decrease the infiltration rate causing increased runoff which could increase the hazard of debris flow in the city below. If the existing intensity level is maintained, no change in the debris flow hazard condition would result from livestock grazing management.

Impacts from Minerals Management. Existing water quality in municipal watersheds should be maintained by including measures designed to mitigate action which would adversely affect water quality in mineral exploration permits.

Impacts from Forest Management. The management and harvest of productive forest and woodland in the Rifle municipal watershed should not significantly degrade water quality because these stands lie on fairly flat slopes (less than 40 percent) and are well removed from the perennial stream channels. Management of large stands of oakbrush suitable for fuelwood in the New Castle municipal watershed would not adversely affect water quality if fuelwood sales or free use areas were designed to protect water quality.

Fuelwood sales in areas with high erosion hazard would attract off-road vehicle (ORV) use which would result in additional watershed damage due to reduced vegetative cover, soil compaction, and erosion. The amount of expected additional erosion would not be quantifiable.

Impacts from Utility and Communication Facility Management. Proposals for siting utility, transportation, and communication facilities in municipal watersheds, debris flow hazard areas, and high erosion hazard areas could adversely affect water quality and damage watersheds if adequate mitigation were not included in land use authorizations. Until proposals are received, more definitive analysis cannot be completed.

Cumulative Impacts on Critical Watersheds

Inclusion of adequate stipulations to prevent adverse effects to debris flow conditions in project proposals and implementation of recommendations from the Glenwood Springs debris flow study should reduce debris flow hazard.

Including adequate stipulations in project proposals in municipal watersheds should protect the watersheds from damage and thus prevent significant water quality degradation.

The lack of restrictions on ORV use, livestock grazing, and forestry could result in adverse impacts to debris flow and municipal watershed conditions.

Permitting ORV use in erosion hazard areas could cause significant watershed damage (soil compaction, reduced vegetative cover, and increased runoff and erosion). Fuelwood sales and utility and communication facility sitings could compound watershed problems if located in the same areas or could result in damage on their own if located in other erosion hazard areas.

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IMPACTS ON MINERALS

Impacts from Proposed Management Actions

Impacts from Mineral Management. Identifying 28,500 acres of public and private lands as acceptable for further coal leasing consideration would make approximately 1.6 billion tons of coal potentially available for future leasing. Identifying 1,560 acres as unacceptable would eliminate that acreage from further leasing consideration at this time.

The impact of identifying 52,000 acres in the Naval Oil Shale Reserve (NOSR) as closed to mineral location and oil and gas leasing under BLM regulations was not analyzed as administration of all minerals in the NOSR is the responsibility of the Department of Energy.

Identifying 32,064 acres of oil shale withdrawal (outside NOSR) as closed to mineral location would be insignificant due to a lack of industry interest for minerals other than oil shale.

Impacts from Wilderness Resource Management. Closing 10,755 acres of preliminarily suitable wilderness areas to mineral location, sale, and oil and gas leasing would have an insignificant impact on mineral development because mineral exploration and development activities indicate a low potential for mineral development.

Impacts from Recreation Resource Management. Closing 4,286 acres in the Thompson Creek Natural Environment Area to mineral location and sales would have an insignificant impact on mineral exploration and development because of a lack of industry interest and mineral bearing geologic formations. There are also 960 acres in Thompson creek closed to oil and gas leasing and 3,326 acres closed to oil and gas surface facilities. These impacts should be insignificant because this area is believed to have a low development potential for oil and gas production.

Closing 250 acres on several recreational sites to mineral location should have an insignificant impact because of the small area at each site.

Impacts from Miscellaneous Withdrawals. Identifying 1,892 acres on several reclamation project sites as closed to mineral location should have an insignificant impact because of the small area at each project site.

Closing 5,120 acres of public water reserves to mineral location should have an insignificant impact because of the small areas involved.

Closing 1,430 acres for recreation and public purpose to mineral location should have an insignificant impact because of the small area involved.

Identifying 1,360 acres at the Rifle Mountain Park and Rifle Fish Hatchery as closed to oil and gas surface facilities should have an insignificant impact because of the small areas involved.

Closing 21,218 acres to oil and gas surface facilities on the Frying Pan, Roaring Fork, Crystal and Colorado River corridors would not have a significant impact because of industry's ability to directional drill for oil and gas if it exists.

Cumulative Impacts on Minerals

Closing 106,797 acres of public and private lands to mineral location would continue to prevent mineral development in those closed areas. However, this acreage (14 percent of the resource area) is not significant when compared to the acreage available to entry.

Closing 63,715 acres of public and private lands to oil and gas leasing (8 percent of the resource area) would not be significant since most of the potentially valuable oil and gas reserves are already under lease.

Closing 25,904 acres to oil and gas surface facility location (3 percent of the resource area) would continue to increase drilling costs and potentially exclude oil and gas development since directional drilling would be required. However, the small area affected would have little significant impact on the oil and gas industry.

There are 28,500 acres of public and private land identified as acceptable for further coal leasing consideration. The impacts can not yet be assessed.

Closing 15,041 acres to mineral sales (2 percent of the resource area) would not be significant since ample supplies are available. The impacts of selling moss rock, top soil, sand and gravel, scoria, and fill dirt in common use areas would have insignificant impacts as stated in site-specific assessments.

Table 5-3 shows all existing mineral limitations.

TABLE 5-3. EXISTING MINERAL LIMITATIONS

Limitation	Acres
Closed to mineral location	106,797
Closed to oil and gas surface facility location	25,904
Closed to oil and gas leasing	63,715
Open to oil and gas leasing	708,617
Acceptable for further consideration for coal leasing.....	28,520
Eliminated from coal leasing consideration	1,560
Closed to mineral sales.....	15,041

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IMPACTS ON AQUATIC WILDLIFE

Impacts from Proposed Management Actions

Impacts from Aquatic Habitat Management. Approximately 15.5 miles of aquatic and riparian habitat on the Naval Oil Shale Reserve would be improved, benefitting the state-threatened Colorado River cutthroat trout through improved habitat conditions and increased distribution of these fish. The expected benefits from these improvements would begin to occur about 2 years after project implementation and would last the life of the project. (This would also apply to projects proposed by other resources that would affect water quality or water yield.)

Monitoring would identify significant declines in aquatic habitat conditions and management required to protect aquatic habitat.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Vegetation manipulations would result in short-term increases in soil erosion and consequently stream sedimentation. After vegetation is reestablished, a long-term decrease in sediment would occur resulting in insignificant impacts to fish habitat. Standard operating procedures (Appendix B) for vegetation manipulation would further reduce sediment increases to a level not harmful to fish populations or aquatic habitat.

Impacts from Forest Land Management. Timber and fuelwood harvest would result in increased sediment yield. Road construction associated with harvest activities would be the greatest single source of sediment. Application of standard operating procedures and proper road layout and design would minimize adverse impacts to the aquatic ecosystem.

Timber harvest, if implemented in a series of small patch clearcuts, would increase water yield. Timing of the increased yield from the subalpine forest zone would be such that increases in baseflow during low flow periods would not occur (Leaf 1975) and would be of little benefit to the aquatic ecosystem.

Impacts from Off-Road Vehicle Management. Off-road vehicle use would cause insignificant localized increases in stream sedimentation and stream bottom disturbance, adversely affecting fish in the same manner but to a lesser degree than vegetation manipulation projects.

Impacts from Transportation Management. Public access to the Naval Oil Shale Reserve would be a significant beneficial long-term impact by providing for increased fishing use.

Cumulative Impacts on Aquatic Wildlife

Water yield increases resulting from implementation of vegetation manipulations for wildlife, range, and forest management could increase instream baseflows and runoff water resulting in long-term benefits to fisheries by increasing the productivity of the aquatic ecosystem. Management of aquatic habitat on the Naval Oil Shale Reserve would have long-term benefits for the Colorado River cutthroat trout and its habitat. Vegetation manipulations would also improve water quality in the long term by reducing sedimentation, potentially increasing fish population. The streams with a fishery having the greatest potential for short-term adverse impacts and long-term benefits from change in siltation levels are areas of existing high sediment loading such as Milk, Alkali, Red Dirt, and Mamm Creeks.

The monitoring program would document streams where management is needed to protect aquatic habitat and maintain fish populations.

IMPACTS ON TERRESTRIAL WILDLIFE

Impacts from Proposed Management Actions

Impacts from Terrestrial Habitat Management. The allocation of 39,672 animal-unit months (AUMs) of existing forage to big game would be 13 percent (5,580 AUMs) short of meeting existing big game forage demands. The allocation would be 32 percent (18,652 AUMs) short of meeting the forage requirement of the Colorado Division of Wildlife's 1988 big game population goals. Annually manipulating 100 acres of pinyon-juniper, oakbrush-sericeberry, and sagebrush would provide an additional 35 AUMs each year. Thus the total allocation would be 12 percent short of meeting existing forage demand and 31 percent short of meeting Colorado Division of Wildlife population goals over the 10-year implementation period (see Table 5-4). These shortages would be greatest in the crucial winter range. Methodology used in forage allocations is explained in Appendix F.

The most significant shortage of forage would occur along the north side of the upper Colorado River in the King Mountain Capability Unit and the northeast side of the Roaring Fork River. Based on the forage allocated to big game, these areas range from 20 percent to 45 percent short of meeting the existing requirements.

Additional big game forage gained through vegetation manipulation would provide sufficient food to maintain only 88 percent of the existing big game

CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE IMPACTS

TABLE 5-4. WILDLIFE FORAGE ALLOCATION BY GAME MANAGEMENT UNIT

Game Management Unit	Existing Demand (AUMs)	Initial Allocation (AUMs)	Percent Change From Existing Demand	Projected Allocation (AUMs)	Percent Change from Existing Demand	Percent of Objective Met	Density of Animals ¹	Number of Animals ¹	Size of Area
15.....	965	767	-20	767	-20	80	High	Moderate	Small
25.....	4,907	3,486	-29	3,666	-25	75	Moderate	Moderate	Moderate
26.....	4,220	2,320	-45	2,474	-41	59	Moderate	Low-moderate	Medium
32.....	3,181	3,156	-1	3,156	-1	99	Low-moderate	Moderate-high	Medium-large
33.....	7,245	7,140	-1	7,140	-1	99	Low-moderate	Large	Large
34.....	2,277	2,020	-11	2,020	-11	89	Low	Low	Small
35.....	5,291	5,056	-4	5,056	-4	96	Low	Moderate	Large
36.....	917	856	-7	856	-7	93	Moderate	Moderate-low	Medium
42.....	3,892	3,878	0	3,878	0	100	Low	Large	Large
43.....	4,597	4,301	-6	4,301	-6	94	Moderate-high	Large	Large
44.....	5,570	4,856	-13	4,856	-13	87	Moderate-high	Large	Large
44A.....	1,596	1,116	-30	1,116	-30	70	High	Large	Medium
47.....	943	720	-23	720	-23	77	Moderate-high	Moderate	Small
Total.....	45,602	39,672	-13	40,022	-12	88			

¹Number of animals and density per square mile based on winter use periods (crucial period for wildlife).

populations. Thus, a long-term decline in big game populations would occur either from increased hunting authorized by the Colorado Division of Wildlife or from declining habitat conditions. A decline in big game populations would be most significant in areas of concentrated big game populations. As big game populations declined, predator populations, carrion dependent species, and hunter success ratios could also decline. The long-term impact could be a 12 percent decline in hunting and a corresponding decline in business income associated with hunting (see Impacts on Social and Economic Conditions).

Manipulating 1,000 acres of vegetation over a 10-year period would increase forage, improve big game health and productivity, and change wildlife species composition and density. The short-term loss of bird and small mammal habitat in vegetation manipulation areas would be insignificant because of the small amount of acreage treated annually and the relatively quick revegetation of these areas. Benefits gained by manipulating vegetation would begin in about 2 years but would not be permanent unless regrowth was controlled. This applies to all types of vegetation treatments.

Impacts from Aquatic Habitat Management. Small riparian habitat improvements along 15.5 miles of stream would result in locally insignificant increase in small game and nongame populations. Increased recreational use would not significantly stress wildlife or result in riparian vegetation losses.

Impacts from Livestock Grazing Management. Annually removing 1,914 acres of serviceberry and piñon-juniper vegetation to provide additional livestock forage would change vegetation composition, density, and form and age classes thereby provid-

ing some additional big game forage and creating habitat for those wildlife species dependent on the successional vegetation type. Species dependent on the original vegetation type would be displaced. These wildlife species changes would be insignificant. (The Resource Area Profile available in the Glenwood Springs Resource Area office contains a list of wildlife species that would be affected.) Because the resource area supports a diversity of vegetation, little overall change in wildlife populations would occur. Project design features would limit the size, location, and configuration to ensure minimal adverse impacts to wildlife.

Changing sagebrush on winter ranges to a grass-forb type would have a long-term adverse impact on big game, sage grouse, and many small game and nongame species that depend on sagebrush for their habitat requirements.

Water developments for livestock grazing management would benefit local wildlife populations by providing additional water sources and by reducing vegetation damage from livestock concentrations.

Fencing would improve livestock management, protect water sources and riparian vegetation from livestock trampling, and reduce overgrazing and competition with big game for forage. Benefits would be local and only insignificantly affect total wildlife populations. Fences could physically restrict big game movement or result in entanglement. Fencing impacts would be most severe on winter ranges and migration routes. Project design features (Appendix B) would reduce the significance of adverse impacts.

Impacts from Forest Management. Impacts of annually harvesting from 269 to 672 acres of timber

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on public land, with most of it occurring in the the King Mountain, Castle Peak, and Eagle-Vail Capability Units, would vary depending on the harvest method, harvest season, length of contract, size, and location of the project.

Short-term adverse impacts would include a temporary loss of understory, solitude, thermal, escape, or resting cover for many wildlife species. Wildlife would also be temporarily displaced during the harvest period. These losses would be greater in clear-cut than in selective cut areas. U. S. Forest Service land adjacent to timber stands on public land near Sunlight Peak and the Seven Hermits would reduce the severity of adverse impacts by providing alternate habitat during harvest periods. Harvesting timber on King Mountain and Castle Peak would produce more severe short-term impacts because alternate cover areas are not locally available. However, localized long-term beneficial impacts to wildlife, especially big game, would result from the increased understory forage production, habitat diversity, and ease of movement.

Harvesting timber in or near elk calving areas would result in a significant long-term detrimental impact because elk are highly sensitive to disturbance during calving and because these areas are limited in number. Standard operating procedures (Appendix B) and site specific management techniques would reduce specific detrimental impacts to wildlife. The small acreage of disturbance, generally good habitat conditions, and compliance with standard operating procedures would reduce the significance of all impacts.

The majority of the woodland stands in the resource area are located in either big game winter or crucial winter range. Annually harvesting from 270 to 674 acres of woodland would result in locally significant increases in big-game forage and wildlife populations associated with more open stands of pinyon-juniper or brush piles.

Insignificant adverse impacts include temporary loss of forage, thermal and hiding cover for big game species, and loss of nesting habitat and solitude for other wildlife species during harvest periods. The small amount of acreage disturbed in relation to the woodland habitat supply and the application of standard operating procedures for woodland harvesting would reduce the significance of adverse impacts.

Impacts from Recreation Resource Management. Recreation management would increase the number of people in wildlife habitat. The resulting stress on wildlife would be an insignificant short-term adverse impact because of the dispersed nature and relatively small amount of expected increase in public land use by recreationists.

Impacts from Visual Resource Management. Restrictions placed on vegetation manipulations in visual resource management Class II areas could increase project costs and thus reduce the number of projects that would be accomplished. This would reduce the amount of forage increase that could be gained through vegetation manipulation and consequently the number of additional big game animals an allotment could support. This means that the proposed allocation to big game may be optimistic.

Impacts from Land Tenure Adjustment. Impacts of land tenure adjustment proposals would be analyzed when such proposals are received by the Bureau.

Cumulative Impacts on Terrestrial Wildlife

Theoretically, there would be an initial 13 percent reduction in big game populations on public land as a result of initial forage allocations. However, additional forage allocations as a result of vegetation manipulation would result in an overall reduction of only 12 percent at the end of 10 years. Small game and nongame species composition and numbers would vary locally but not significantly with these projects.

An estimated 8 percent of the big game crucial winter range occurring on private land could be lost to development in the next 10 years. This loss coupled with the forage allocation would result in an overall 20 percent reduction in big game populations. This would increase the potential for game damage to private lands.

In the long run, if the big game populations were not reduced to the allocated carrying capacity through intensive management, as forage demand exceeded availability, habitat conditions would decline, fawn and calf production would decline, winter mortality would increase and game damage to private land would probably increase. Declining habitat conditions would also have a long-term adverse affect on small and nongame species.

Species such as bighorn sheep, sage and sharp-tail grouse, turkey, peregrine falcon, and river otter, whose populations are currently declining, would continue to do so. Therefore, hunting and viewing opportunities would decrease as would restaurant, motel, sporting good store, and gas station business. For a discussion of additional impacts on local communities see the Impacts on Social and Economic Conditions.

CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE IMPACTS

IMPACTS ON LIVESTOCK GRAZING

Impacts from Proposed Management Actions

Impacts from Livestock Grazing Management. The initial allocation of 26,443 animal-unit months (AUMs) would result in a 30 percent reduction from

current existing use. Forage increases accrued through vegetation manipulation practices would result in a final allocation of 34,177 AUMs, which is 10 percent less than current actual livestock use and 10 percent short of the existing livestock use objective of 37,709 AUMs. Table 5-5 shows this information by capability unit.

TABLE 5-5. RELATION OF LIVESTOCK FORAGE ALLOCATION TO EXISTING USE AND ALTERNATIVE OBJECTIVE

Capability Unit	Initial Allocation (AUMs)	Percent Change from Existing Use	Projected Allocation (AUMs)	Percent Change from Existing Use	Percent of Objective Met
Garfield.....	12,288	-31	16,912	-5	95
Roaring Fork.....	2,915	-31	3,889	-8	92
Eagle-Vail.....	2,932	-20	3,551	-3	97
Castle Peak.....	6,818	-15	7,073	-12	88
King Mountain.....	1,490	-63	2,952	-32	68
Total.....	26,443	-30	34,177	-10	90

The short-term impact from initial allocation would be a substantial reduction in livestock numbers on most allotments requiring operators to buy, lease, or develop 11,266 AUMs of forage. Reduction levels would vary by allotment and be greatest on lower elevation allotments encompassing crucial wildlife winter range. Spring range is critical to livestock operations and any reductions in spring range would be highly significant to individual operators. The long-term impacts of the projected allocation would be moderate to substantial increases from the existing situation except in the King Mountain Capability Unit. These increases would not be used on spring-fall range where the operator moves to the national forest for summer grazing if that permit is limiting. The King Mountain Capability Unit would have overall long-term reductions varying by allotment but averaging 32 percent. This would require affected operators to permanently reduce herd size or acquire an additional 3,532 AUMs of forage.

Range improvements, including vegetation manipulation, would improve livestock distribution, reduce livestock concentrations, and provide for more even use of forage. This would help to maintain those allotments in satisfactory range condition and improve those in unsatisfactory range condition. Improved range condition would increase forage quantity and quality thereby increasing the potential for improved livestock production.

Impacts from Aquatic Habitat Management. The *Naval Oil Shale Reserve Aquatic Habitat Management Plan* would have insignificant impacts on

livestock grazing in the three allotments affected in both amounts of forage and water excluded from livestock.

Impacts from Terrestrial Habitat Management. The amount of vegetation manipulation proposed would be insignificantly beneficial to livestock by providing additional available forage.

Impacts from Forest Management. The woodland acreage proposed for harvest would have slight benefits to livestock because of eventual forage increases.

Impacts from Wilderness Resource Management. Designation of 10 acres of Hack Lake as wilderness would have no impacts on allotment 8633. Designation of 330 acres at Eagle Mountain as wilderness would have no significant impact on allotment 8402. The majority of the usable grazing area would be outside the wilderness boundary.

Designation of 10,415 acres of Bull Gulch as wilderness would not have significant impacts on allotment 8625. The majority of this allotment is steep and rocky, limiting potential range improvements. There is sufficient existing forage production to meet allocation goals.

Impacts from Visual Resource Management. Visual resource management Class II objectives would potentially increase the costs of vegetation manipulation projects because of limitations on size, shape, location and treatment methods resulting in low cost-benefit ratios. The extent of the ad-

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verse impacts cannot be determined until site-specific locations and needs are determined.

Impacts from Utility and Communication Facility Management. An insignificant beneficial impact of increased forage availability would result from reseeding rights-of-way through woodland or shrubland and from improved livestock movement along right-of-way routes.

Cumulative Impacts on Livestock Grazing

Significant beneficial impacts from vegetation manipulation of 19,139 acres for livestock grazing, woodland, and terrestrial habitat management would provide approximately 7,734 additional AUMs of forage for livestock which would hold livestock use reductions overall to 10 percent rather than 30 percent.

Significant adverse impacts from forage allocation would include the insufficient number of AUMs in the critical spring range. Any reduction in this critical period of use would be highly significant to individual operations.

The forage allocation objective of this alternative would be to provide first for the existing numbers of wildlife, then the existing use number of AUMs for livestock. Wildlife would receive the first cut of existing and potential forage. The lack of potential for forage production on allotments with large proposed reductions would be the primary limiting factor in not being able to reach the existing livestock use objective.

IMPACTS ON VEGETATION

Impacts from Proposed Management Actions

Management actions that would not result in conversions generally would have insignificant impacts on vegetation because large scale vegetation changes would not occur. Management actions such as clearcutting and vegetation manipulation for increased water yield, livestock, and wildlife forage production would reduce ground cover and disturb soils, resulting in localized adverse impacts. The localized significance of vegetation manipulations would be reduced by the 10-year implementation schedule, project dispersion throughout the resource area, and standard design features (Appendix B) for project implementation. Harvesting forest land and manipulating vegetation, as proposed by water yield, livestock grazing, terrestrial habitat, and forest management, would result in the following annual vegetation disturbances:

Productive Forest Land Management—672 acres

Woodland Management—674 acres

Livestock Grazing Management—1,914 acres

Terrestrial Habitat Management—100 acres

Water Yield Management—0 acres

The acreage shown for productive forest land and woodland management is the allowable cut converted to acres. The annual acreage shown for livestock grazing, terrestrial habitat, and water yield management is 10 percent of the total proposed.

The figures shown are proposed by each resource; however, in some cases, acreages proposed for management overlap and therefore cannot be totalled. For example, cutting firewood in pinyon-juniper would also meet livestock or wildlife needs for increased forage; likewise, oakbrush removal for additional forage could help increase water yield.

Site-specific impacts of vegetation changes are discussed under the resource affected. For example, the impacts of brush control on wildlife are discussed under Impacts on Terrestrial Wildlife.

Modifying mountain shrub, sagebrush, pinyon-juniper, and forest vegetation types in relative amounts indicated above for 10 years would not significantly affect vegetation types in the resource area. This is because of the tremendous variety of types and species diversity present since the resource area lies in the transition zone between two distinctly different physiographic regions—the Colorado Plateau and Southern Rocky Mountains.

No adverse impacts would occur to known occurrences of threatened or endangered plant species from any management action that has identified a site-specific project location. Threatened, endangered, or sensitive plant species would be protected from adverse impacts of management actions through activity plans and environmental assessments when specific site locations are identified.

Cumulative Impacts on Vegetation

Cumulative impacts would be the same as those discussed under Impacts from Proposed Management Actions.

CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE IMPACTS

IMPACTS ON FORESTRY

Impacts from Proposed Management Actions

Impacts from Forest Management. Managing 17,800 acres of productive forest land would result in a potential annual allowable harvest of 1.75 million board feet.

Managing 61,560 acres of suitable woodland would result in a potential annual harvest of 3,720 cords.

Harvest practices such as clearcutting, shelterwood cutting, selective cutting, and commercial thinning would increase stand productivity thereby increasing revenues, and could improve wildlife habitat.

Forest development practices such as thinnings and plantings would increase vigor and growth in managed forest stands and thus increase forest production potential. Actual increased production is unknown but is considered significant because it would decrease disease and pest incidence in these stands.

Acquiring legal access into presently inaccessible forest stands would open these areas to public land management.

Impacts from Livestock Grazing and Terrestrial Habitat Management. Chaining and burning in the pinyon-juniper forest type would conflict with woodland management objectives for fuelwood sales. The impact area is unknown because the livestock grazing management objectives for chaining and burning cover other vegetation types. Woodland species would take 40 years to regenerate after chaining and over 60 years to regenerate after burning. This loss would be considerable, especially if a high degree of vegetation manipulation occurred on forest land suitable for forest management.

Minor beneficial impacts would be gained from chaining practices, such as increasing the available supply of fuelwood that could be offered for sales.

Construction of fences and water pipeline projects would destroy an insignificant amount of forest land.

Increased livestock numbers could increase damage to forest regeneration. Generally, such damage is insignificant. Exceptions would be where high-valued productive forest land reforestation at proper stocking levels is a requirement. Added reforestation cost would result if grazing use were allowed in these stands. Suspension of grazing or fencing in these areas (an average of 250 acres annually) would reduce potential adverse impacts.

Seeding and fertilizing on forest land to promote understory browse species would create added competition for moisture and nutrients, potentially reducing forest growth. The impact is considered insignificant.

Impacts from Visual Resource Management. Visual resource management Class II designations would occur on 40 percent of forest land. The impact would be moderate. Stipulations placed on harvesting in these Class II areas would be undesirable.

Class III designations would occur on 20 percent of forest land. The impacts would be slight as stipulations placed on harvesting would be less severe under this class.

Impacts from Fire Management. Fire exclusion areas would provide the forest land a certain degree of insurance against major disasters. Buildups of forest fuels are inevitable, however. Managing fires within fire management areas would reduce forest fuels and competitive vegetation, thereby increasing forest growth and productivity.

Cumulative Impacts on Forestry

By intensively managing forest lands, productivity and revenues would increase. Overall health and vigor of stands would be improved, and disease and insect problems would generally be reduced. In the long term (200 or more years for productive forest land), the annual allowable harvest would increase.

Designating fire management areas would reduce fuel buildups, competitive vegetation, and wildfire risks and improve forest growth and productivity. Designating fire exclusion zones would reduce timber losses from wildfire.

Approximately 79,360 acres of forest land or 36 percent of the total resource area forest base would be managed. This management would provide an annual allowable harvest of 1.75 million board feet of timber and 3,720 cords of fuelwood. This annual harvest rate is expected to meet the demand for wood products for the next 10 years.

IMPACTS ON RECREATION RESOURCES

Impacts from Proposed Management Actions

Impacts from Recreation Resource Management. Recreation opportunity spectrum (ROS) settings identified in the Affected Environment

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(Chap. 4) would be adopted as ROS classes; thus, existing settings and recreation opportunities would be maintained throughout the resource area and a variety of settings would remain available. Maintenance of existing recreational facilities would prevent deterioration of these facilities.

Designation of 4,286 acres in Thompson Creek as a natural environment area and withdrawal of the area from mineral entry would protect the identified natural, cultural, and scenic values.

Impacts from Aquatic Habitat Management. Improvement of 15.5 miles of aquatic habitat on the Naval Oil Shale Reserve would increase fish populations and fishing success. The effect cannot be quantified since fishing success is only one of several factors that affect a fishing experience. However, the overall effect would be minimal to low because of the small amount of public land involved and because only about 5 percent of current fishing use in the region occurs on public land.

Impacts from Terrestrial Habitat Management. Manipulating 100 acres of vegetation per year could slightly increase big game populations and could somewhat enhance hunting opportunities locally by increasing the hunting success ratio. However, the effect cannot be quantified since hunting success is only one of several factors that affect a hunting experience.

Impacts from Wilderness Resource Management. Designation of 10,755 acres in the Eagle Mountain, Hack Lake, and Bull Gulch Wilderness Study Areas as wilderness would help maintain existing ROS settings and recreational opportunities in these areas. In addition, designation of 10,415 acres as wilderness in the Bull Gulch WSA would protect identified ecological, geological, and scenic values.

Impacts from Visual Resource Management. Visual resource management Class II objectives would benefit recreation resources by helping maintain setting opportunities in the primitive and semi-primitive non-motorized ROS classes in the Thompson Creek, Deep Creek, Hack Lake, Bull Gulch, and Castle Peak areas. These settings are limited in supply within the resource area and thus would provide for scarce recreation opportunities.

Impacts from Off-Road Vehicle Management. The 10,755 acres recommended as suitable for wilderness designation would be closed to all off-road vehicle (ORV) use which would protect approximately 9,176 acres of the semi-primitive non-motorized classes in Hack Lake and Bull Gulch. The closures would have no adverse impacts on ORV use since no use is known to occur in the affected areas. Designation of the remainder of the resource area as open to ORV use would be inconsistent

with management objectives for the remaining 25,931 acres of primitive and semi-primitive non-motorized ROS classes. Motorized use would conflict with non-motorized types of recreation and reduce the remoteness of these areas. Adverse impacts would be moderate to high on the semi-primitive non-motorized class in the Hack Lake area (2,426 acres), but would be minimal on the remaining 32,681 acres because of the lack of suitable terrain for motorized vehicles or limited legal access.

Cumulative Impacts on Recreation Resources

Maintenance of existing developed recreational facilities would prevent deterioration of these sites. Unique and fragile natural, cultural, and scenic values in Thompson Creek would be protected by the designation and withdrawal from mineral entry of the natural environment area. Similar values in the Bull Gulch area would be protected by designation of 10,415 acres as wilderness. Existing ROS settings and recreation opportunities would be maintained. However, allowable motorized use in the Hack Lake area could cause conflicts with non-motorized types of recreation and reduce the remoteness of the 2,426 acre semi-primitive non-motorized class in this area.

Management under this alternative would not accommodate existing levels of recreation use throughout the resource area nor provide for future recreation demands resulting from increased populations within and near the resource area. Recreational visits would remain at or near existing levels because legal access to currently inaccessible public land would not be obtained and additional facilities such as river access sites and trailheads would not be developed. However, recreation visits could decrease if legal access to public land would be further reduced by private landowners. This lack of legal access would also not reduce the number of trespass incidents on private land by recreational users. Dispersed recreational activities, including hunting, fishing, and ORV use would be most adversely affected as these dispersed activities are highly dependent on public land and future demand is expected to be the greatest for these types of activities. Maintenance of existing ROS settings would not allow changes in management objectives and setting opportunities that would help accommodate existing and future recreation demands.

Existing undeveloped and unmaintained use areas would not be developed, maintained, or managed and would continue to deteriorate. The impacts would be most severe along the upper Colorado River, the most intensively used recreation area in the resource area. Although ROS classes

CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE IMPACTS

would be adopted, no specific actions would be implemented to protect setting opportunities. Thus, setting opportunities, especially the primitive and semi-primitive non-motorized settings, could be lost or degraded by the development of other resources or conflicting recreational uses. Unique and fragile ecological, cultural, and scenic values in Deep Creek would not receive protection and could be degraded by the development of other resources. However, the steep topography would limit the probability that degradation would occur.

IMPACTS ON SOCIAL AND ECONOMIC CONDITIONS

Impacts from Proposed Management Actions

Impacts from Livestock Grazing Management.

The estimated direct economic impacts of forage allocation under this alternative are shown in Table 5-6. The initial forage allocation would reduce livestock forage available from public land by 11,266 animal-unit months (AUMs), 30 percent below current usage. The resultant decrease in total gross revenue of ranches with BLM grazing permits or leases would be about \$365,000, less than 2 percent of the current total. Net revenue (personal income) would decrease by over \$240,000—a 13 percent reduction, but less than $\frac{1}{10}$ of 1 percent of all personal income in the resource area. The direct reduction in hired employment would be equivalent to 10 man-years.

These changes would not significantly affect the local economy, but individual ranch operators could be affected significantly. Of 168 operators with permits or leases, 110 would receive reductions in forage allocation, 26 would receive increases, and 32 would receive the same allocation. Fifteen of the 110 operators receiving reductions would have a decrease in gross revenue greater than 10 percent; of these, 4 would have a decrease greater than 20 percent. None of the 26 operators receiving increases in forage allocation would have gross revenue rise more than 10 percent.

While the methodology used to assess the income effects of changes in forage allocation does not enable the evaluation of specific ranching operations, estimates of changes in average revenue by ranch size can be made. They suggest that a number of ranches could be placed in situations of economic stress by the proposed reductions, especially smaller operators and those with a greater reliance on forage from public land (see Appendix J, Table J-1). While all ranches receiving reductions would have an average net revenue decrease of 10.7 percent, the decline by size of operation varies from

as much as \$18,000 for larger operations to about \$700 for smaller ranches and could be as much as 35 percent of current net revenue.

To the extent that ranchers and their families would be economically stressed, their social well-being and quality of life may also be adversely affected. In addition, such economic stress could have an unmeasurable but adverse effect on other social and economic sectors where ranching and its way of life are valued for the economic diversity and unique character they provide to the area.

Adverse impacts would be mitigated by several factors. In the first place, no forage reductions would take place until a period of monitoring (5 years) had verified the need for such cuts. This 5-year period would provide time to develop alternative forage or income sources and thus avoid the full impact of any required forage reductions.

Secondly, many grazing allotments have the potential for increases in forage use following implementation of several types of improvement projects. Successful implementation of such projects could permit some operators to reestablish current forage use. If all range improvement projects under this alternative were implemented, the number of operators with forage reductions would drop to 70. However, total forage available from public land in the resource area would still be 3,532 AUMs (9 percent) less than current use.

Impacts from Terrestrial Habitat Management.

Big game forage allocations would be reduced by 12 percent in the long term. When combined with the big game forage lost due to residential and commercial development of private land, the total big game forage needed from public land to maintain existing deer and elk populations would be short by 20 percent.

This shortfall would translate into directly proportional reductions in both big game populations and recreational uses of big game with significant adverse effects on economic and social conditions. Local expenditures in support of big game recreational activities would decrease by \$2.96 million from the current \$14.8 million. Employment would be reduced by 219 man-years. Direct and induced loss of personal income would total \$1.5 million. Although this is less than 1 percent of the area's total personal income, the impact is significant because it would occur largely during the fall, a traditionally slow economic period, and because the reductions would be focused on certain groups—guides and outfitters, and hotel, motel, and restaurant owners and employees.

The social well-being and quality of life of some area residents would also suffer both because of the economic loss and because of the increased

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TABLE 5-6. INCOME EFFECTS OF CHANGES IN FORAGE ALLOCATION

	Number of Ranches	Change in Forage Allocation (AUMs)		Change in Gross Revenue (dollars)		Change in Net Revenue (dollars)	
		Total	Average	Total	Average	Total	Average
Initial Allocation							
Reductions.....	110	-12,100	-110	-389,640	-3,542	-242,747	-2,207
Increases.....	26	+834	+32	+25,357	+975	+14,611	+562
Net.....	136	-11,266	-83	-364,283	-2,679	-228,136	-1,677
Potential Allocation							
Reductions.....	71	-5,225	-74	-158,358	-2,230	-95,755	-1,349
Increases.....	39	+1,693	+43	+50,472	+1,294	+29,864	+766
Net.....	110	-3,532	-32	-107,886	-980	-65,891	-599

difficulty in successfully pursuing wildlife related recreational activity.

Impacts from Forest Management. Timber harvest of 1.75 million board feet and 3,720 cords per year would yield \$82,000 in revenue. Half of the fuelwood would be sold later by commercial cutters and all of the timber would be manufactured and sold as lumber, together generating sales of \$891,500. This would be an addition of about 10 percent to wood product sales already generated by BLM and the U. S. Forest Service in the area. Direct and induced personal income growth of \$337,000 and 32 man-years of employment would result from the sales. Much of the income and employment would, however, be generated outside the resource area.

Sales of 1,860 cords of fuelwood to the public would help offset residential energy costs as well as provide an opportunity for people to socialize and recreate with friends and family.

Impacts from Recreation Resource Management. The local economic and social impacts of recreation management activities would be minimal.

Impacts from Wilderness Resource Management. Only low mineral values would be affected and there is little likelihood of their development. No change would be expected in the amount of recreation use in the resource area because of this recommendation and, hence, there would be no economic or social impact related to recreation use. An insignificant quantity of commercial timber in the Bull Gulch Wilderness Study Area would be removed from the area timber supply with no economic impacts.

Impacts from Land Tenure Adjustments. Because land tenure adjustments would occur on a case-by-case basis, it is not possible to predict any impacts on economic or social conditions. Howev-

er, as activity in this area has been minimal, it is predicted that any impacts would be insignificant.

Cumulative Impacts on Social and Economic Conditions

Table 5-7 shows the cumulative annual impacts of proposed management actions on personal income and employment. Net impacts are only about 1 percent of current totals for the resource area but individuals and certain groups may be significantly affected. Other proposed management actions would not have measurable economic impacts. Area population and the provision of social and public services would not be affected.

TABLE 5-7. CUMULATIVE IMPACTS ON PERSONAL INCOME AND EMPLOYMENT

Management Activity	Change Agent	Change in Personal Income (\$1,000)	Change in Employment (man-years)
Livestock Grazing	-11,266 AUMs	-493	-10
Big Game Habitat	-20 percent	-1,500	-219
Forest Land	+3,610*	+337	+32
Net Change		-1,656	-197

*In thousand board feet.

The impacts from terrestrial habitat and forest land management would endure over the long term. The impacts of livestock grazing management would be short term but are included here because it would be the short-term forage allocation decisions that might be decisive to individual ranchers.

CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE IMPACTS

Social well-being and quality of life would be most likely to be affected under the livestock grazing and terrestrial habitat management proposals.

IMPACTS ON CULTURAL RESOURCES

Impacts from Proposed Management Actions

Impacts from Cultural Resource Management. Cultural resource inventories conducted for all surface-disturbing activities would result in increased information about the local cultural resources and thus contribute to our knowledge of the past.

Identified high value sites would continue to deteriorate and would continue to be subject to loss from natural causes and vandalism.

Impacts from Livestock Grazing Management. Livestock grazing would result in cultural resource loss or damage as a result of livestock trampling and rubbing. However, present information indicates these impacts would be insignificant because most sites are not susceptible to these impacts.

Cumulative Impacts on Cultural Resources

Cumulative impacts would be the same as those presented under Proposed Management Actions.

IMPACTS ON PALEONTOLOGICAL RESOURCES

Impacts from Proposed Management Actions

Proposed management actions would not adversely affect paleontological resources. Required paleontological resource clearances in areas with a high probability of fossil occurrence would prevent the accidental destruction of any fossils present.

Required paleontological resource clearances would result in beneficial impacts. Information would be collected about local paleontological resources. However, little information would be collected, as few projects are proposed in high occurrence areas.

Cumulative Impacts on Paleontological Resources

Cumulative impacts would be the same as those discussed under Impacts from Proposed Management Actions.

IMPACTS ON WILDERNESS VALUES

Impacts from Proposed Management Actions

Impacts from Wilderness Resource Management. Designating the entire Eagle Mountain Wilderness Study Area (WSA) (330 acres), and portions of the Hack Lake (10 acres) and Bull Gulch (10,415 acres) WSAs as wilderness would have long-term beneficial impacts to wilderness values. It would provide additional protection to the wilderness values and permit the natural ecological processes to continue. Protecting the wilderness values would in turn benefit related supplemental values such as wildlife, geological, ecological, and scenic values.

Diversity in the local wilderness supply would increase as a result of the designation of the Bull Gulch WSA because its ecosystem type is not locally represented.

Transferring administration of the entire Eagle Mountain WSA and the suitable portion of the Hack Lake WSA to the U. S. Forest Service would provide consistent management with the existing adjacent wildernesses.

Wilderness values would be adversely affected by nondesignation of the 19,875 acres recommended as nonsuitable since the areas would be open to development of other resources. These impacts are discussed below by resource activity and in the Cumulative Impacts section.

Impacts from Forest Management. Commercial timber harvesting in the Castle Peak WSA and nonsuitable portions of the Hack Lake and Bull Gulch WSAs would impair the naturalness throughout these areas. Human activities and noise associated with timber harvesting would also reduce opportunities for solitude.

Impacts from Recreation Resource Management. Designating the entire Bull Gulch WSA, 2,221 acres of the nonsuitable portion of Hack Lake WSA, and 6,545 acres of the Castle Peak WSA as semi-primitive non-motorized would help maintain existing primitive recreation opportunities in these areas.

Impacts from Visual Resource Management. Upon designation as wilderness, the suitable areas would be managed under visual resource management (VRM) Class I objectives providing additional protection of visual qualities. All of the nonsuitable portion of the Hack Lake WSA and 10,513 acres of the Castle Peak WSA would be managed under VRM Class II objectives to protect visual qualities. Visual quality could be degraded in the nonsuitable portion of the Bull Gulch WSA and the remaining

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1,427 acres of the Castle Peak WSA because of the less restrictive VRM Class IV objectives.

Impacts from Off-Road Vehicle Management. Upon designation, the suitable areas would be closed to motorized use preventing conflicts with primitive types of recreation use. All of the nonsuitable portions would be designated as open to off-road vehicle (ORV) use which could conflict with and reduce opportunities for primitive types of recreation.

Cumulative Impacts on Wilderness Values

Wilderness values would be preserved in 10,755 acres in the Eagle Mountain, Hack Lake, and Bull Gulch WSAs. Preservation of wilderness values would in turn protect related supplemental values including wildlife, geological, ecological, and scenic values. Diversity in the local wilderness supply would be increased by designation of the suitable portion of the Bull Gulch WSA since its ecosystem type is not currently represented locally.

Wilderness values would be adversely affected by non-designation of the 19,875 acres recommended as nonsuitable. The areas would be open to development of other resources including mineral exploration and production and timber harvesting that would impair naturalness. ORV use would be allowed and would create potential conflicts with and reduce opportunities for primitive types of recreational use. Human use associated with resource development activities and motorized recreation would eliminate the opportunities for solitude. Over the long term, the wilderness values would be lost forever.

IMPACTS ON VISUAL RESOURCES

Impacts from Proposed Management Actions

Impacts from Visual Resource Management. The tentative visual resource management (VRM) classes identified in the Affected Environment (Chap. 4) would be adopted; thus existing visual quality throughout the resource area would be maintained.

Impacts from Recreation Resource Management. Management objectives for the primitive and semi-primitive non-motorized recreation opportunity spectrum (ROS) classes would help maintain visual quality. Class A scenic quality areas in Thompson Creek, Deep Creek, Hack Lake, Bull Gulch, and Castle Peak are within these ROS classes.

Impacts from Wilderness Resource Management. Designation of 10,755 acres as wilderness would maintain the visual quality of the areas in a natural state.

Cumulative Impacts on Visual Resources

Existing visual quality throughout the resource area would be maintained. The three areas (Thompson Creek, Deep Creek, and Bull Gulch) that qualify for consideration as areas of critical environmental concern would not be designated, but their visual quality would be protected under VRM Class II objectives.

IMPACTS ON TRANSPORTATION

Impacts from Proposed Management Actions

The transportation system would not provide proper access to public land for public use and proper resource management.

The Continuation of Current Management Alternative would pose the most impact on the transportation system. Many of the existing roads could not be maintained properly under this proposal. Increased use on these roads would cause further degradation to the transportation system.

Cumulative Impacts on Transportation

Cumulative impacts would be the same as those presented under Proposed Management Actions.

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IMPACTS ON AIR QUALITY

Impacts from Proposed Management Actions.

Short-term localized impacts on air quality would result from mechanical and burning vegetation manipulations. These impacts would be small in scale and dispersed throughout the resource area. These factors combined with standard design features for vegetation manipulations would reduce the significance of the impacts.

Proposed limited development would result in commensurately lower impacts to air quality, but in-

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creased levels of air pollution would still occur as a result of regional growth and energy minerals development.

Cumulative Impacts on Air Quality

Cumulative impacts would be the same as those discussed under Impacts from Proposed Management Actions.

IMPACTS ON SOILS

Impacts from Proposed Management Actions

Impacts from Water Quality Management. Proposals for maintaining or improving water quality

might benefit soils. Measures to reduce sediment may also reduce erosion and measures to protect riparian areas might also benefit soil productivity in those areas. The actions that would be taken are not yet known; consequently, impacts cannot be quantified.

Impacts from Water Yield Management. The impacts on soils from water yield management would be similar to those expected from range and wildlife vegetation manipulations and from timber harvesting. The changes in erosion conditions expected from water yield vegetation manipulations on typical sites are indicated in Table 5-8.

TABLE 5-8. POTENTIAL SOIL LOSS FROM WATER YIELD TREATMENT

(in tons per acre per year)

Vegetation Type	Present Erosion		Short-Term Erosion		Long-Term Erosion	
	Mechanical Treatment	Burning	Mechanical Treatment	Burning	Mechanical Treatment	Burning
Mountain Brush.....	4.5	4.5	6.8	10.8	4.5	4.5
Aspen.....	1.1	.....	6.8	.....	1.1	.....
Conifer.....	1.1	.....	6.8	.....	1.1	.....

In the short term, manipulation of 25,615 acres of these vegetation types would increase soil loss within the range of 9,400 to 30,800 tons per year depending on whether mountain brush were mechanically manipulated or burned. These figures are derived from an implementation of 10 percent of the total proposed treatments each year of the 10-year implementation period. Sediment yield increases from these manipulations are discussed under Impacts on Water Quality.

Impacts from Critical Watershed Areas. Minimizing surface disturbance in these areas would prevent an increase in erosion and would probably protect soil productivity.

Impacts from Minerals Management. Surface disturbance resulting from mine development and operation would cause short-term increases in erosion. Impacts would continue until rehabilitation measures were completed. Road construction would be one of the greatest impacts on soils from minerals management. The impacts of road construction on soils are discussed in the Impacts from Forest Management section.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Implementation of grazing systems would have long-term beneficial impacts on soils. Rest from livestock grazing during critical growing periods would improve plant vigor, reproduction, and litter accumulation and would increase the organic matter content in surface soils. This would cause beneficial changes in soil structure, permeability, porosity, and potentially the soils productivity. Impacts from rest rotation grazing would be greater than from deferred rotation grazing because in the former system at least one pasture would be rested annually through the entire year whereas the latter system would graze every pasture each year (see Appendix A for description of grazing systems).

Mechanical vegetation manipulation would create localized short-term impacts to the soil resource. Disturbance caused by plowing or discing could increase the surface soil's permeability. Soil loss through wind and water erosion would increase until revegetation occurred. Compaction caused by mechanical equipment would be short term and would not be significant.

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Burning would cause localized short-term impacts to the soil's physical, chemical, and biological properties primarily through the loss of ground cover and litter accumulation. The severity of the impact would depend on the fuel type and the severity of the fire. Burning might decrease soil infiltration rates in some soils which would result in accelerated erosion and the removal of some nutrients mineralized by the fire. After burning, concentrations of calcium and magnesium could be greater in the surface soils and the water-soluble potassium concentrates might be less. Total nitrogen could be lower in soils of the burned area, which would decrease soil productivity (BLM Grand Junction Grazing EIS 1979). The overall effect on plant production would depend on the initial concentration of these nutrients in the soils at sites selected for burning. These data are presently unknown.

Loss of ground cover would increase evaporation rates from the soil (Shown, Lusby, and Branson

1972) resulting in reduced soil moisture content. This would retard seedling emergence and plant growth. Data is not available to predict the magnitude of these changes.

Soil erosion from wildlife and livestock vegetation manipulations would increase during the short term. Erosion would be greatest immediately following disturbance. It would decline rapidly with the establishment of new vegetation during the following two to three years and then decline at a slower rate. In the long term, erosion would probably be less than current losses. This would be due to better livestock distribution and ground cover. Potential changes in soil erosion due to practices such as chaining, plowing, furrowing, brush beating, spraying, and burning are indicated in Table 5-9 for typical site conditions where manipulations would be implemented.

TABLE 5-9. POTENTIAL SOIL LOSS FROM MECHANICAL TREATMENT AND BURNING

(in tons per acre per year)

Vegetative Type	Present Erosion		Short-term Erosion		Long-term Erosion	
	Mechanical Treatment	Burning Areas	Mechanical Treatment	Burning Areas	Mechanical Treatment	Burning Areas
Sagebrush.....	2.8	4.2	3.4	15.6	2.1	3.9
Mountain Brush.....	2.3	3.4	3.2	15.6	1.3	2.8
Pinon-Juniper.....	3.4	5.0	3.6	11.7	3.4	5.0

The sediment yield impacts caused by range and wildlife treatment on approximately 75,360 acres of the three vegetation types mentioned above over a 10-year period are discussed in Impacts on Water Quality.

Impacts from Forest Management. The greatest impact to soils from forest management is the road construction associated with harvest operations. Clearing and grubbing exposes the accelerated erosion by agents such as water, wind, and freeze-thaw cycles. Cuts and fills cause adverse impacts by altering the natural drainage from hillsides, exposing underlying soils to weathering actions, and removing lateral support for adjacent material, potentially causing landslides and slumps. Blasting could cause fractures or settling of the soil and an increase in erosion. Depending on soil material, newly constructed fills having slopes greater than 2:1 or 3:1 are subject to failure and may contribute to increased erosion and sedimentation until stabilized. Additional sediment yield from these sources

would shorten the useful life of downstream dams or other water diversion or retention structures.

The types of cutting practice selected can also affect soil conditions. Clearcutting results in the greatest increase in soil loss per acre and also increases the potential for landslides on noncohesive soils. Thinning and selective cutting leave most of the ground cover intact and result in minimal soil exposure. Changes in erosion from harvest practices on typical sites in the resource area are indicated in Table 5-10.

The forest harvest under level 1 of 0.7 million board feet of productive forest and 2,650 cords of fuelwood from woodlands annually would disturb 296 to 741 acres and result in the loss of 1,820 to 3,050 tons of soil annually in the short term depending on whether clearcutting or selective cutting were chosen as the preferred harvest method. In the long term, increases in ground cover in woodland areas would reduce soil losses by 210 to 530 tons annually below existing conditions.

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TABLE 5-10. EXPECTED SOIL LOSS FROM TIMBER HARVESTING

(in tons per acre per year)

	Present Erosion		Short-term Erosion		Long-term Erosion	
	Selective Cut Areas	Clear-cut Areas	Selective Cut Areas	Clear-cut Areas	Selective Cut Areas	Clear-cut Areas
Productive Forest Land						
Less than 40 percent slope	1.1	1.1	4.5	6.8	1.1	1.1
More than 40 percent slope.....	6.8	6.8	11.3	13.2	5.7	5.7
Woodland						
Less than 40 percent slope	6.8	6.8	11.3	13.2	5.7	5.7
More than 40 percent slope.....	6.8	6.8	11.3	13.2	5.7	5.7

The forest harvest under level 2 of 4 million board feet of sawtimber and 4,330 cords of fuelwood annually would disturb from 911 to 2,276 acres and result in an increase in soil loss of 8,610 to 13,760 tons annually in the short term, depending on whether clearcutting or selective cutting were the preferred harvest method. In the long term, soil erosion would be reduced below the present condition by 560 to 1,410 tons annually because of increases in ground cover in woodland areas.

Impacts from Off-Road Vehicle Management. Critical big game winter range areas ranging in erosion hazard from low to high would be subject to off-road vehicle (ORV) limitations during January through April. Existing ORV use in these areas is generally low but is expected to increase substantially in the Battlement Mesa area. Soils are generally either frozen or wet during the closure period. Soils are most susceptible to damage when wet; consequently, these closures would protect the soils when they are most sensitive.

Additional acres would be closed because of recreation opportunity spectrum classification and inclusion in wilderness study areas. Erosion hazard ranges from low to very high. Minor beneficial impacts would be expected from these closures due to negligible existing or projected ORV use in these areas.

Impacts from Utility and Communication Facility Management. Impacts would depend on the type and extent of surface disturbance. Impacts would probably be short term pending successful reclamation.

Cumulative Impacts on Soils

Short-term increases in erosion would result from mechanical treatment and burning associated with livestock, wildlife, and water yield vegetation manip-

ulation and from forest management practices. In the long term, increases in ground cover would reduce erosion below existing conditions. Except for road construction, short-term erosion increases would also result from soil disturbances associated with minerals, transportation, and utility and communication facility management. Road construction would be a major cause of erosion and impacts from this source would last until reclamation stipulations effectively stabilized these areas.

Approximately 160,400 acres would be affected by ORV limitations. ORV limitations in erosion hazard areas where there is existing ORV use would have the greatest beneficial impacts. Limitations for protection of critical big game winter range would also be beneficial because soils are most susceptible to degradation when wet. Other ORV limitations would have minimal beneficial impacts because of negligible current or projected ORV activities in the areas.

IMPACTS ON WATER QUALITY

Impacts from Proposed Management Actions

Impacts from Water Quality Management. Review of project proposals and addition of stipulations to prevent adverse impacts would minimize water quality degradation in the short term and maintain existing quality in the long term. Monitoring four areas with known water quality problems (see Map 3-1) to identify the problem source and feasibility of reducing it would probably result in beneficial impacts to water quality in these areas. The problems are listed in the Management Situation Analysis and include as high sediment, salinity, sulfate temperature and bacteria levels. The quantification of impact benefits cannot be determined

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until the problem sources are identified and measures designed to reduce the problems selected.

Impacts from Water Yield Management. Vegetation manipulations to increase water yield would increase sediment in the short term by 5,400 to 6,600 tons per year and increase salinity by an unknown amount. Increased sediment would reduce water quality during the 10-year implementation period. In the long term, sediment yield would be expected to return to its original level.

Salinity impacts from vegetation manipulations would be proportional to runoff quantity and duration, mineral content of the soil, and the resultant soil disturbance and erosion. Excessive runoff and accelerated erosion would degrade water quality until the soils were stabilized or runoff velocities decreased. Impacts would be local and insignificant.

Impacts from Minerals Management. Potential short-term, generally insignificant salinity impacts would continue to occur from mineral developments. Spoil pile runoff would increase surface water salinity. A secondary source of salinity impacts would include improperly designed or rehabilitated roads, pipelines, and drill pads. Impacts would continue until soils were stabilized by revegetation or other land treatments such as water bars, generally accomplished during rehabilitations.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Manipulating 75,360 acres of sagebrush, mountain brush, and pinyon-juniper to meet the forage requirements of wildlife and livestock would increase sediment yield by 1,800 to 39,200 tons per year during the 10-year implementation period. This range is dependent on the type of manipulation method selected, mechanical or burning. In the long term, ground cover on sagebrush and mountain brush manipulation areas would improve above existing cover conditions and, in turn, decrease sediment yield by 9,060 to 12,883 tons per year.

Burning as a management tool for implementing range, wildlife, and water yield vegetation manipulations would cause several chemical reactions and nutrient losses in addition to increases in runoff and sediment that would adversely affect water quality (see Impacts on Soils). Short-term increases in salinity in local streams could be expected, and the potential for algae blooms in stock ponds from increased phosphorous levels also would exist. Impacts probably would not be significant, and concentrations of nutrients and salts would decrease rapidly as watershed conditions stabilized.

Little change in fecal coliform levels would be expected from livestock grazing management. The effects of an increase in livestock numbers should be

offset by better livestock distribution and aquatic habitat improvements which protect riparian areas.

Livestock grazing management involving proper stocking rates, seasons of use, and plant use would have no significant effect on salinity. Excessive grazing resulting in reduced ground cover and increased compaction would increase runoff, erosion, and salinity. Implementation of allotment management plans would minimize salinity impacts.

Impacts from Forest Management. Annual sediment yield resulting from harvesting 0.7 million board feet of sawtimber and 2,650 cords of fuelwood per year (harvest level 1) would range from 910 tons from clearcutting to 1,550 tons from selective cutting.

Annual sediment yield resulting from harvesting 4.0 million board feet of sawtimber and 4,330 cords of fuelwood per year (harvest level 2) would range from 5,364 tons from clearcutting to 8,666 tons from selective cutting.

Total sediment yield increases from productive forest land and woodland harvest would range from 910 tons per year to 2,730 tons per year depending on which harvest level and harvest method were selected. Impacts per acre are greater from clearcutting, but total number of acres disturbed would be greater for selective cutting.

In the long term, sediment yield from woodland harvest areas would decrease from 106 to 881 tons per year due to increases in cover conditions.

Impacts from Recreation Resource Management. Upgrading of floatboating access areas would include establishing sanitary facilities. This would decrease the amount of bacteria entering surface waters, thereby improving water quality. The impact would be localized, beneficial, and long term.

Impacts from Wilderness Resource Management. Recreational activity would impact bacteriological quality of water. Increased recreational use in wilderness study areas would result in a corresponding increase in bacteria due to lack of established sanitary facilities. The impact would be dispersed throughout the wilderness study area and would be intermittent depending on recreational use patterns.

Impacts from Off-Road Vehicle Management. Off-road vehicles (ORVs) would decrease ground cover and reduce infiltration by compaction resulting in accelerated runoff and erosion. Limiting ORV use to areas of non-saline soils would minimize dissolved solid water quality degradation. Restrictions proposed to control ORVs in sensitive areas would somewhat reduce overall adverse impacts and

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would likely have a significant, localized, long-term beneficial impact on water quality.

Impacts from Fire Management. Sediment and turbidity are the most significant water quality responses associated with fire. Sediment and turbidity result primarily from overland flow, secondarily from channel scour caused by increased discharge. See Impacts from Terrestrial Habitat and Livestock Grazing Management for estimates of sediment produced from burning as well as other vegetation manipulation proposals.

Cumulative Impacts on Water Quality

The short-term increase in sediment yield from livestock, wildlife, water yield, and forestry vegetation manipulations would range from 8,100 tons per year to 54,500 tons per year. These increases would be greatest immediately following disturbance and would decrease rapidly in the following 2 to 3 years as vegetation became reestablished. Sediment yield would decline more slowly thereafter. The increase in sediment yield over the entire resource area represents 0.6 to 3.8 percent rise over existing conditions and would range from less than 0.01 to 0.04 tons per acre per year. These figures are not significant on a resource area wide basis, but individual watersheds would be adversely impacted if a large amount of the vegetation manipulation were completed by burning and timber harvesting were conducted in the same area at the same time. Watersheds that would exceed allowable departures in sediment yield under these conditions include Battlement, Garfield, and Canyon Creeks in the Garfield Capability Unit; Prince and Threemile Creeks in the Roaring Fork Capability Unit; Big Alkali Creek in the Castle Peak Capability Unit; and Rock Creek in the King Mountain Capability Unit.

In the long term, increases in cover in sagebrush and oakbrush manipulations would reduce sediment yield below existing conditions. The reduction would range from 9,060 to 12,880 tons per year. These figures represent a decline of 0.6 to 0.9 percent in sediment yield below existing conditions and a decrease per acre of less than .01 to 1 ton per year, which would not be significant.

IMPACTS ON WATER YIELD

Impacts from Proposed Management Actions

Impacts from Water Yield Management. Water yield increases expected from treatment of different vegetation types in the resource area are 1-3 inches per acre per year for mountain brush, 3-5

inches per acre per year for aspen, and 1-3 inches per acre per year for conifer (Hibbert 1977). Treatment of 52,362 acres of these vegetation types in the Garfield Capability Unit would increase water yield by an average of 6,180 acre-feet annually (see Table 5-11).

TABLE 5-11. ACREAGE AND WATER YIELD INCREASES FROM VEGETATION TREATMENT IN THE GARFIELD CAPABILITY UNIT

Vegetation Type	Acres	Average Water Yield Increase (acre-feet per year)
Conifer ¹	5,650	940
Aspen ²	16,139	2,690
Mountain Brush ³	30,573	2,550
Total.....	52,362	6,180

¹Forty (40) percent of the conifer acreage would actually be converted.

²Fifty (50) percent of the aspen acreage would actually be converted.

³Fifty (50) percent of the mountain brush acreage would actually be converted.

Timing of the increased yield would vary by vegetation type treated. In conifer areas, Leaf (1975) indicates that snowmelt in clearcut openings is more rapid than in the uncut forest. This accelerated melt causes streamflow to be higher on the rising limb of the hydrograph than before harvest cutting. If there is natural regulation in the form of deep porous soils recession, flows are not changed appreciably and annual and daily peak flows are not significantly increased, provided forest cover on no more than 50 percent of the watershed is removed in a system of small openings.

Information is lacking about the timing of water yield increases in oakbrush areas; however, Tew (1969) indicates that oakbrush eradication probably results in deep seepage which could ultimately appear as streamflow or recharge ground water.

Debye (1976) indicates that the increase in water yield from aspen clearcuts occurs as baseflow and interflow. The increase results from retention of greater quantities of water in the soil following each growing season in the postharvest situation.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Manipulating sagebrush and pinyon-juniper would have little effect on water yield. Sturgis (1975) indicates that sagebrush manipulation increases water yield only when soils are sufficiently deep that roots of replacement vegetation are above soil occupied by the deeper

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roots of sagebrush (generally greater than 3 feet deep), and where precipitation is sufficient to wet the soil throughout its profile. These conditions are met at very few sites within the resource area. Similarly, a review by Gifford (1975) indicates that little change in water yield can be expected from pinyon-juniper manipulation. Mountain brush manipulation, however, could increase water yield by 1-3 inches per acre per year (Hibbert 1977). Mechanically manipulating 4,370 acres or burning 17,823 acres of mountain brush to increase forage available for livestock or wildlife would result in an average water yield increase ranging from 730 acre-feet per year through mechanical manipulation to 2,970 acre-feet per year through burning. These increases would be short-lived (3 to 5 years) if shrub regrowth were not controlled. (See Impacts from Water Yield Management for effects on water yield timing.)

Impacts from Forest Management. Maximum increases in water yield from timber harvesting in the Rocky Mountain subalpine forest result when 40 percent of a timbered watershed is harvested in a series of openings less than eight tree heights in diameter (Leaf 1975). Increased water yield of 1 to 3 inches per acre per year would be expected. When timber harvest is conducted by selective cutting of individual trees, increases in water yield are much less. Selective cutting resulting in the uniform removal of 50 percent of canopy cover density in low elevation, south aspect, lodgepole pine would increase water yield by 1 inch per acre per year. The same treatment of spruce-fir on north aspect slopes would reduce water yield by 0.5 inches per acre per year (Leaf 1975). Water yield changes from harvesting 0.7 million board feet of sawtimber annually (harvest level 1) would range from no change through selective cutting to an increase of 43 acre-feet annually through a series of patch clearcuts. Water yield changes from harvesting 4.0 million board feet of sawtimber annually (harvest level 2) would range from no change through selective cutting to an increase of 249 acre-feet annually through a series of patch clearcuts. Increases from patch clearcuts would endure for up to 30 years. See Impacts from Water Yield Management for changes in water yield timing.

Cumulative Impacts on Water Yield

The cumulative impact would range from 6,910 acre-feet per year, if range and wildlife manipulations were done through mechanical means and timber were harvested by selective cutting, to 9,400 acre-feet per year if range and wildlife manipulations were conducted by burning and timber were harvested at harvest level 2 in a series of patch clearcuts. On the basis of an implementation

schedule of 10 percent per year for water yield and range and wildlife vegetation manipulation projects, water yield would increase by 700 to 1,160 acre-feet per year until all manipulation proposals were completed. Water yield from forest management would continue to increase every year timber were harvested in small clearcuts.

The range of increase in water yield under the Resource Protection Alternative represents a 6 to 9 percent increase over existing water yield and 45 to 62 percent of the total potential for increasing water yield on public land in the resource area.

The additional water would be of benefit to local water users, mostly in the spring, but might also provide some additional water during low flow periods due to seepage into ground water and reappearance as baseflow from ground water discharge. BLM programs such as aquatic habitat, livestock grazing, and wildlife habitat management would also benefit from additional water for stockponds and reservoirs and by potentially prolonging the discharge period of springs. The additional water, although regionally insignificant, would also generally benefit the Colorado River Basin whose existing supplies are over allocated and whose future development appears limited only by the availability of water.

IMPACTS ON CRITICAL WATERSHEDS (MUNICIPAL WATERSHEDS, DEBRIS FLOW HAZARD ZONES, AND EROSION HAZARD AREAS)

Impacts from Proposed Management Actions

Impacts from Critical Watershed Areas. Designation of the debris flow hazard zones areas of critical environmental concern (ACECs) would enable prescription of special management (including recommendations developed by the Glenwood Springs debris flow study) which should reduce debris flow incidents. In addition to ACEC designation, restrictions on other activities would help to reduce debris flow hazard or at least prevent the hazard condition from worsening. Historically, livestock grazing on the public land portions of the watersheds has been at a low to moderate use level. The results of a review by Gifford and Hawkins (1978) indicate that grazing has an effect on infiltration but that the difference between light and moderate grazing infiltration is statistically insignificant, while heavy grazing on has a distinct impact which is different from that of light to moderate grazing. Any increase in the grazing intensity level would decrease infiltration rates and cause additional runoff

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which could compound the debris flow hazard. Restricting livestock grazing to a light to moderate use level would maintain the existing infiltration rate and prevent additional runoff, thus preventing an increase in the debris flow hazard.

The impact of off-road vehicle (ORV) use has also been found to be detrimental to watershed conditions. In a study done for the BLM in California (Snyder, et al. 1976), it was evident that ORVs had a damaging impact on the soil, plant cover, and hydrologic processes in study areas. In one of the study areas, motorcycle use produced about eight times as much runoff as a nearby unused area. The large difference was directly attributable to reduction in plant cover and infiltration rates due to soil compaction in the heavily used area. By restricting ORV use to designated roads and trails in debris flow hazard areas, an increase in hazard conditions associated with ORV use should be prevented and could result in some improvement.

Additional restrictions on timber harvesting; water yield, range, and wildlife vegetation manipulations; designation as a fire exclusion area; and designation as unsuitable for new utility and communication facilities would also prevent an increase in the debris flow hazard.

Prohibiting vegetation manipulation, timber harvesting, wildlife habitat improvements, new utility and communication development, and oil and gas leasing (once existing leases expire); would prevent damage to municipal watersheds. Limiting ORV use in municipal watershed areas to existing roads and trails would also help to prevent damage; thus, existing water quality would be preserved.

In the study referred to above (Snyder et al. 1976) the most serious watershed damage resulted from soil compaction and reduction of permeability. Soil compaction reduces depth of moisture penetration which deprives plants of moisture needed for growth. In some instances, compaction may be irreversible. The loss of moisture available for plants results in reduced watershed cover which causes increased runoff and erosion. In addition, they found that motorcycle trails became focal points for rill development. Prohibiting or limiting ORV use in eight erosion hazard areas with existing ORV use would help to prevent further watershed damage and possibly begin a vegetation recovery process in already damaged areas. Increased ground cover would reduce runoff and erosion thus benefitting downstream areas.

Impacts from Fire Management. Designating debris flow hazard zones as fire exclusion areas would help to reduce debris flow hazard by minimizing the area affected by fire. Maximum effort is directed towards extinguishing wildfires as rapidly as possible in fire exclusion areas. A report prepared

by the Colorado Geological Survey (Mears 1977) following the 1977 debris flow in Glenwood Springs indicates that a wildfire partially on public land above Glenwood Springs may have been responsible for increased runoff rates which may have contributed to the debris flow in the city below.

Designating municipal watersheds as fire exclusion areas would help to prevent watershed damage and minimize water quality degradation resulting from wildfires.

Cumulative Impacts on Critical Watersheds

Restrictions on timber and woodland harvest, vegetation manipulation, livestock grazing, and ORV use as well as inclusion in a fire exclusion area and an unsuitable area for utility and communication facility development should prevent adverse impacts to the debris flow hazard. In addition, special management derived from ACEC designation and recommendations evolving from the Glenwood Springs debris flow study should result in a reduction in the hazard which would reduce the frequency and severity of damage from debris flow incidents.

A high degree of protection for water quality in municipal watersheds would be provided by restrictions on other resource activities (forest and woodland harvest, vegetation manipulation, ORV use, and oil and gas leasing) and by inclusion in a fire exclusion area and an unsuitable area for utility and communication facility development. The effect would be to provide water of the best quality possible from public lands in the municipal watershed.

The potential for improvement in watershed conditions on 50,200 acres of erosion hazard areas by restricting ORV use also exists. An improvement in ground cover would reduce runoff and erosion and prolong the life of downstream water retention and diversion facilities.

IMPACTS ON MINERALS

Impacts from Proposed Management Actions

With the exception of wilderness, all restrictions and related impacts identified in the Continuation of Current Management Alternative would carry through to this alternative. The following impacts are in addition to those identified in Continuation of Current Management.

Impacts from Minerals Management. Identifying 28,520 acres of public and private lands as acceptable for further leasing consideration would

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make approximately 1.6 billion tons of coal available for future leasing. Identifying 1,560 acres as unacceptable would eliminate that acreage from further leasing consideration.

Impacts from Wilderness Management. Closing 30,630 acres of preliminarily suitable wilderness areas to mineral location, sales, and oil and gas leasing would have an insignificant impact on mineral development because mineral exploration and development activities indicate a low potential for mineral development in these areas.

Impacts from Recreation Resource Management. Closing 2,470 acres in Deep Creek Canyon to mineral location, sales, and oil and gas leasing would have an insignificant impact on mineral exploration and development because of a lack of industry interest and mineral bearing geologic formations.

Identifying 3,456 acres near Hack Lake as closed to oil and gas facility location would increase costs because directional drilling would be required. This area is presently not under lease and is believed to have a low development potential for oil and gas production. The 3,956 acres near Hack Lake are also closed to mineral sales. This is not a significant impact because few known salable minerals exist in this area.

Closing 50 acres on two Frying Pan Recreation Sites to mineral sales would have an insignificant impact because of the small area involved at each site.

Impacts from Cultural Resource Management. Closing 4,200 acres of public land in the Blue Hill Archaeological District to oil and gas surface facility location would have an insignificant impact because industry seems to have little interest in developing the oil and gas in this area and also because the oil and gas potential is low.

Impacts from Critical Watershed Areas. Closing 5,858 acres of municipal watersheds to oil and gas leasing would be moderately significant because these watersheds are believed to contain a potential for oil and gas production based on other oil and gas exploration and development occurring in the vicinity. The 1,108 acre municipal watershed south of Rifle is within an area of existing oil and gas development on private land and is believed to have a very high potential for development under the existing leases for the area.

Impacts from Land Tenure Adjustments.

Disposing of 9,555 acres of public land would have an insignificant impact on mineral development because mineral rights would be retained on all areas containing significant mineral development potential.

Cumulative Impacts on Minerals

Closing 129,142 acres of public and private land to mineral location would continue to prevent mineral development in those closed areas. However, this acreage, which is 17 percent of the resource area, is not significant when compared to the acreage available to entry.

Closing 33,560 acres to oil and gas surface facility location, which is 4 percent of the resource area, would continue to increase drilling cost and potentially exclude oil and gas development since directional drilling would be required.

Closing 91,918 acres of public and private lands to oil and gas leasing, which is 12 percent of the resource area, would not be significant since most of the potentially valuable oil and gas reserves are already under lease. However, some local impacts could be more significant to companies holding leases in closed areas.

There are 28,520 acres of public and private lands identified as acceptable for further coal leasing consideration. The impact can not yet be assessed.

Closing 40,992 acres to mineral sales, which is 6 percent of the resource area, would not be significant since ample supplies are available. The impacts of selling mossrock, top soil, sand and gravel, scoria, and fill dirt in common use areas would have insignificant impacts as stated in site specific assessments. Table 5-12 summarizes the mineral limitations.

TABLE 5-12. PROPOSED MINERAL LIMITATIONS

Limitation	Acres
Closed to mineral location	129,142
Closed to oil and gas surface facility location.....	33,560
Closed to oil and gas leasing	91,918
Open to oil and gas leasing	680,414
Acceptable for further consideration for coal leasing.....	28,520
Eliminated from coal leasing consideration	1,560
Closed to mineral sales.....	40,992

IMPACTS ON AQUATIC WILDLIFE

Impacts from Proposed Management Actions

Impacts from Aquatic Habitat Management. Aquatic habitat improvements such as instream structures would increase aquatic invertebrate populations, lower water temperatures, improve spawn-

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ing, resting and holding areas for fish, allow for better fish migration, and reduce stream bottom siltation by increasing water velocities in riffles. Riparian habitat improvements such as fencing and vegetation reestablishment would reduce water temperatures and streambank damage and increase terrestrial invertebrate populations that serve as a source of food for fish. This would occur on 90 miles of public stream and 3 lakes (17 surface acres). Minimum streamflow maintenance on 43 additional streams would provide conservation pools for fish during periods of low flow and would sustain riparian habitat during dry periods. These projects would improve fish condition, productivity, and longevity. These expected improvements would begin to occur about 2 years after project implementation and would last the life of the project. (This would also apply to projects proposed by other resources that would affect water quality or water yield.)

Impacts from Water Quality Management. Water quality management for the Milk and Alkali Creek watersheds could significantly improve fisheries habitat in the Eagle River if management is successful in substantially reducing sediment load. This would increase overall production of fish and invertebrates in the Eagle River.

Impacts from Water Yield Management. In the short term, water yield vegetation manipulations would cause increased erosion and sediment yield. The increase in sediment would have adverse impacts on aquatic habitat condition. It would reduce fish production by reducing food supplies and by siltation of spawning areas. In the long term, beneficial impacts might result from increased water yield. The effect of water yield management during the low flow period is uncertain. It is possible that oakbrush and aspen manipulations would increase flow during this period while conifer manipulations would not. Many of the streams in the Garfield Capability Unit are limited by low flows in the latter part of the summer. If these flows could be increased by water yield management, it would reduce or dilute siltation and benefit those streams where low flows and siltation are limiting factors on aquatic habitat condition.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Vegetation manipulations could cause increased erosion, resulting in localized short-term decreases in invertebrate populations in streams draining the area of disturbance. This would result in reduced fish production from reduced food supplies and siltation of spawning areas. Burning generally has a greater adverse impact than other manipulation methods because of the potential for greater loss of ground cover and the chance of significant quantities of ash entering the stream. Fishing streams potentially sub-

ject to significant adverse impacts include: Battlement Creek, Garfield Creek and Canyon Creek in the Garfield Capability Unit; Prince Creek and Threemile Creek in the Roaring Fork Capability Unit; and Rock Creek in the King Mountain Capability Unit. Total public fishing stream mileage affected would be 10.3 miles. Adverse impacts would be reduced by following the standard operating procedures listed in Appendix B.

Beneficial impacts would include long-term increases in water yield which would increase the level and possibly the duration of stream flow, resulting in better invertebrate and fish populations and better fish condition. The long-term increase in understory vegetation on manipulated areas would improve water quality by reducing sedimentation.

Implementation of proper stocking rates and improved livestock distribution through monitoring, water development, fencing, and vegetation manipulation would benefit aquatic habitat by improving vegetation cover and reducing grazing pressure in riparian areas. This would reduce erosion and bank damage and improve riparian vegetation which in turn would reduce water temperature and improve stream quality for fish.

These long-term benefits would have a significant impact on aquatic conditions and associated fisheries.

Impacts from Forest Management. In the short term, timber and fuelwood harvest would result in increased sediment yield which would adversely impact aquatic habitat in affected streams. Road construction associated with harvest activities would be the greatest single source of sediment. Application of standard operating procedures and proper road layout and design would minimize adverse impacts to the aquatic ecosystem.

Timber harvest, if implemented in a series of small patch clearcuts, would increase water yield. Timing of the increased yield from the subalpine forest zone would be such that increases in baseflow during low flow periods would not occur (Leaf 1975) and would be of little benefit to the aquatic ecosystem.

Impacts from Recreation Resource Management. Increased fishing would increase fish harvest, reducing the chance of winter kill in over populated streams and lakes and would cause an insignificant loss of riparian habitat from trampling and vehicle use.

Impacts from Areas of Critical Environmental Concern. Protection of aquatic habitat through area of critical environmental concern designations would reduce the level of adverse impacts from other resource activities, thus reducing aquatic

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disturbance and resulting in long-term beneficial impacts to aquatic habitat. Approximately 35.5 miles of stream habitat and 1 lake (2 surface acres) supporting state-threatened or endangered species would be protected through designation.

Impacts from Land Tenure Adjustments. Some very limited access to the Eagle River and other small streams would be lost. Most of the small parcels along the upper Colorado River do not supply access from roads, but do provide boaters a place to land and fish.

Fisheries in the lower portion of the Colorado River could benefit from the protection and more intensive management of aquatic habitat anticipated under the cooperative management program. This area is currently being rapidly developed with significant losses of riparian habitat and increases in water degradation occurring.

Impacts from Off-Road Vehicle Management. Off-road vehicle (ORV) closures would reduce erosion where roads and trails cross streams. Where roads exist in closed areas, ground cover would increase and erosion would be reduced.

Streams located in areas open to ORV open areas would continue to be damaged by vehicles crossing or driving down stream channels. Because existing and projected off-road vehicle use is low, no significant increase in impacts on aquatic habitat would occur.

Impacts from Transportation Management. Significant benefits would occur where access to public fishing streams was gained. This would allow for better stream management and more fishing opportunities.

Cumulative Impacts on Aquatic Wildlife

In the short term, vegetation manipulation by the various resource programs would cause increases in sediment that would adversely affect aquatic habitat. Significant adverse impacts would occur to Battlement, Garfield, Canyon, Prince, Threemile, and Rock Creeks if vegetation manipulation by burning and if timber and fuelwood harvest occur in the same watershed at the same time.

In the long term, aquatic and riparian habitat improvements and vegetation manipulation projects could significantly increase invertebrate populations and fish production and significantly improve stream quality, fish condition, and water quality. This would occur through increases in water yield and possibly base flows during low flow periods and improved water quality after reestablishment of vegetation on disturbed sites. The significance of these impacts cannot be determined until actions are implemented and monitored.

Cooperative management could improve aquatic habitat on the lower Colorado River and increase fish and invertebrate production.

All suitable aquatic and riparian habitat on public land would be managed to obtain optimal aquatic habitat conditions. Habitat currently in average to excellent condition would be maintained and potential fishery streams would be improved to support fish. Long-term beneficial impacts to aquatic habitat would result from maintaining optimal aquatic condition ratings.

These impacts would provide an undetermined increase in fish populations which in turn would provide more and better fishing opportunities.

IMPACTS ON TERRESTRIAL WILDLIFE

Impacts from Proposed Management Actions

Impacts from Terrestrial Habitat Management. The allocation of 47,173 animal-unit months (AUMs) of existing forage to big game would exceed by 3 percent (1,571 AUMs) existing big game forage demands, but would be 19 percent (11,151 AUMs) short of meeting the forage requirement of the Colorado Division of Wildlife's 1988 big game population goals. Annually manipulating 2,341 acres of pinyon-juniper, oakbrush-serviceberry, and sagebrush would provide an additional 756 AUMs each year, exceeding by 20 percent over a 10-year period the existing forage demand but still falling 6 percent short of meeting Colorado Division of Wildlife population goals (the objective of this alternative). These shortages would be greatest in the crucial winter range. Forage allocations by game management unit are shown in Table 5-13. Appendix F explains the methodology used in allocating forage.

The most significant shortage of forage would occur northeast of the Roaring Fork River and northwest of the upper Colorado River. Both of these areas support moderate to high densities of animals. The initial allocation to big game in these areas would be from 15 to 43 percent short of meeting the existing big game forage demand. Thus, short-term declines in existing populations would occur in these areas, potentially reducing hunting opportunities.

The remainder of the resource area would receive initial forage allocations ranging from 3 to 29 percent above existing demand. Existing demand would be exceeded by 20 percent by allocating an additional 7,560 AUMs gained through vegetation manipulation on 23,410 acres. However, Colorado Division of Wildlife population goals would not be

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TABLE 5-13. WILDLIFE FORAGE ALLOCATION BY GAME MANAGEMENT UNIT

Game Management Unit	Existing Demand (AUMs)	Initial Allocation (AUMs)	Percent Change From Existing Demand	Project- ed Allocation (AUMs)	Percent Change From Existing Demand	Percent of Ob- jective Met	Density of Animals ¹	Number of Animals ²	Size of Area
15.....	965	817	-15	1,126	+17	100	High	Moderate	Small
25.....	4,907	3,695	-25	5,098	+4	86	Moderate	Moderate	Moderate
26.....	4,220	2,414	-43	2,925	-31	60	Moderate	Low-moderate	Medium
32.....	3,181	4,118	+29	4,299	+35	99	Low-moderate	Moderate-high	Medium-large
33.....	7,246	8,971	+24	9,932	+37	100	Low-moderate	Large	Large
34.....	2,277	2,391	+5	2,526	+11	100	Low	Low	Small
35.....	5,291	6,082	+15	6,258	+18	99	Low	Moderate	Large
36.....	917	946	+3	1,127	+23	99	Moderate	Moderate-low	Medium
42.....	3,892	4,629	+19	4,685	+20	97	Low	Large	Large
43.....	4,597	5,927	+29	6,957	+51	98	Moderate-high	Large	Large
44.....	5,570	5,220	-6	6,692	+20	95	Moderate-high	Large	Large
444.....	1,596	1,222	-23	2,010	+26	94	High	Large	Medium
47.....	943	741	-21	1,096	+16	90	Moderate-high	Moderate	Small
Total.....	45,602	47,173	+3	54,731	+20	94			

¹Number of animals and density per square mile based on winter use periods (crucial period for wildlife).

achieved. This long-term increase in big game populations would increase hunting opportunities and success, and would likely bring increased business to the local towns (see Impacts on Social and Economic Conditions).

Manipulating the 23,410 acres of vegetation over a 10-year period would increase forage, improve big game health and productivity, and change wildlife species composition and density. The short-term loss of bird and small mammal habitat in vegetation manipulation areas would be insignificant because of the small amount of acreage treated annually and the relatively quick revegetation of these areas. Benefits gained by manipulating vegetation would begin in about 2 years but would not be permanent unless regrowth was controlled. This applies to all types of vegetation manipulations.

Identification of habitat suitable for and subsequent introductions of state-threatened (river otter) or federal-endangered species (peregrine falcon) would help maintain a viable population of these species within the state. Introductions of bighorn sheep, sage and sharp-tail grouse, and turkey would increase these populations. They in turn could be used for other reintroductions, hunting, and increased gene pools. Map 3-11 shows areas potentially suitable for these introductions.

Improvement of riparian habitat could result in local increases in waterfowl populations which would provide additional local hunting opportunities.

Water developments would increase the amount of available habitat, allowing local wildlife populations to increase.

Cooperative management of 62,170 acres of public and state land, especially the public land

along the Colorado River west of New Castle, would benefit bald eagles, great blue herons, and waterfowl.

Hunting opportunities, success, and achievement of big game population goals would improve in areas identified for additional public access. This would result in healthier animals, improved productivity, and reduced game damage to privately-owned land.

Impacts from Water Yield Management. Removing oakbrush would result in better big game distribution by removing physical barriers to free movement. It would also create additional big game habitat. Thinning dense, overmature stands of sagebrush in sage grouse summer range could increase nesting and brood areas and improve meadow habitat. These vegetation manipulations would also provide wildlife with additional and longer duration water sources.

Removing aspen stands would reduce thermal and hiding cover, calving and fawning areas and essential nongame habitat. The application of project design features (Appendix B) and the small amount of aspen that would be removed would reduce the significance of these impacts.

Impacts from Critical Watershed Areas. Refer to Impacts from Off-Road Vehicle section.

Impacts from Aquatic Habitat Management. Small riparian habitat improvements along 90 miles of stream would result in local, insignificant increases in small game and nongame populations. Increased recreational use would not significantly stress wildlife or result in riparian vegetation losses.

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Impacts from Livestock Grazing Management. Annually removing 5,195 acres of sagebrush, oak-brush, and pinyon-juniper vegetation to provide additional livestock forage would change vegetation composition, density, and form and age classes thereby providing some additional big game forage and creating additional habitat for those wildlife species dependent upon the successional vegetation type. Species dependent on the original vegetation type would be displaced. These wildlife species changes would be insignificant. The Resource Area Profile (available in the Glenwood Springs Resource Area office) contains a list of wildlife species that would be affected.

Changing sagebrush on winter ranges to a grass-forb type would have a long-term adverse impact on big game, sage grouse, and many small game and nongame species that depend upon sagebrush for many of their habitat requirements.

Because the resource area supports a diversity of vegetation, little overall change in wildlife populations would occur. Project design features would limit the size, location, and configuration to ensure minimal adverse impacts on wildlife. Improvements in wildlife habitat and increases in populations would be commensurate with improvements in rangeland condition.

Water developments for livestock grazing management would benefit local wildlife populations by providing additional water sources and by reducing vegetation damage from livestock concentrations.

Fencing would improve livestock management, protect water sources and riparian vegetation from trampling, and reduce overgrazing and competition with big game for forage. Benefits would be local and have an insignificant effect on total wildlife populations. Fences could physically restrict big game migration or result in entanglement. This would be most severe on winter ranges and migration routes. Project design features (Appendix B) would reduce the significance of adverse impacts.

Impacts from Forest Management. Impacts of annually harvesting from 104 to 1,492 acres of timber—mostly in the King Mountain, Castle Peak, and Eagle-Vail Capability Units—would vary depending on harvest method, harvest season, length of contract, size, and location of the project.

Short-term adverse impacts would include a temporary loss of understory, soltude, thermal and escape cover, and nesting habitat for many wildlife species. Wildlife would also be temporarily displaced during the harvest period. These losses would be greater in clearcut than in selective cut areas. U. S. Forest Service land adjacent to timber stands on public land near Sunlight Peak and the Seven Hermits would reduce the severity of ad-

verse impacts by providing alternate habitat during harvest periods. Harvesting timber on King Mountain would produce more severe short-term impacts because alternate cover areas are not locally available. However, localized long-term beneficial impacts to wildlife, especially big game, would result from the increased forage production, habitat diversity, and ease of movement.

Harvesting timber in or near elk calving areas would result in a significant long-term detrimental impact because elk are highly sensitive to disturbance during calving and these areas are limited in number. Standard operating procedures (Appendix B) and site specific management techniques would reduce specific detrimental impacts to wildlife. The small acreage of disturbance, generally good habitat conditions, and compliance with standard operating procedures would reduce the significance of all impacts.

The majority of the woodland stands in the resource area are located in either big game winter or crucial winter range. Annually harvesting from 192 to 784 acres of woodland would result in locally significant increases in big game forage and wildlife populations associated with more open stands of pinyon and juniper or brush piles.

Insignificant adverse impacts include temporary loss of forage, thermal and hiding cover for big game species, and loss of nesting habitat, and soltude for other wildlife species during harvest periods. The small amount of acreage disturbed in relation to the woodland habitat supply and the application of standard operating procedures for woodland harvesting (Appendix B) would reduce the significance of adverse impacts.

Impacts from Recreation Resource Management. Recreation management would increase the number of people in wildlife habitat. The resulting stress would be an insignificant short-term adverse impact because of the dispersed nature and relatively small amount of increase expected in public land use by recreationists.

Impacts from Visual Resource Management. Restrictions placed on vegetation manipulations in visual resource management Class II areas could increase project costs and thus reduce the number of projects that would be accomplished. This would reduce the amount of forage increase that could be gained through vegetation manipulation and consequently the number of additional big game animals an allotment could support. This means that the proposed allocation to big game may be optimistic.

Impacts from Land Tenure Adjustments. Table 5-14 lists, by capability unit, the significant acreage of wildlife habitat that would be lost through sale or exchange. (Nothing larger than 100 acres was con-

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sidered except for riparian habitat). These large tracts would provide viable habitat even if adjoined by developed tracts of private land. Small tracts (less than 100 acres) would not provide significant big game habitat if surrounded by developed private land, thus they were not included in the totals in Table 5-14, but they would still provide open space and important habitat for nongame species.

TABLE 5-14. ACRES OF WILDLIFE HABITAT DISPOSALS

Capability Unit	Big Game Summer Range	Big Game Crucial Winter Range	Riparian Habitat
Garfield.....	0	3,810	40
Roaring Fork.....	120	1,910	0
Eagle-Vail.....	700	530	0
Castle Peak.....	0	240	69
King Mountain.....	400	300	0
Total.....	1,220	6,790	109

Loss of summer range could be locally significant, but because of the large amount and good condition of summer range throughout the resource area and because this type of habitat is not generally developed in an intensive manner, the overall adverse impact would be insignificant.

Disposal of 6,790 acres (3 percent) of the total crucial big game winter range within the resource area would be a locally significant, long-term adverse impact resulting in an estimated 3 percent loss in big game populations. Loss of winter range is especially significant because its availability in the resource area limits big game populations. This loss is magnified by the expected 8 percent additional loss of crucial winter range on private land from development. Development of those lands considered as winter range is usually very intensive—subdivisions and industrial parks, for example; thus, remaining habitat is of little value, especially to big game.

Impacts of riparian habitat disposals would be insignificant resource area wide. However, because of the diversity of wildlife species supported by riparian vegetation, these disposals could be locally significant.

Impacts from Off-Road Vehicle Management. Closing 12,147 acres to off-road vehicle (ORV) use would reduce stress on wildlife by eliminating the presence of recreation vehicles. However, without motorized access during hunting season, big game populations could not be effectively controlled in some areas. Because of the limited amount of acreage closed and the little ORV use occurring in

the resource area, these impacts would not be significant.

Limiting snowmobile use on 75,463 acres of big game winter range would significantly reduce stress on local big game herds, resulting in improved spring time health conditions and productivity, possibly resulting in increased deer and elk populations.

Impacts from Transportation Management. Providing better access to public land would make big game herds more accessible to hunters, thus increasing hunting success. This could reduce game damage on private land and winter mortality, and increase animal health and productivity. This would offset the adverse impacts of added stress resulting from the additional access.

Impacts from Utility and Communication Facility Management. Designating sensitive and unsuitable zones would protect fragile wildlife habitats such as elk calving areas, sage grouse strutting areas, and bald eagle roosting trees by either prohibiting siting of facilities or requiring adequate mitigation.

Impacts from Fire Management. Controlled use of fire to modify vegetation types would provide additional forage and improved habitat conditions, resulting in improved animal health and productivity. This would offset the significance of adverse impacts such as short-term habitat loss and fire-caused mortality to small and nongame wildlife species.

Cumulative Impacts on Terrestrial Wildlife

Species such as bighorn sheep, sage and sharp-tail grouse, turkey, peregrine falcon, and river otter, whose populations are currently declining, would benefit from new introductions and populations would stabilize or increase. The proposed habitat improvement projects, seasonal off-road vehicle closures, cooperative management areas, and additional access would provide long-term beneficial impacts to wildlife.

Theoretically, there would be a short-term 3 percent increase in big game populations on public land as a result of initial forage allocations. In the next 10 years, approximately 105,500 acres of vegetation would be manipulated. The allocation of the increased forage resulting from the wildlife projects would mean a 20 percent increase to existing big game populations, but it would be 6 percent short of meeting the Colorado Division of Wildlife goals. Small game and nongame species composition and numbers would vary locally, but no significant long-term changes would occur because of

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the great habitat diversity offered by public and private lands in the resource area.

An estimated 8 percent of the big game crucial winter range occurring on private land may be lost to development in the next 10 years. An additional 6,790 acres (3 percent) of the big game crucial winter range occurring on public land would be lost through land tenure disposals.

In the next 10 years, an overall 9 percent increase in existing big game populations would occur. This would still be 9 percent short of meeting the Colorado Division of Wildlife goals. This means an overall increase in hunting and viewing opportunities and, consequently, an increase in business to those establishments such as restaurants, motels, sporting goods stores, and gas stations. See Impacts on Social and Economic Conditions for additional impacts to local communities.

IMPACTS ON LIVESTOCK GRAZING

Impacts from Proposed Management Actions

Impacts from Livestock Grazing Management. The initial allocation of 31,399 animal-unit months (AUMs) would result in a 17 percent reduction in existing livestock use. Forage increases accrued through vegetation manipulation practices would result in a final allocation of 56,885 AUMs providing for a 50 percent increase in livestock use. With the increase in AUMs from manipulation, the total AUMs provided would still remain 23 percent short of meeting the total livestock preference objective of 73,868 AUMs. Table 5-15 shows this information by capability unit.

TABLE 5-15. RELATION OF LIVESTOCK FORAGE ALLOCATION TO EXISTING USE AND ALTERNATIVE OBJECTIVE

Capability Unit	Initial Allocation (AUMs)	Percent Change from Existing Use	Projected Allocation (AUMs)	Percent Change from Existing Use	Percent of Objective Met
Garfield.....	14,637	-18	32,018	+80	74
Roaring Fork.....	3,731	-12	7,734	+83	83
Eagle-Vail.....	3,411	-7	4,067	+11	71
Castle Peak.....	8,041	0	9,577	+19	97
King Mountain.....	1,579	-61	3,489	-13	60
Total	31,399	-17	56,885	+50	77

The short-term impact from initial allocation would be a substantial reduction in livestock numbers on most allotments requiring operators to buy, lease, or develop 2,538 AUMs of forage. Reduction levels would vary by allotment and be greatest on lower elevation allotments encompassing crucial wildlife winter range. Spring range is critical to livestock operations and any reductions in spring range would be highly significant to individual operators. The long-term impacts of the projected allocation would be moderate to substantial increases from the existing situation except in the King Mountain Capability Unit. These increases would not be used on spring-fall range where the operator moves to the national forest for summer grazing if that permit is limiting. The King Mountain Capability Unit would have overall long-term reductions varying by allotment but averaging 13 percent. This would require affected operators to permanently reduce herd size or acquire an additional 539 AUMs of forage.

Range improvements, including vegetation manipulation, would improve livestock distribution, reduce livestock concentrations, and provide for more even use of forage. This would help to maintain those allotments in satisfactory range condition and improve those in unsatisfactory range condition. Improved range condition would increase forage quantity and quality thereby increasing the potential for improved livestock production.

Impacts from Water Yield Management. Converting mountain brush and trees to grass would benefit livestock through the additional forage that would be available in the long term. The 2-year restriction on livestock grazing would be more of an impact to management of livestock (how to keep them off the treated land) than the AUMs foregone.

Any increase in duration of flow of streams or springs for late season livestock use would be beneficial.

Impacts from Critical Watershed Areas. All or portions of five allotments occur in debris flow hazard zones. Limiting these allotments to light use (approximately 30 percent utilization) would not significantly impact the permittees. Data indicates enough forage production is available on the allotments to graze at this level and meet AUM objectives.

Impacts from Aquatic Habitat Management. The amount of forage and water excluded from livestock use by riparian vegetation enclosures would be insignificant and thus would not impact livestock grazing.

Impacts from Terrestrial Habitat Management. The Basalt land exchange with the Colorado Division of Wildlife would have potential adverse impact on one operator with 72 AUMs preference if

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the Colorado Division of Wildlife excludes livestock grazing. The Garfield Creek cooperative management with the Colorado Division of Wildlife would have no significant impact if livestock grazing continues at the level proposed. There would probably be no significant impact from bighorn sheep introductions on the Hogback. Vegetation manipulation would provide long-term benefits to livestock by increasing the amount of available forage. Though most of the increased forage developed for wildlife would accrue to wildlife, some would be available for livestock. The short-term impact (2 years) of keeping livestock off the vegetation treatment areas would depend on the size of the area treated and control of the stock.

Impacts from Forest Management. Slight to moderate beneficial impacts would result from woodland management where livestock forage production and animal distribution would be increased with the removal of pinyon-juniper. The exact extent of the beneficial impacts cannot be determined until management areas and sizes are determined.

Impacts from Wilderness Resource Management. Designation of 330 acres of Eagle Mountain as wilderness would have no significant impact on allotment 8402. The majority of usable grazing area is outside of the area. Designation of 3,360 acres of Hack Lake as wilderness would preclude vegetation manipulation in allotments 8632 and 8634 eliminating the potential to provide 120 AUMs which would be moderately significant for those allotments. Designation of 15,000 acres of Bull Gulch as wilderness would limit vegetation manipulation and potential increases forage production in allotment 8642, which would be moderately significant for that allotment. Designation of 11,940 acres in Castle Peak as wilderness would have no impacts on vegetation manipulation. Wilderness management plans would identify restrictions, if any, that would be placed on livestock management such as motor access for range improvement maintenance.

Impacts from Visual Resource Management. Visual resource management Class II objectives potentially would increase the costs of vegetation manipulation projects because of limitations on size, shape, location, and treatment methods resulting in low cost-benefit ratios. The extent of the adverse impacts cannot be determined until site-specific locations and needs are determined.

Impacts from Land Tenure Adjustments. Any reduction in acreage within allotments resulting from land disposals would adversely affect livestock operators. Reductions in spring livestock range would be most critical. Land disposals would involve approximately 6,800 acres and 1,026 AUMs on 29 allotments.

Impacts from Utility and Communication Facility Management. An insignificant beneficial impact of increased forage availability would result from reseeding rights-of-way through woodland or shrubland, and from improved livestock movement along right-of-way routes.

Impacts from Fire Management. The impacts of fire management would be highly beneficial. Using wildfire to manipulate shrubland and woodland would increase livestock forage availability. The identification of areas for fire management around expensive range improvements helps limit potential fire losses. The extent of beneficial impacts cannot be determined until specific fire management plans are prepared.

Cumulative Impacts on Livestock Grazing

Significant beneficial impacts would result from vegetation manipulation through livestock grazing, water yield, forest, terrestrial habitat, and fire management, increasing forage availability for livestock. Over the 10-year implementation period, vegetation manipulation of at least 51,952 acres would provide an additional 25,486 AUMs. This is approximately a 50 percent increase in AUMs above existing livestock use. Only 77 percent of this alternative's objective for AUMs would be achieved, however.

The major adverse impacts resulting from loss of AUMs or potential for forage production would be from land tenure adjustments and wilderness designation of Hack Lake and Bull Gulch. These actions would be significant to less than 10 percent of the total allotments.

The forage allocation objective of this alternative is to satisfy the Colorado Division of Wildlife goals first and then livestock goals. This is one of the limiting factors in not achieving livestock objectives in numbers of AUMs. The other is lack of potential for increased forage in the allotments where it is most needed.

IMPACTS ON VEGETATION

Impacts from Proposed Management Actions

Management actions that would not result in conversions generally would have insignificant impacts on vegetation because large scale vegetation changes would not occur. Management actions such as clearcutting and vegetation manipulation for increased water yield, livestock, and wildlife forage production would reduce ground cover and disturb soils, resulting in localized adverse impacts.

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The localized significance of vegetation manipulations would be reduced by the 10-year implementation schedule, project dispersion throughout the resource area, and standard design features (Appendix B) for project implementation. Harvesting forest land and manipulating vegetation, as proposed by water yield, livestock grazing, terrestrial habitat, and forest management, would result in the following annual vegetation disturbances:

Productive Forest Land Management—261 acres

Woodland Management—480 acres

Livestock Grazing Management—5,195 acres

Terrestrial Habitat Management—2,341 acres

Water Yield Management—5,236 acres

The acreage shown for productive forest land and woodland management is based on harvest level 1 allowable cut converted to acres. The annual acreage shown for livestock grazing, terrestrial habitat, and water yield management is 10 percent of the total proposed.

The figures shown are proposed by each resource management; however, in some cases, acreages proposed for management overlap and therefore cannot be totalled. For example, cutting firewood in pinyon-juniper would also meet livestock or wildlife needs for increased forage; likewise, oakbrush removal for additional forage could help increase water yield.

Site-specific impacts of vegetation changes are discussed under the resource affected. For example, the impacts of brush control on wildlife are discussed under Impacts on Terrestrial Wildlife.

Modifying mountain shrub, sagebrush, pinyon-juniper, and forest vegetation types in relative amounts indicated above for 10 years would not significantly affect vegetation types in the resource area. This is because of the tremendous variety of types and species diversity present since the resource area lies in the transition zone between two distinctly different physiographic regions—the Colorado Plateau and Southern Rocky Mountains.

No adverse impacts would occur to known occurrences of threatened or endangered plant species from any management action that has identified a site-specific project location. Threatened, endangered, or sensitive plant species would be protected from adverse impacts of management actions through activity plans and environmental assessments when specific site locations are identified.

Cumulative Impacts on Vegetation

Cumulative impacts on vegetation would be the same as those discussed under Impacts from Proposed Management Actions.

IMPACTS ON FORESTRY

Impacts from Proposed Management Actions

Impacts from Forest Management. Managing 7,175 acres of productive forest land and 45,130 acres of woodland (harvest level 1) would result in a potential annual allowable harvest of .7 million board feet and 2,650 cords, respectively.

Managing 40,370 acres of productive forest land and 91,680 acres of woodland (harvest level 2) would result in a potential annual allowable harvest of 4 million board feet and 4,330 cords, respectively.

Harvest practices such as clearcutting, shelterwood cutting, selective cutting, and commercial thinning would increase stand productivity thereby increasing revenues and improving wildlife habitat.

Forest development practices such as thinnings and plantings would increase vigor and growth in managed forest stands and thus increase forest production potential. Actual increased production is unknown but is considered significant because it would decrease disease and pest incidence in these stands.

Acquiring legal access into presently inaccessible forest stands would open these areas to public land management.

Impacts from Critical Watershed Areas. Closing 525 acres of woodland in municipal watersheds and 655 acres of woodland in severe debris flow hazard zones would remove a total of 1,180 acres from the total woodland base of 189,500 acres. When compared with the total base, this loss would be insignificant.

Impacts from Livestock Grazing and Terrestrial Habitat Management. Chaining and burning in the pinyon-juniper forest type would conflict with woodland management objectives for fuelwood sales. The impact area is unknown because the livestock grazing management objectives for chaining and burning cover other vegetation types. Woodland species would take 40 years to regenerate after chaining and over 60 years to regenerate after burning. This loss would be considerable, especially if a high degree of vegetation manipulation occurred on forest land suitable for forest management.

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Minor beneficial impacts would be gained from chaining practices, such as increasing the amount of fuelwood that could be offered for sale.

Construction of fences and water pipeline projects would destroy an insignificant available supply of forest land.

Increased livestock numbers would increase damage to forest regeneration. Generally, such damage is insignificant. Exceptions would be where high-valued productive forest land reforestation at proper stocking levels would be a requirement. Added reforestation cost would result if grazing were allowed in these stands. Suspension of grazing or fencing in these areas (an average of 250 acres annually) would reduce potential adverse impacts.

Seeding and fertilizing on forest land to promote understory browse species would create added competition for moisture and nutrients, potentially reducing forest growth. The impact is considered insignificant.

Restricting motorized vehicle travel in forested big game crucial winter ranges and during elk calving season would increase logging costs. These added costs could be reduced by extending contract periods to compensate for expected lost harvest time, thus reducing the impacts significantly.

Impacts from Recreation Resource Management. Designating the Thompson Creek area as a natural environment area and prohibiting harvesting within Deep Canyon would reduce the forest land base by 560 acres and 80 acres, respectively. This loss would be relatively insignificant because the forest land lost is neither readily accessible nor economically harvestable.

Designation of recreation sites would result in a loss of 25 acres of forest land. This loss also would be insignificant. Less preferred harvest methods would be implemented adjacent to such recreation sites; however, the few acres impacted would not have a significant impact on the forest land base.

The designation of approximately 35,100 acres for semi-primitive non-motorized recreation throughout the resource area would have a slight affect on the forestry program. On Sunlight Peak, restrictions placed on harvesting and road building would make harvesting economically marginal on 2,000 acres. Other forest land in areas designated semi-primitive non-motorized would be lost from the productive forest base, resulting in a reduction of approximately 1,000 acres. Approximately 10,000 acres are woodlands in the Bull Gulch area. However, the Bull Gulch area has rough terrain and no suitable access.

Restrictions on road construction in forest areas designated semi-primitive motorized would increase harvesting costs, which would be a minor impact.

Designating Hack Lake as a recreation management area would reduce the forest base by approximately 3,456 acres. Of this lost acreage, 1,800 acres are commercial forest land supporting an estimated 9.3 million board-feet of spruce-fir and 1,656 acres are noncommercial forest land supporting aspen. Loss of acreage and volume from the forest base is considerable. However, the lack of physical access to the area creates a marginal forest sales program for Hack Lake reducing the significance of the adverse impact.

Designating Eagle Mountain, Castle Peak, Hack Lake, and Bull Gulch as wilderness would result in a loss of approximately 15,000 acres. Of this total, 8,500 acres are on Castle Peak and represent approximately 55 million board feet of commercial sawtimber. This loss of forest base would be very significant considering the timber condition, marketability, and contribution to the allowable cut. The loss of Bull Gulch, Hack Lake, and Eagle Mountain is relatively insignificant for previously discussed reasons.

Impacts from Visual Resource Management. The designation of Bull Gulch and Deep Creek as visual areas of critical environmental concern would result in a loss of 6,350 acres of forest land. This loss would be minimal as most of this forest is unsuitable for management.

Visual resource management Class II designations would occur on 45 percent of forest land. The impact would be moderate. Stipulations placed on harvesting in these Class II areas would be undesirable.

Class III designations would occur on 15 percent of forest land. The impacts would be slight as stipulations placed on harvesting would be less severe under this class.

Impacts from Land Tenure Adjustments. Disposal zones would affect 4,235 acres of forest land. The overall affect would be minimal, although loss of forest or woodland products may be important in localized areas.

Impacts from Off-Road Vehicle Management. Off-road vehicle (ORV) limitations proposed by critical watershed, recreation and wildlife management would impact forest management to a moderate degree. An estimated 2,500 acres would be affected by ORV limitations. Limitations would increase the already major problem of limited access to public land, especially important to the fuelwood sale program. Closing roads or limiting use to existing or designated trails and roads would slightly

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affect fuelwood collection. Such limitations, however, would help control wood trespass.

Seasonal limitations (see Impacts from Terrestrial Habitat Management) would affect forest product sales as well as harvesting times and costs. These impacts would have the greatest impacts on fuelwood cutters and gatherers.

Impacts from Transportation Management. Any development of roads (upgrading, new construction, easement acquisitions) would greatly benefit forest management by reducing the cost of timber sales and administrative work in the forest management program.

Impacts from Fire Management. Fire exclusion areas would provide the forest land a certain degree of insurance against major disasters. Buildups of forest fuels are inevitable. However, managing fires within fire management areas would reduce forest fuels and thereby competitive vegetation, increasing forest growth and productivity.

Cumulative Impacts on Forestry

By intensively managing forest lands, productivity and revenues would increase. Overall health and vigor of stands would be improved, and disease and insect problems would generally be reduced. In the long term (200 or more years for productive forest land), the annual allowable harvest would increase.

Designating fire management areas would reduce fuel buildups, competitive vegetation and wildfire risks and improve forest growth and productivity. Designating fire exclusion zones would reduce timber losses from wildfire.

Approximately 52,305 acres of forest land or 66 percent of the total existing resource area forest base would be managed under harvest level 1. This management would provide an annual allowable harvest of 0.7 million board feet of timber and 2,650 cords of fuelwood. This annual harvest rate is expected to meet the demand for wood products for the next 10 years.

Approximately 132,050 acres of forest land or 51 percent of the total potential resource area forest base would be managed under harvest level 2. This management would provide an annual allowable harvest of 4 million board feet of timber and 4,330 cords of fuelwood. This annual harvest rate is expected to exceed the demand for wood products for the next 10 years.

IMPACTS ON RECREATION RESOURCES

Impacts from Proposed Management Actions

Impacts from Recreation Resource Management. Because existing recreation opportunity spectrum (ROS) settings and recreation opportunities would be maintained on approximately 480,741 acres (85 percent) in the resource area, a variety of settings would remain available.

All primitive and semi-primitive non-motorized ROS settings (35,107 acres) would be protected by off-road vehicle (ORV) closures and limitations that would prevent conflicts between non-motorized and motorized activities. Recreation designations, withdrawals from mineral entry, and prohibition of mineral leasing and mineral sales would further protect ROS settings and unique and fragile resource values in Thompson Creek (4,286 acres) and Deep Creek (2,470 acres). The semi-primitive non-motorized setting and identified resource values in the Hack Lake area would also receive additional protection by the recreation lands designation (3,456 acres) and the associated no surface facilities stipulation on mineral leasing and prohibition of mineral sales. Maintenance of existing developed recreational facilities would prevent deterioration of these sites. The development of 13 additional facilities would accommodate existing recreational use occurring at the sites, prevent deterioration of the sites caused by use, and reduce existing visitor safety and health problems. The development of a river access site and 6 primitive use sites along the upper Colorado River would be the most significant benefits because this area receives the most intensive recreation use in the resource area.

Impacts from Water Quality Management. Improvement in water quality would benefit aquatic habitat by decreasing sedimentation and salinity. The effects of aquatic habitat improvement on recreation are discussed in the aquatic habitat management section.

Impacts from Water Yield Management. Increases in water yield in the Garfield Capability Unit would help improve aquatic habitat by potentially increasing stream flows. The effects of aquatic habitat improvement on recreation are discussed in the aquatic habitat management section.

Impacts from Critical Watershed Areas. ORV limitations in critical watershed areas would have adverse impacts on motorcycle and four-wheel drive use. Although the affected areas are generally near population centers, thus potentially increasing the significance, the overall adverse effect is low

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because ORV use on public land is a very small percentage of the total use in the region.

Impacts from Aquatic Habitat Management. Improving 90 miles of aquatic habitat would increase fish populations and could enhance fishing opportunities by increasing the fishing success ratio. However, the effect cannot be quantified since fishing success is only one of several factors that affect a fishing experience.

Designating Hack Lake as an area of critical environmental concern (ACEC) would protect habitat for the state listed threatened Colorado River cut-throat trout, one of the resource values identified within the proposed Hack Lake Recreation Lands.

Impacts from Livestock Grazing Management. Vegetation manipulations by livestock grazing and terrestrial habitat management and timber harvesting would result in concentrations of vegetation and surface disturbances inconsistent with management objectives for the existing semi-primitive motorized ROS class and result in changes to the roaded natural class. The impacts are quantified in the cumulative impacts section for this alternative.

Impacts from Terrestrial Habitat Management. Manipulating 2,341 acres of vegetation per year would increase big game populations and could enhance hunting opportunities by increasing the hunting success ratio. However, the effect cannot be quantified since hunting success is only one of several factors that affect a hunting experience. See Impacts on Livestock Grazing for adverse impacts of vegetation manipulations. Seasonal ORV limitations prohibiting snowmobile use would have low adverse impacts on such use in most of the resource area because of the low amount of use that presently occurs, but would have low to moderate impacts on snowmobile use in areas south of Parachute and Rifle and in the Basalt Mountain area. The impacts on these areas would be more significant because public land in these areas is used for access to adjacent national forest land where most of the snowmobile use occurs and this access would be reduced. The impacts of the limitations on motorcycle and four-wheel drive use would be minimal since use would be allowed on existing roads and trails.

Impacts from Wilderness Resource Management. Designating four wilderness study areas (Eagle Mountain, Hack Lake, Bull Gulch, and Castle Peak) totaling 30,630 acres as wilderness would help maintain existing semi-primitive non-motorized ROS settings and recreational opportunities in these areas. In addition, designating Bull Gulch (15,000 acres) and Hack Lake (3,360 acres) as wilderness would protect identified ecological, geological, cultural, and scenic values.

Impacts from Visual Resource Management. Designating 12,102 acres in Thompson Creek, Deep Creek, and Bull Gulch as ACECs and management under visual resource management (VRM) Class I objectives would provide additional protection of primitive and semi-primitive non-motorized settings and fragile and unique resource values. VRM Class II objectives would protect semi-primitive non-motorized settings in Hack Lake, Castle Peak, and the 2,452 acres of the Bull Gulch area outside of the proposed ACEC (upon designation as wilderness, these 3 areas would also be further protected by Class I objectives).

Impacts from Land Tenure Adjustments. The proposed disposals would have minimal to low adverse impacts on dispersed recreation opportunities, mainly hunting, because most of the tracts are small and many are currently inaccessible to the general public. Furthermore, the losses of opportunities would be offset by the increases in opportunities resulting from acquisitions of legal access (see Impacts on Transportation Management section).

Impacts from Transportation Management. Acquisition of private land near Twin Bridges on the upper Colorado River would allow development of a river access site that would be necessary to accommodate the existing and future levels of float-boating use and reduce trespass problems on private land.

Legal access acquisitions would accommodate existing levels of visitor use and expected future demand for all recreation activities, except that some fishable streams potentially would not be accessible to the general public. These access acquisitions would result in a moderate to high increase in visitor use throughout the resource area.

Impacts from Utility and Communication Facility Management. The unsuitable and sensitive zoning classifications would help protect all developed recreation sites, all primitive and semi-primitive non-motorized ROS classes, the proposed Thompson Creek natural environment area, and the entire upper Colorado River corridor between State Bridge and Dotsero by either precluding construction of such facilities or identifying areas where restrictive stipulations would be applied to reduce the impacts.

Impacts from Fire Management. Including all developed recreation sites in the fire exclusion zones would help protect the sites from wildfire and decrease fire hazards to recreational users.

Cumulative Impacts on Recreation Resources

Existing ROS settings and recreation opportunities would be maintained on approximately 85 per-

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cent of the resource area. Thus, a variety of settings would remain available.

Recreation designations, withdrawals, ORV closures and limitations, VRM objectives, and designation of ACECs, zoning for utilities and communication facilities, and wilderness designation would protect all primitive and semi-primitive non-motorized ROS classes and unique and fragile resource values in Thompson Creek, Deep Creek, and Bull Gulch. Maintenance of existing developed recreational facilities would prevent deterioration of these sites. The development of 13 additional facilities would accommodate and prevent resource deterioration caused by existing recreation use.

Management under this alternative would accommodate existing levels of recreation use. Access acquisitions to currently inaccessible public land would provide for future recreation demands for all activities. The acquisitions would result in moderate to high increases in recreational use throughout the resource area.

Concentrations of vegetation manipulations and timber harvesting would cause changes in 85,301 acres from the existing semi-primitive motorized ROS class to the roaded natural class. Additional impacts to the physical settings could occur since any future proposals would be subject to the less restrictive management objectives for the roaded natural class. The overall effects of the changes in class would be low as approximately 223,000 acres of public lands in the resource area would remain in the semi-primitive motorized class. Thus, an ample supply of semi-primitive motorized recreation opportunities would remain available in the region and a variety of opportunities would also be available. Although legal access acquisitions would provide additional public land to meet future recreation demands, no facilities would be provided in the new use areas that would be created by the access acquisitions and could result in resource deterioration in these new use areas. Maintenance of the existing ROS classes in Thompson Creek would not allow changes in setting opportunities and management objectives that would be more appropriate with use of the area for environmental education. Lack of additional legal access would also restrict full use of Thompson Creek by the public.

IMPACTS ON SOCIAL AND ECONOMIC CONDITIONS

Impacts from Proposed Management Actions

Impacts from Water Quality Management. Efforts to monitor and address water quality problems might have some marginal economic and social

impact. The quality of recreation use of water might be improved and water treatment costs could be slightly lowered.

Impacts from Water Yield Management. Demand for water locally and throughout the western United States promises to continue to grow. An anticipated increase in water yield of 6,910 to 9,400 acre feet, equivalent to about 2 percent of annual use in the Colorado portion of the Colorado River drainage, would yield positive economic and social benefits.

Impacts from Critical Watershed Areas. Municipal watershed protection should result in lower water treatment costs. Reduced debris flow would prevent property loss or damage to private landowners. Off-Road vehicle restrictions in erosion hazard areas would reduce sediment yield and prolong the useful life of downstream retention or diversion structures resulting in marginal economic benefits.

Impacts from Aquatic Habitat Management. Improved Aquatic habitat and higher fish populations would increase the probability of catching fish which would improve the quality of the fishing experience with positive economic and social results.

Impacts from Livestock Grazing Management. Estimated economic impacts of proposed forage allocation are shown on Table 5-16. The initial forage allocation would reduce livestock forage available from public land by 6,310 animal-unit months (AUMs), 17 percent less than current usage. The resultant decline in total gross revenue of \$208,858 amounts to about 1 percent of the current annual total. Net revenue (personal income) would decrease \$136,766. The direct reduction in hired employment would be equivalent to 2 man-years.

These changes would not significantly affect the local economy but individual ranchers may be significantly affected. One-hundred and three of the 168 permit and lease holders would receive initial allocations less than their current use. Eleven of those would have resultant gross revenues 10 to 20 percent less than current levels. Four would have gross revenues more than 20 percent less than current levels. Fifty-nine operators would get forage increases, six with resultant revenue increases between 10 and 20 percent, two greater than 20 percent. Six operators would receive the same allocation.

While the methodology used to assess income effects does not enable the evaluation of specific ranching operations, estimates of changes in average revenue by ranch size can be made (see Appendix J, Table 2). They suggest that a number of ranches would be placed in situations of economic stress by proposed forage reductions. This would

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TABLE 5-16. INCOME EFFECTS OF CHANGES IN FORAGE ALLOCATION

	Number of Ranches	Change in Forage Allocation (AUMs)		Change in Gross Revenue (dollars)		Change in Net Revenue (dollars)	
		Total	Average	Total	Average	Total	Average
Initial Allocation							
Reductions.....	103	-11,224	-109	-356,470	-3,480	-222,866	-2,164
Increases.....	59	+4,914	+83	+149,612	+2,536	+86,100	+1,459
Net.....	162	-6,310	-39	-208,858	-1,289	-136,766	-844
Potential Allocation							
Reductions.....	36	-2,386	-66	-71,309	-1,389	-42,673	-1,185
Increases.....	117	+21,580	+184	+894,833	+5,939	+435,326	+3,721
Net.....	153	+19,194	+125	+623,524	+4,075	+392,653	+2,566

be especially true for small to mid-size ranches and those with a greater dependence on forage from public land. For all ranches receiving reductions in allocation, net revenue would decline an average of \$2,164, 20 percent of the current average net revenue. By ranch size, average net revenue reductions could be as great as \$5,843 or as much as 37 percent of current levels.

A smaller number of ranchers (59) would receive forage increases, but their individual gain could be significant with an average net revenue increase of \$1,459, 13 percent above the current average. This would particularly be the case with several moderately large cattle ranches whose average net revenue increase would equal \$6,006, 39 percent of the current average for that size.

To the extent that ranchers and their families would economically stressed, their social well-being and quality of life may also be adversely affected. In addition, such economic stress could have an unmeasurable but adverse effect on other social and economic sectors where ranching and its way of life are valued for the economic diversity and unique character they provide the area.

Adverse impacts would be mitigated by several factors. No forage reductions would take place until monitoring had verified the need for such reductions. This monitoring would provide a transition period during which alternative forage or income sources could be sought, perhaps thus avoiding the full impacts of forage reductions.

In addition, many grazing allotments have the potential for increased forage production following implementation of forage improvement projects. In the long term, such projects would increase forage available to holders of permits and leases by 50 percent, 19,194 AUMs. This would increase gross revenue by \$623,524, a 3 percent increase, and

would improve net revenue by 23 percent, \$2,566 per operation.

Impacts from Terrestrial Habitat Management. Forage allocated to big game would increase by 20 percent in the long term. However, big game forage would be lost in some areas due to residential and commercial development of private land and public land that had been sold. The net impact would be a 9 percent increase in forage available to big game.

This increase in forage supply would translate into directly proportional increments in deer and elk populations and in recreational activities associated with big game. Local expenditures in support of big game recreational activities would increase \$1.332 million from the current \$14.8 million. Employment would increase by 98 man-years. Personal income in the resource area would increase by \$672,000. This is less than 1 percent of the area's current total personal income, but much of it would occur during the fall, a traditionally slow economic period.

The social well-being and quality of life of some area residents would improve marginally due to the increased income and the greater ease with which big game recreational activities could be pursued.

Access recommendations under this proposal could result in some increase in hunter use of public land. To the extent this encourages more hunting activity in the resource area, economic benefits would accrue. However, much of the increased access would simply bring about movement of hunters from other parts of the resource area. Access to or through public land would also diminish somewhat the income of those who charge gate fees for access through their property.

Impacts from Forest Management.

Harvest level 1 would supply .7 million board feet of sawtimber and 2,650 cords of fuelwood annually

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which would yield \$45,000 in government revenue. Half of the fuelwood would be sold later by commercial cutters and all of the timber would be manufactured and sold as lumber, together generating sales of \$460,000 per year. This is about 5 percent of current wood product sales generated by BLM and the U. S. Forest Service in the area. Direct and indirect growth of \$174,000 in personal income and 16 man-years of employment would result from the sales. Much of it would occur outside the resource area, however.

Sales of 1,325 cords of wood to individuals would help offset residential energy costs as well as provide an opportunity for people to socialize and recreate with friends and family.

The four million board feet of sawtimber that harvest level 2 would make available annually would exceed demand by 1 million board feet. The sale of 3 million board feet, however, and 4,330 cords of fuelwood would yield \$120,000 in federal revenue annually. Half of the fuelwood would be resold later by commercial cutters. Together with the manufacture and sale of 3 million board feet of timber, local sales of \$1,050,000 would be generated, about 10 percent of current wood products sales generated in the area through BLM and the U. S. Forest Service. Personal income of \$398,000 and 37 additional man-years of employment would be generated, although much of the impact would occur outside the resource area.

Sales of 2,165 cords of fuelwood to the public would help offset residential energy costs and would provide an additional social and recreational outlet.

Impacts from Recreation Resource Management. The local economic and social impacts of recreation management activities would be minimal. Increased numbers of recreation facilities would improve the quality and hence the value of recreational experiences.

Impacts from Wilderness Resource Management. The designation of all wilderness study areas (WSAs) as suitable for wilderness removes from exploration and development only low potential mineral values. There would be little increase in wilderness recreation use because any use in the BLM areas would most likely be displaced use from already existing Forest Service wilderness areas. About 67 million board feet of commercial timber (a potential annual harvest of 555 thousand board feet annually) would be removed from area timber supply with marginal economic impact. Potential increases in livestock forage would be eliminated since vegetative manipulations would be precluded in the WSAs but the adverse economic impact would be minimal.

Impacts from Land Tenure Adjustments. This alternative would add 9,555 acres to the private land base of the resource area, an increase of just over 1 percent. That amount is unlikely to have a significant effect on the price of other undeveloped land, except on some nearby or adjacent properties. Adjacent or nearby landowners would in some instances be adversely affected if a public land parcel is available as an alternative to property they have offered for sale. They also may be beneficiaries, however, as prospective purchasers of nearby parcels that had previously been unavailable to them.

Some increase in BLM-administrative costs could be required to deal with increased sales activity. However, clarification of the disposal status of public land in the resource area would contribute toward reduced costs for both BLM and applicants.

Sales revenue would be as much as \$9.5 million, based on estimated sales prices of \$200 to \$1,000 per acre. Receipts would go to the federal treasury. Local jurisdictions would benefit from increased property tax revenues although their administrative costs would be increased by additions to the private land base.

The proposed sale and exchange tracts include 6,790 acres of crucial big game winter range. The average value of such land in the resource area has been estimated at \$176 to \$725 per acre of crucial winter range (see Existing Management Situation, Wildlife, available for review at the Glenwood Springs Resource Area office). If, after disposal, that land is developed and lost forage is not replaced, adverse economic impacts would be felt. The economic analysis of the terrestrial habitat management proposals assumes such a loss. The tracts also include land with 1,026 AUMs of livestock forage which could be transferred to private ownership and potentially lost as productive rangeland.

Cumulative Impacts on Social and Economic Conditions

Table 5-17 shows the cumulative annual impacts of proposed management actions on personal income and employment. Net changes for both are less than one percent of current resource area totals but individuals or certain groups may be significantly affected. Other proposed management actions would not have measurable economic impacts. Area population and the provision of public and social services would not be significantly affected.

The impacts from terrestrial habitat and forest management would endure over the long term. The

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TABLE 5-17. CUMULATIVE IMPACTS ON PERSONAL INCOME AND EMPLOYMENT

Management Activity	Change Agent	Change in Personal Income (\$1,000)	Change in Employment (man- years)
Livestock Grazing	-6,310 AUMs	-296	-6
Wildlife Habitat	+9 percent	+672	+98
Forest Land	+2,025 to 6,165*	+174 to 398	+16 to 37
Net Change		+550 to 774	+108 to 129

*In thousand board feet.

livestock grazing management impacts would be short term but were included here because it would be the short-term allocation decisions which might be decisive to individual ranchers.

Social well-being and quality of life would be most likely to be affected under the livestock grazing management proposals.

IMPACTS ON CULTURAL RESOURCES

Impacts from Proposed Management Actions

Impacts from Cultural Resource Management. Designation of the Blue Hill Archaeological District as an area of critical environmental concern and nomination to the *National Register of Historic Places* would help protect significant cultural resources and provide additional information about the prehistoric culture.

Actively managing high value cultural sites would substantially decrease the number of sites lost and would slow or prevent deterioration of the values present. Establishing and maintaining accurate and complete data about these sites would also significantly add to our knowledge of these past cultures.

Cultural resource inventories conducted for all surface-disturbing activities would result in increased information about the local cultural resources and thus contribute to our knowledge of the past.

No significant adverse impacts would occur from managing the high value sites or from protecting the Blue Hill Archaeological District.

Impacts from Livestock Grazing Management. Livestock grazing would result in cultural resource loss or damage as a result of livestock trampling and rubbing. However, present information indicates these impacts would be insignificant because most sites are not susceptible to these impacts.

Cumulative Impacts on Cultural Resources

Cumulative impacts would be the same as those presented under Proposed Management Actions.

PALEONTOLOGICAL RESOURCES

Impacts from Proposed Management Actions

Proposed management actions would not adversely affect paleontological resources. Required paleontological resource clearances in Class 1 areas with a high probability of fossil occurrence would prevent the accidental destruction of any fossils present.

Required paleontological resource clearances would result in beneficial impacts. Information would be collected about local paleontological resources. However, little information would be collected, as few projects are proposed in high occurrence areas.

Cumulative Impacts on Paleontological Resources

Cumulative impacts would be the same as those presented under Proposed Management Actions.

IMPACTS ON WILDERNESS VALUES

Impacts from Proposed Management Actions

Impacts from Wilderness Resource Management. Designating all four wilderness study areas (WSAs) (30,630 acres) as wilderness would have long-term beneficial impacts to wilderness values by providing additional protection and permitting the natural ecological processes to continue. Protecting wilderness values would in turn benefit related supplemental values such as wildlife, geological, ecological, and scenic values. Diversity in the local wilderness supply would increase by designation of

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the Bull Gulch WSA, as its ecosystem type is not currently represented locally.

Transferring administration of the Eagle Mountain and Hack Lake WSAs to the U. S. Forest Service would provide consistent management with the existing adjacent wildernesses.

Since all four wilderness study areas would be designated, no adverse impacts would occur to wilderness values.

Impacts from Aquatic Habitat Management. Designation of Hack Lake as an area of critical environmental concern (ACEC) and habitat improvement would protect habitat for the Colorado River cutthroat trout, a state-threatened species, and one of the supplemental values of the wilderness study area.

Impacts from Recreation Resource Management. Management objectives for the semi-primitive non-motorized recreation opportunity spectrum classes in the Hack Lake, Bull Gulch, and Castle Peak WSAs would help maintain the primitive recreation opportunities. The off-road vehicle closures in the semi-primitive non-motorized zones would prevent conflicts between non-motorized and motorized types of recreation; however, motorized use would be prohibited upon designation of the WSAs as wilderness.

Impacts from Visual Resource Management. Designation of 6,714 acres within the Bull Gulch WSA as an ACEC and management under visual resource management (VRM) Class I objectives would provide additional protection of the area's visual quality. All four WSAs would be managed under VRM Class I objectives upon designation as wilderness.

Impacts from Utility and Communication Facility Management. Zoning the four WSAs as unsuitable for utility and communication facilities would protect the naturalness of the environment.

Cumulative Impacts on Wilderness Values

Wilderness values would be preserved in all 30,630 acres in the Eagle Mountain, Hack Lake, Bull Gulch, and Castle Peak WSAs. Preservation of wilderness values would in turn protect related supplemental values including wildlife, geological, ecological, cultural, and scenic values. Diversity in the local wilderness supply would be increased by designation of the Bull Gulch WSA since its ecosystem type is not currently represented locally.

Since all WSAs would be designated, there would be no adverse impacts on wilderness values in this alternative.

IMPACTS ON VISUAL RESOURCES

Impacts from Proposed Management Actions

Impacts from Visual Resource Management. Existing visual quality throughout the resource area would be maintained, or improved by rehabilitation of the nine specific cultural modifications that have been identified as having rehabilitation potential. Rehabilitation of eight sites would reduce their visual contrast to conform with the visual resource management (VRM) objective for the class in which each is located. Rehabilitation of the old burn south of Battlement Mesa would result in a change of 173 acres from VRM Class V to Class IV. Rehabilitation of the off-road vehicle (ORV) areas near Gypsum and Eagle would be the most significant since both areas are within the viewshed of Interstate 70.

Designation of 12,102 acres in the Thompson Creek, Bull Gulch, and Deep Creek areas as areas of critical environmental concern (ACECs) and management under Class I objectives would provide additional protection of the visual qualities of these areas.

Impacts from Critical Watershed Areas. The ORV limitations would help maintain visual quality in the restricted areas by reducing degradation from ORV use. The debris flow area near Glenwood Springs and the ORV areas near Gypsum and Eagle would be the most significant since these areas are within the viewshed of Interstate 70 and the limitations would be necessary for successful rehabilitation of the ORV areas.

Impacts from Recreation Resource Management. Management objectives for the primitive and semi-primitive non-motorized recreation opportunity spectrum (ROS) classes would help maintain visual quality. The three proposed ACECs and Class A scenic quality areas on Castle Peak and Hack Lake are within these ROS classes. ORV closures and limitations in the above areas would also help maintain visual quality.

Impacts from Wilderness Resource Management. Designation of the four WSAs as wilderness would maintain the visual quality of these areas in a natural state. Designation of the Bull Gulch WSA would help protect the visual quality of the proposed ACEC.

Impacts from Utility and Communication Facility Management. The unsuitable classifications would protect visual quality by precluding construction of utility and communication facilities. The three proposed ACECs (12,102 acres) are included in this classification. The sensitive classification would protect visual quality by identifying areas

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where restrictive stipulations would be applied to mitigate the impacts of such facilities in conformance with VRM objectives.

Cumulative Impacts on Visual Resources

Visual quality throughout the resource area would be maintained, or improved by rehabilitation of cultural modifications. Designation of the three proposed ACECs and management under VRM Class I objectives would provide additional protection of the visual qualities of these areas.

IMPACTS ON TRANSPORTATION

Impacts from Proposed Management Actions

This alternative would provide greater access to public land. Traffic on roads and trails would increase as public access were obtained and road conditions improved. This would create some adverse impacts on the land itself due to resource degradation such as vandalism, littering, and off-road vehicle damage caused by the increased use.

The Resource Protection Alternative would help to preserve the transportation system. New access routes would be provided to areas where roads are substandard and cannot be maintained properly. Roads and trails that would be provided under this alternative would be high standard roads and could be maintained properly.

The resource programs proposing management actions on the lands identified for access would benefit as it would help them accomplish their management objectives.

Access proposed in this alternative would serve primarily large public land tracts with usually one way access. This would not provide the access that is demanded by the public in all cases and might not provide the access desired by all BLM resource programs. Only about 3 miles of public roads and 15 miles of public trail would be provided over the current situation.

Cumulative Impacts on Transportation

Cumulative impacts would be the same as those presented under Proposed Management Actions.

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IMPACTS ON AIR QUALITY

Impacts from Proposed Management Actions

Short-term localized impacts to air quality would result from mechanical and burning vegetation manipulations. These impacts would be small in scale and dispersed throughout the resource area. These factors combined with standard design features for vegetation manipulations would reduce the significance of the impacts.

Intensive development proposed under the Economic Development Alternative and anticipated regional growth and energy minerals development would result in commensurately higher levels of air pollution. Emissions from primary sources would be minimized through applicable policies, regulations, and statutes.

Cumulative Impacts on Air Quality

Cumulative impacts would be the same as those discussed under Impacts from Proposed Management Actions.

IMPACTS ON SOILS

Impacts from Proposed Management Actions

Impacts from Water Quality Management. Proposals for maintaining or improving water quality might benefit soils. For example, measures to reduce sediment could also reduce erosion and measures to protect riparian zones could also improve soil productivity in these areas. The actions that would be taken are not yet known; consequently, impacts cannot be quantified.

Impacts from Water Yield Management. The impacts on soils from water yield management would be similar to those expected from range and wildlife vegetation manipulation and from timber harvesting. The changes in erosion conditions expected from water yield vegetation manipulation on typical sites are indicated in Table 5-18.

In the short term, treatment of 50,590 acres of these vegetation types would increase soil loss in the range of 20,000 to 55,850 tons per year depending on whether mountain brush were mechanically manipulated or burned. These figures are de-

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TABLE 5-18. POTENTIAL SOIL LOSS FROM WATER YIELD TREATMENTS

(in tons per acre per year)

Vegetation Type	Present Erosion		Short-Term Erosion		Long-Term Erosion	
	Mechanical Treatment	Burning	Mechanical Treatment	Burning	Mechanical Treatment	Burning
Mountain Brush	4.5	4.5	6.8	10.8	1.1	1.1
Aspen	1.1	1.1	6.8	6.8	1.1	1.1
Conifer	1.1	1.1	6.8	6.8	1.1	1.1
Sagebrush	5.7	5.7	7.6	20.8	5.7	5.7

rived from implementation of ten percent of the total treatment each year during the 10-year implementation period. Sediment yield associated with these treatments is discussed in Impacts on Water Quality.

Impacts from Critical Watershed Areas. Minimizing surface disturbance in critical watershed areas would prevent an increase in erosion and probably would protect soil productivity.

Impacts from Minerals Management. Surface disturbance and spoil piles resulting from mine development and operation would cause short-term increases in erosion. Impacts would continue until rehabilitation measures were completed. Road construction would be one of the greatest impacts on soils from minerals management. The impacts of road construction on soils are discussed under Impacts from Forest Management.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Implementation of grazing systems would have long-term beneficial impacts on soils. Rest from livestock grazing during critical growing periods would improve plant vigor, reproduction, and litter accumulation and would increase the organic matter content in surface soils. This would cause beneficial changes in soil structure, permeability, porosity, and potentially the soils productivity. Impacts from rest rotation grazing would be greater than from deferred rotation grazing because in the former system at least one pasture would be rested annually through the entire year.

Mechanical vegetation manipulation would create localized short-term impacts to the soil resource. Disturbance caused by plowing or discing could increase the surface soil's permeability. Compaction caused by mechanical equipment would be short term and significant.

Burning would cause localized short-term impacts to the soil's physical, chemical, and biological properties primarily through the loss of ground cover and litter accumulation. The severity of the impact

would depend on the fuel type and the intensity of the fire. Burning might decrease soil infiltration rates in some soils which would result in accelerated erosion and the removal of some nutrients mineralized by the fire. After burning, concentrations of calcium and magnesium might be greater in the surface soils and the water-soluble potassium concentrates might be less. Total nitrogen could be lower in soils of the burned area, which would decrease soil productivity (BLM, Grand Junction Grazing EIS 1979). The overall effect on plant production would depend on the initial concentration of these nutrients in the sites selected for burning. This data is not known at present.

Loss of vegetation would increase evaporation rates from the soil (Shown, Lusby, and Branson 1972) resulting in reduced soil moisture content. This would retard seedling emergence and plant growth. Data is not available to predict the magnitude of these changes.

Soil erosion from wildlife and livestock vegetation manipulation would increase during the short term. Erosion would be greatest immediately following disturbance and would decline rapidly during the following 2 to 3 years with the establishment of new vegetation. Erosion would decline more slowly thereafter. In the long term, erosion would probably be less than current losses. This would be due to better livestock management and ground cover. Potential changes in soil erosion due to practices such as chaining, plowing, furrowing, brush beating, spraying, and burning are indicated in Table 5-19 for typical site conditions where treatments would be implemented.

The sediment yield impacts of range and wildlife treatment on approximately 70,630 acres of the three vegetation types mentioned above over a 10-year period are discussed under Impacts on Water Quality.

Impacts from Forest Management. The greatest impact to soils from forest management is the road construction associated with harvest oper-

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TABLE 5-19. SOIL LOSS FROM MECHANICAL TREATMENT AND BURNING

(in tons per acre per year)

Vegetation Type	Present Erosion		Short-Term Erosion		Long-Term Erosion	
	Mechanical Treatment	Burning Areas	Mechanical Treatment	Burning Areas	Mechanical Treatment	Burning Areas
	Segebrush	2.8	4.2	3.4	15.6	2.1	3.9
Mountain Brush.....	2.3	3.4	3.2	15.6	1.3	2.8
Pinon-Juniper	3.4	5.0	3.8	11.7	3.4	5.0

ations. Clearing and grubbing exposes the soil to accelerated erosion by various agents such as water, wind, and freeze/thaw cycle. Cut and fills cause adverse impacts by altering the natural drainage from hillsides, exposing underlying soils to weathering actions, and removing lateral support for adjacent material, potentially causing slumps or landslides to occur. Blasting may cause fractures or settling of the soil and an increase in erosion. Depending on soil material, newly constructed fills having slopes greater than 2:1 or 3:1 are subject to failure and may contribute to increased erosion and sedimentation until stabilized. Additional sediment yield from these sources would shorten the useful life of downstream dams or other water diversion or retention structures.

The types of cutting practice selected can also affect soil conditions. Clearcutting results in the greatest increase in soil loss per acre and also increases the potential for landslides on noncohesive soils. Thinning and selective cutting leave most of the ground cover intact and result in minimal soil exposure. Changes in erosion from harvest practices on typical sites in the resource area are indicated in Table 5-20.

The forest harvest under level 1 of 1.75 million board feet of sawtimber and 3,695 cords of fuelwood annually would disturb 592 to 1,322 acres and result in the loss of 3,200 to 5,230 tons of soil annually in the short term, depending on whether clearcutting or selective cutting were chosen as the preferred harvest method. In the long term, increases in ground cover in woodland areas would reduce soil losses by 295 to 736 tons annually below existing conditions.

The forest harvest under level 2 of 6.3 million board feet of sawtimber and 7,950 cords of fuelwood annually would disturb from 1,516 to 3,791 acres and result in an increase in soil loss of 15,070 to 24,400 tons annually depending on whether clearcutting or selective cutting were the preferred harvest method. In the long term, soil erosion would be reduced below the present condition

TABLE 5-20. EXPECTED SOIL LOSS FROM TIMBER HARVESTING

(In tons per acre per year)

	Present Erosion		Short-Term Erosion		Long-Term Erosion	
	Selective Cut Areas	Clear-cut Areas	Selective Cut Areas	Clear-cut Areas	Selective Cut Areas	Clear-cut Areas
Productive Forest Land						
Less than 40 percent slope	1.1	1.1	4.5	6.8	1.1	1.1
More than 40 percent slope	2.9	2.9	11.3	17.2	2.9	2.9
Woodland						
Less than 40 percent slope	6.8	6.8	11.3	13.2	5.7	5.7
More than 40 percent slope	17.3	17.3	28.9	33.7	14.4	14.4

by 1,190 to 2,970 tons annually because of increases in ground cover in woodland areas.

Impacts from Off-Road Vehicle Management. Off-road vehicle (ORV) restrictions in 63,184 acres of municipal watershed areas, debris flow hazard zones, and erosion hazard areas should result in beneficial impacts to soils (see Impacts on Critical Watersheds section for a discussion of the impacts of ORV use). Restrictions in these areas, particularly erosion hazard areas that currently receive substantial ORV use, would probably result in improved ground cover and reduced erosion.

Limiting ORV use on critical big game winter range in areas with erosion hazard ranging from

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low to high would have beneficial impact. ORV use is generally low, but is expected to increase substantially in the Battlement Mesa area. The limitation period would be from January through April when soils are either frozen or wet. Soils are most susceptible to ORV damage when wet; consequently, closures in these areas would protect the soils when they were most sensitive.

Restrictions to protect recreation resource values and in wilderness study areas would have minimal beneficial impacts due to the low level of current or projected ORV use. Designation of intensive ORV use areas would cause soil compaction, reduced infiltration, reduced ground cover, and increased erosion. Erosion hazard ranges from moderate to very high. These areas currently receive some use and use would be expected to increase in the future by an unknown amount, consequently, some adverse impacts to the soils would be expected.

Impacts from Utility and Communication Facility Management. Impacts would depend on the type and extent of surface disturbance. Impacts would probably be short term pending successful reclamation.

Cumulative Impacts on Soils

Short-term increases in erosion would result from mechanical treatments and burning associated with wildlife, water yield, and forestry vegetation management practices. In the long term, improved ground cover conditions would be expected to reduce erosion below the current level. Except for road construction, short-term increases in erosion would also result from soil disturbance associated with minerals, transportation, and utility and communication facility management. Road construction would be a major cause of erosion and impacts from this source would last until reclamation effectively stabilized these areas.

Approximately 120,000 acres would be affected by ORV limitations. ORV limitations in erosion hazard areas where there is existing ORV use would have the greatest beneficial impacts. Limitations for protection of critical big game winter range would also be beneficial because soils are most susceptible to degradation when wet. Other ORV limitations would have minimal beneficial impacts because of negligible current or projected ORV use. Some watershed deterioration would be expected in intensive use areas. The overall impact of ORV limitations within the resource area would be beneficial to erosion hazard areas. The significance of erosion impacts from range, wildlife, water yield, and forestry vegetation treatments is discussed in terms of sediment yield under Impacts on Water Quality.

IMPACTS ON WATER QUALITY

Impacts from Proposed Management Actions

Impacts from Water Quality Management. Review of project proposals and the addition of stipulations to prevent adverse impacts would minimize water quality degradation in the short term and maintain existing quality in the long term. Monitoring four areas of known water quality problems (see Map 3-1) to identify the problem source and feasibility of reducing the problem would probably result in beneficial impacts to water quality. The problems in these areas are listed in the Management Situation Analysis and include high sediment, salinity, sulfate, temperature and bacteria levels. The quantification of impact benefits cannot be determined until the problem sources are identified and measures designed to reduce the problems selected.

Impacts from Water Yield Management. Vegetation manipulations to increase water yield would increase sediment in the short term by 17,671 to 20,050 tons per year and increase salinity by an unknown amount. Increased sediment would reduce water quality during the 10-year implementation period. In the long term, sediment yield conditions would return to present levels.

Salinity impacts from vegetation manipulations would be proportional to runoff quantity and duration, mineral content of the soil, and the resultant soil disturbance and erosion. Excessive runoff and accelerated erosion would degrade water quality until the soils were stabilized or runoff velocities decreased.

Impacts from Minerals Management. Impacts would depend upon the mining method and type of mineral mined. Short-term generally insignificant salinity and sediment impacts would continue to occur from existing mineral developments. Spoil pile runoff would increase surface water salinity and sediment. A secondary source of these impacts would include improperly designed or rehabilitated roads, pipelines, and drill pads. Impacts would continue until soils were stabilized by revegetation or other land treatments such as water bars, generally accomplished during rehabilitations.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Manipulating 70,630 acres of sagebrush, mountainbrush, and pinyon-juniper to meet the forage requirements of wildlife and livestock would increase sediment yield by 2,600 to 34,900 tons per year during the 10-year implementation period. The range is dependent on the type of manipulation method selected, mechanical or burning. In the long term, ground cover on

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sagebrush and mountainbrush manipulation areas would improve above existing cover conditions and, in turn, decrease sediment yield by 8,800 to 12,300 tons per year.

Burning as a management tool for implementing range, wildlife, and water yield vegetation manipulations would cause several chemical reactions and nutrient losses, in addition to increases in runoff and sediment, that would adversely affect water quality (see Impacts on Soils). Short-term increases in salinity in local streams could be expected and the potential for algae blooms in stock ponds from increased phosphorous levels also would exist. Impacts would probably not be significant, and concentrations of nutrients and salts would decrease rapidly as watershed conditions stabilized.

Livestock grazing management involving proper stocking rates, seasons of use, and plant use, would have no significant affect on salinity. Excessive grazing resulting in reduced ground cover and increased compaction would increase runoff, erosion, and salinity. Implementation of allotment management plans would minimize salinity impacts.

Change in fecal coliform levels would be expected from livestock grazing management. The effects of an increase in livestock numbers would probably be offset by improved livestock distribution and by aquatic habitat improvements that protect riparian areas.

Impacts from Forest Management. Annual sediment yield resulting from harvesting 1.7 million board feet of sawtimber and 3,695 cords of fuelwood per year (harvest level 1) would range from 1,602 tons from clearcutting to 2,680 tons from selective cutting.

Annual sediment yield resulting from harvesting 4.0 million board feet of sawtimber and 4,330 cords of fuelwood per year (harvest level 2) would range from 9,537 tons from clearcutting to 15,624 tons from selective cutting.

Total sediment yield increases from productive forest land and woodland harvest would range from 1,602 to 15,624 tons per year depending on which harvest level and harvest method were selected. Impacts per acre would be greater from clearcutting but total acres disturbed would be greater from selective cutting.

In the long term, sediment yield from woodland harvest areas would decrease from 106 to 881 tons per year due to increases in cover conditions.

Impacts from Recreation Resource Management. Upgrading of floatboating access areas would include establishing sanitary facilities. This would decrease the amount of bacteria entering surface waters, thereby improving water quality.

The impact would be localized, beneficial, and long term.

Impacts from Wilderness Resource Management. Recreational activity would impact bacteriological quality of water. Increased recreational use in wilderness study areas would result in a corresponding increase in bacteria due to lack of established sanitary facilities. The impact would be dispersed throughout the wilderness study area and would be intermittent depending on recreational use patterns.

Impacts from Off-Road Vehicle Management. Off-road vehicle (ORV) activity would decrease ground cover and reduce infiltration by compaction resulting in accelerated runoff and erosion (see Impacts on Critical Watershed Areas). Limiting ORV use to areas of non-saline soils would minimize dissolved solid water quality degradation. Restrictions proposed to control ORV use in sensitive areas would somewhat reduce the overall adverse impacts and would likely have a significant, localized, long-term beneficial impact on water quality.

Impacts from Fire Management. Sediment and turbidity are the most significant water quality responses associated with fire. Sediment and turbidity result primarily from overland flow and secondarily from channel scour caused by increased discharge. See Impacts from Wildlife Habitat and Livestock Grazing Management for estimates of sediment manipulation proposals as well as other vegetation manipulation proposals.

Cumulative Impacts on Water Quality

The short-term increase in sediment yield from all vegetation manipulation proposals would range from 22,000 to 64,000 tons per year in the resource area. The increases would be greatest immediately following disturbance and would decrease rapidly during the following two to three years as new vegetation established. Sediment yield would decline more slowly thereafter. The increase in sediment yield over the entire resource area represents an increase of 1.5 to 4.5 percent above existing conditions and a per acre increase of 0.02 to 0.05 tons per acre per year which would not exceed allowable departure levels on a resource area wide basis. Individual watersheds could be adversely impacted if methods of conversion which result in the high range of sediment yield, such as burning and timber harvest on slopes greater than 40 percent, were selected, and if timber harvest and livestock, wildlife, and water yield vegetation manipulations were implemented simultaneously. Watersheds that exceed allowable departure levels recommended in the Northwest Colorado Council of Governments

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208 plan include Garfield, Rifle, Elk and Canyon Creeks in the Garfield Capability Unit; Fourmile, Prince, and Threemile Creeks in the Roaring Fork Capability Unit; Cottonwood and Brush Creeks in the Eagle-Vail Capability Unit; Big Alkali and Milk Creeks in the Castle Peak Capability Unit; and Sweetwater and Rock Creeks in the King Mountain Capability Unit.

In the long term, increases in ground cover in sagebrush and mountain brush manipulations would reduce sediment yield below existing conditions. The reduction would range from 8,800 to 12,300 tons per year. These figures represent a decrease of 0.6 to 0.9 percent below existing conditions and a per acre decrease of less than .01 tons per year, which would be insignificant.

IMPACTS ON WATER YIELD

Impacts from Proposed Management Actions

Impacts from Water Yield Management. Water yield increases expected from treatment of different vegetation types in the resource area are 0-1 inches per acre per year for sagebrush, 1-3 inches per acre per year for mountain brush and conifer, and 3-5 inches per acre per year for aspen (Hibbert 1977). Treatment of 104,396 acres of these vegetation types in the resource area would increase water yield by an average of 13,167 acre-feet per year (see Table 5-21).

TABLE 5-21. ACREAGE AND WATER YIELD INCREASES EXPECTED FROM VEGETATION TREATMENT IN THE RESOURCE AREA

Vegetation Type	Acres	Average Water Yield Increase (acre-feet per year)
Conifer ¹	19,473	3,245
Aspen ²	34,492	5,748
Mountain Brush ³	49,745	4,146
Sagebrush ⁴	686	28
Total	104,396	13,167

¹Forty (40) percent of the conifer acreage would actually be converted.

²Fifty (50) percent of the aspen acreage would actually be converted.

³Fifty (50) percent of the mountain brush acreage would actually be converted.

⁴One hundred (100) percent of the sagebrush acreage would actually be converted.

Timing of the increased yield would vary by vegetation type treated. In conifer areas, Leaf (1975) indicates that snowmelt in clearcut openings is more

rapid than in the uncut forest. This accelerated melt causes streamflow to be higher on the rising limb of the hydrograph than before harvest cutting. If there is natural regulation in the form of deep porous soils, recession flows are not changed appreciably and annual and daily peak flows are not significantly increased, provided that forest cover on no more than 50 percent of the watershed is removed in a system of small openings.

Information is lacking about the timing of water yield increases in oakbrush areas, however, Tew (1969) indicates that oakbrush eradication probably results in deep seepage which could ultimately appear as streamflow or recharge ground water.

Debyle (1976) indicates that the increase in water yield from aspen clearcuts occurs as baseflow and interflow. The increase results from retention of greater quantities of water in the soil following each growing season in the postharvest situation.

In big sagebrush areas, the increase in yield occurs gradually through the snowmelt period because less melt water is required for moisture recharge. Treatment has no effect on the yearly maximum discharge rate, mean daily maximum discharge rates, or summer discharge during the low flow period (Sturges 1975). The additional water would benefit other BLM programs that use water such as aquatic habitat management and recreation and would be available for storage and later use or benefit downstream water rights.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Manipulating sagebrush and pinyon-juniper would have little effect on water yield. Sturges (1975) indicates that sagebrush manipulation increases water yield only when soils are sufficiently deep that roots of replacement vegetation are above soil occupied by the deeper roots of sagebrush (generally greater than 3 feet deep), and where precipitation is sufficient to wet the soil throughout its profile. These conditions would be met at very few sites within the resource area. Similarly, a review by Gifford (1975) indicates that little change in water yield could be expected from pinyon-juniper manipulation. Mountain brush manipulation, however, could increase water yield by 1-3 inches per acre per year (Hibbert 1977). Mechanically manipulating 225 acres or burning 8,273 acres of mountain brush to increase forage available for livestock and wildlife would result in an average water yield increase ranging from 37.5 acre-feet per year through mechanical manipulation to 2,970 acre-feet per year through burning. These increases would be short-lived (3 to 5 years) if shrub regrowth is not controlled. (See Impacts from Water Yield Management for effects on water yield timing.)

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Impacts from Forest Management. Maximum increases in water yield from timber harvesting in the Rocky Mountain subalpine forest would result when 40 percent of a timbered watershed were harvested in a series of openings less than 8 tree heights in diameter (Leaf 1975). Increased water yield of 1 to 3 inches per acre per year is expected. When timber harvest would be conducted by selective cutting of individual trees, increases in water yield are much less. Selective cutting resulting in the uniform removal of 50 percent of canopy cover density in low elevation, south aspect, lodgepole pine would increase water yield by 1 inch per acre per year. The same treatment of spruce-fir on north aspect slopes would reduce water yield by 0.5 inches per acre per year (Leaf 1975). Water yield changes from harvesting 1.75 million board feet of sawtimber annually (harvest level 1) would range from no change through selective cutting to an increase of 109 acre-feet annually through a series of patch clearcuts. Water yield changes from harvesting 6.3 million board feet of sawtimber annually (harvest level 2) would range from no change through selective cutting to an increase of 392 acre-feet annually through a series of patch clearcuts. Increases from patch clearcuts would endure for up to 30 years. (See Impacts from Water Yield Management for changes in water yield timing.)

Cumulative Impacts on Water Yield

The cumulative impact of all vegetation manipulations in this alternative would range from 13,200 acre-feet per year, if range and wildlife manipulations were done through mechanical means and timber were harvested at level 1 by selective cutting, to 14,940 acre-feet per year if range and wildlife manipulations were conducted by burning and timber were harvested at level 2 in a series of patch clearcuts. On the basis of an implementation schedule of 10 percent per year for water yield and range and wildlife vegetation manipulation projects, water yield would increase by 1,320 to 1,850 acre-feet per year until all manipulation proposals were completed. Further water yield increases could be expected for any year in which the annual timber harvest were completed by a series of small clearcuts.

The range of increase in water yield under the Economic Development Alternative represents an increase of 12 to 14 percent over existing water yield and 87 to 98 percent of the total potential for increasing water yield on public land in the resource area.

The additional water would be of benefit to local water users, mostly in the spring, but also might provide some additional water during low flow peri-

ods due to seepage into ground water and reappearance as baseflow from ground water discharge. BLM programs such as aquatic habitat management, livestock grazing management, and wildlife would also benefit from additional water for stockponds and reservoirs and by potentially prolonging the discharge period of springs. The additional water, although regionally insignificant, would also generally benefit the Colorado River Basin whose existing supplies are over allocated and whose future development appears limited only by the availability of water.

IMPACTS ON CRITICAL WATERSHEDS (MUNICIPAL WATERSHEDS, DEBRIS FLOW HAZARD ZONES, AND EROSION HAZARD AREAS)

Impacts from Proposed Management Actions

Impacts from Critical Watershed Areas. Designation of the debris flow hazard zones as areas of critical environmental concern (ACECs) would enable prescription of special management (including recommendations developed by the Glenwood Springs debris flow study) which should reduce debris flow hazard and the frequency and potential for damage from debris flow incidents.

In addition, restrictions on other activities would help to reduce debris flow hazard or at least prevent the hazard condition from worsening. Historically, livestock grazing on the public land portions of the watersheds has been at a high to moderate use level. The results of a review by Gifford and Hawkins (1978) indicate that grazing has an effect on infiltration but that the difference between light and moderate grazing infiltration is statistically insignificant, while heavy grazing has a distinctly different impact from that of light to moderate grazing. Any increase in the grazing intensity level would decrease infiltration rates and cause additional runoff which could compound the debris flow hazard. Restricting livestock grazing to a light to moderate use level would maintain the existing infiltration rate and prevent additional runoff, thus preventing an increase in the debris flow hazard.

The impact of off-road vehicle (ORV) use also has been found to be detrimental to watershed conditions. In a study done for the BLM in California (Snyder et al. 1976), it was evident that ORVs had a damaging impact on the soil, plant cover, and hydrologic processes in study areas. In one of the study areas, motorcycle use produced about eight times as much runoff as a nearby unused area. The large difference was directly attributable

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to reduction in plant cover and infiltration rates due to soil compaction in the heavily used area. By restricting ORV use to designated roads and trails in debris flow hazard areas, an increase in hazard conditions associated with ORV use should be prevented and could result in some improvement.

Additional restrictions on timber harvesting; water yield, range, and wildlife vegetation manipulations; and designation of the area as a fire exclusion area and as unsuitable for new utility and communication facilities would also prevent an increase in the debris flow hazard.

Prohibiting vegetation manipulation, timber harvesting, wildlife habitat improvements, new utility and communication developments, and oil and gas leasing (once existing leases expire); and excluding fire would prevent damage to municipal watersheds. Limiting ORV use in municipal watershed areas to existing roads and trails would also help to prevent damage, thus, existing water quality would be preserved.

In the study referred to above (Snyder et al. 1976) the most serious watershed damage resulted from soil compaction and reduction of permeability. Soil compaction reduces depth of moisture penetration which deprives plants of moisture needed for growth. In some instances, compaction may be irreversible. The loss of moisture available for plants results in reduced watershed cover which causes increased runoff and erosion. In addition, they found that motorcycle trails became focal points for rill development. Prohibiting or limiting ORV use in eight erosion hazard areas with existing ORV use would help to prevent further watershed damage and possibly begin a vegetation recovery process in already damaged areas. Increased vegetation cover would reduce runoff and erosion thus benefitting downstream areas.

Impacts from Forest Management. Management of one stand of pinyon-juniper in the Rifle municipal watershed should not degrade water quality due to the flatness of the slope and the distance from water courses.

Impacts from Land Tenure Adjustment. Transfer of public land in the debris flow hazard zone to other ownership would prevent implementation of measures designed to reduce the debris flow hazard by the BLM. The effect of tenure adjustment on the debris flow hazard would depend on the type of activities undertaken by the new owners. Approximately 900 acres within debris flow hazard areas could be affected by land tenure adjustments.

Impacts from Utility and Communication Facility Management. Prohibiting utility and communication facility placement in municipal watersheds

and debris flow hazard zones would aid in water quality preservation and debris flow hazard reduction by preventing surface disturbance which could result in increased runoff and erosion.

Impacts from Fire Management. Designating debris flow hazard zones as fire exclusion areas would help to reduce debris flow hazard by minimizing the area affected by fire (maximum effort is directed towards extinguishing wildfires as rapidly as possible in fire exclusion areas). A report prepared by the Colorado Geological Survey (Mears 1977) following the 1977 debris flow in Glenwood Springs indicates that a wildfire partially on public land above Glenwood Springs may have been responsible for increased runoff rates which may have contributed to the debris flow in the city below.

Cumulative Impacts on Critical Watersheds

Restrictions on timber and fuelwood harvest, vegetation manipulation, livestock grazing, and ORV use as well as inclusion in a fire exclusion area and an unsuitability area for utility development should prevent adverse impacts to the debris flow hazard. In addition, special management derived from ACEC designation and recommendations evolving from the Glenwood Springs debris flow study should result in a reduction in the hazard which could reduce the frequency and severity of damage from debris flow incidents.

A high degree of protection for water quality in municipal watersheds would be provided by restrictions on other resource activities (forest and woodland harvest, vegetation manipulation, ORV use, and oil and gas leasing) and by inclusion in a fire exclusion area and an unsuitability area for utility development. The harvest of pinyon-juniper in the Rifle municipal watershed would probably not result in water quality degradation due to the flat slope and distance from water. The effect would be to provide water of the best quality possible from public land in the municipal watershed.

The potential for improvement in watershed conditions on 50,200 acres of erosion hazard areas by restricting ORV use also exists. An improvement in vegetation cover would reduce runoff and erosion and prolong the life of downstream water retention and diversion facilities.

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IMPACTS ON MINERALS

Impacts from Proposed Management Actions

With the exception of wilderness, all restrictions and related impacts identified in the Continuation of Current Management Alternative would carry through to this alternative. The following impacts are in addition to those identified in Continuation of Current Management.

Impacts from Minerals Management. Identifying 28,500 acres of public and private lands as acceptable for further leasing consideration would make approximately 1.6 billion tons of coal available for future leasing. Identifying 1,560 acres as unacceptable would eliminate that acreage from further leasing consideration.

Impacts from Wilderness Resource Management. Closing 10,755 acres of preliminarily suitable wilderness areas to mineral location, sales, and oil and gas leasing would have an insignificant impact on mineral development because mineral exploration and development activities indicate a low potential for mineral development.

Impacts from Recreation Resource Management. Closing 2,470 acres in Deep Creek Canyon to mineral location, sales, and oil and gas leasing would have an insignificant impact on mineral exploration and development because of a lack of industry interest and mineral bearing geological formations.

Closing 50 acres on two Frying Pan Recreation Sites to mineral sales would have an insignificant impact because of the small area involved at each sight.

Impacts from Critical Watershed Areas. Closing 5,858 acres of municipal watersheds to oil and gas leasing would be moderately significant because these watersheds are believed to contain a potential for oil and gas production based on other oil and gas exploration and development occurring in the vicinity. The 1,108 acre municipal watershed south of Rifle is within an area of existing oil and

gas development on private land and is believed to have a very high potential for development under the existing leases for the area. The closures represent less than 1 percent of the federal minerals available for lease within the resource area.

Impacts from Land Tenure Adjustments. Disposing of 37,550 acres of public land would have an insignificant impact on mineral development because mineral rights would be retained on all areas containing significant mineral development potential.

Cumulative Impacts on Minerals

Closing 109,267 acres of public and private land to mineral location would continue to prevent mineral development in those areas. However, this acreage, 14 percent of the resource area, is not significant when compared to the acreage available to entry.

Closing 72,043 acres of public and private land to oil and gas leasing, which is 10 percent of the resource area, would not be significant resource area wide since most of the potentially valuable oil and gas reserves are already under lease. However, some local impacts could be more significant to companies holding leases in closed areas.

Closing 25,904 acres to oil and gas surface facilities, which is 3 percent of the resource area, would continue to increase drilling costs and potentially exclude oil and gas development since directional drilling would be required.

There are 28,500 acres of public and private lands identified for further coal leasing consideration. The impacts can not yet be assessed.

Closing 17,561 acres to mineral sales, which is 2 percent of the resource area, would not be significant since ample supplies are available. The impacts of selling mossrock, top soil, sand and gravel, scoria, and fill dirt in common use areas would have insignificant impacts as stated in site-specific assessments. Table 5-22 summarizes proposed mineral limitations.

TABLE 5-22. PROPOSED MINERAL LIMITATIONS

Limitation	Acres
Closed to mineral location.....	109,267
Closed to oil and gas surface facility location.....	25,904
Closed to oil and gas leasing.....	72,043
Open to oil and gas leasing.....	700,239
Acceptable for further consideration for coal leasing.....	28,520
Eliminated from coal leasing consideration.....	1,560
Closed to mineral sales.....	17,561

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IMPACTS ON AQUATIC WILDLIFE

Impacts from Proposed Management Actions

Impacts from Aquatic Habitat Management. Aquatic habitat improvements such as instream structures would increase aquatic invertebrate populations, lower water temperatures, improve spawning, resting and holding areas for fish, allow for better fish migration, and reduce stream bottom siltation by increasing water velocities in riffles. Riparian habitat improvements such as fencing and vegetation reestablishment would reduce water temperatures and streambank damage and increase terrestrial invertebrate populations that serve as a source of food for fish. This would occur on 90 miles of public stream and 3 lakes (17 surface acres). Minimum streamflow maintenance on 43 additional streams would provide conservation pools for fish during periods of low flow and would sustain riparian habitat during dry periods. These projects would improve fish condition, productivity, and longevity. These expected improvements would begin to occur about 2 years after project implementation and would last the life of the project. (This would also apply to projects proposed by other resources that would affect water quality or water yield.)

Legal access to an additional 42.7 miles of stream could increase fishing. Increased use could cause localized insignificant riparian habitat damage from trampling, thus reducing fish populations somewhat.

Impacts from Water Quality Management. Water quality management for the Milk and Alkali Creek watersheds could improve fisheries habitat in the Eagle River by substantially reducing sediment load. This would increase overall production of fish and invertebrates in the Eagle River.

Impacts from Water Yield Management. In the short term, water yield vegetation manipulations would cause increased erosion and sediment yield. The increase in sediment would have adverse impacts on aquatic habitat condition. It would reduce fish production by reducing food supplies and by siltation of spawning areas. In the long term, beneficial impacts may result from increased water yield. The effect of water yield management during the low flow period is uncertain. It is possible that oakbrush and aspen manipulations would increase flow during this period while conifer manipulations would not. Many of the streams in the resource area are limited by low flows in the latter part of the summer. If these flows could be increased by water yield management, it would reduce or dilute siltation and benefit those streams where low flows and silt-

ation are limiting factors on aquatic habitat condition.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Increased erosion resulting from vegetation manipulations could cause localized short-term decreases in invertebrate populations in streams draining the area of disturbance. This would result in reduced fish production from reduced food supplies and siltation of spawning areas. Burning generally has a greater adverse impact than other treatment methods because of the potential for greater loss of ground cover and the chance of significant quantities of ash entering the stream. Streams subject to potentially significant adverse impacts include: Garfield, Rifle, Elk and Canyon Creeks in the Garfield Capability Unit; Fourmile, Prince and Threemile Creeks in the Roaring Fork Capability Unit; Cottonwood Creek in the Eagle-Vail Capability Unit; and Sweetwater and Rock Creeks in the King Mountain Capability Unit. Total public fishing stream mileage affected would be 12.9 miles. Adverse impacts would be reduced by following the standard operating procedures listed in Appendix B.

Beneficial impacts would include long-term increases in water yield which would increase the level of stream flows and could increase their duration, resulting in better invertebrate and fish populations and better fish condition. The long-term increase in understory vegetation on manipulated areas would improve water quality by reducing sedimentation.

Implementation of proper stocking rates and improved livestock distribution through monitoring, water development, fencing, and vegetation modification would benefit aquatic habitat by improving vegetation cover and reducing grazing pressure in riparian zones. This would reduce erosion and bank damage, and improve riparian vegetation which in turn would reduce water temperature and improve stream quality for fish.

These long-term benefits would have a significant impact on aquatic conditions and associated fisheries.

Impacts from Forest Management. In the short term, timber and fuelwood harvest would result in increased sediment yield which would adversely impact aquatic habitat in affected streams. Road construction associated with harvest activities would be the greatest single source of sediment. Application of standard operating procedures and proper road layout and design would minimize these impacts.

Timber harvest, if implemented in a series of small patch clearcuts, would increase water yield. Timing of the increased yield from the subalpine

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forest zone would be such that increases in base-flow during low flow periods would not occur (Leaf 1975) and would be of little benefit to the aquatic ecosystem.

Impacts from Recreation Resource Management. Increased fishing would increase fish harvest, reducing the chance of winter kill in overpopulated streams and lakes, and would cause an insignificant loss of riparian habitat from trampling and vehicle use.

Impacts from Areas of Critical Environmental Concern. Protection of aquatic habitat through area of critical environmental concern designations would reduce the level of adverse impacts from other resource activities, thus reducing aquatic disturbance and resulting in long-term beneficial impacts to aquatic habitat. Approximately 35.5 miles of stream habitat and 1 lake (2 surface acres) supporting state-threatened or endangered species would be protected through designation.

Impacts from Land Tenure Adjustments. Some very limited access to the Eagle River and other small streams would be lost. Most of the small parcels along the upper Colorado River do not supply access from roads, but do provide boaters a place to land and fish.

Impacts from Off-Road Vehicle Management. Off-road vehicle (ORV) closures would reduce erosion where roads and trails cross streams. Where roads exist in closed areas, vegetation cover would increase and erosion would decrease.

Streams located in areas open to ORVs would continue to receive damage by vehicles crossing or driving down stream channels. Because existing and projected ORV use is low, no significant increase in impacts on aquatic habitat would occur.

Impacts from Transportation Management. Significant benefits would occur where access to public fishing streams was gained. This would allow for better stream management and more fishing opportunities.

Cumulative Impacts on Aquatic Wildlife

In the short term, vegetation manipulation by the various resource programs would cause increases in sediment that would adversely affect aquatic habitat. Significant adverse impacts would occur to Garfield, Rifle, Elk, Canyon, Fourmile, Prince, Threemile, Cottonwood, Sweetwater, and Rock Creeks if vegetation were manipulated by burning and if timber and fuelwood harvest occur in the same watershed at the same time.

In the long term, aquatic and riparian habitat improvements and vegetation manipulation projects

could significantly increase invertebrate and fish populations and significantly improve stream quality, fish condition, and water quality. This would occur through increases in water yield, and possibly baseflows during low flow periods, and improved water quality after reestablishment of vegetation on disturbed sites. The significance of these impacts cannot be determined until actions are implemented and monitored.

All suitable aquatic and riparian habitat on public land would be managed to obtain optimal aquatic habitat conditions. Habitat currently in average to excellent condition would be maintained and potential fishery streams would be improved to support fish. Long-term beneficial impacts to aquatic habitat would result from maintaining optimal aquatic condition ratings.

These impacts would provide an undetermined increase in fish populations which in turn would provide more and better fishing opportunities.

IMPACTS ON TERRESTRIAL WILDLIFE

Impacts from Proposed Management Actions

Impacts from Terrestrial Habitat Management. The allocation of 39,496 animal-unit months (AUMs) of existing forage to big game would be 13 percent (6,101) AUMs short of meeting the existing big game forage demands and 32 percent (18,828 AUMs) short of meeting the forage requirement of the Colorado Division of Wildlife's 1988 big game population goals (the objective of this alternative). Annually manipulating 1,820 acres of pinyon-juniper, oakbrush-serviceberry, and sagebrush would provide an additional 658 AUMs each year, exceeding by 1 percent existing forage demand but still falling 21 percent short of Colorado Division of Wildlife population goals over the 10-year implementation period. Shortages would be greatest in the crucial winter range. Forage allocations by game management unit are shown in Table 5-23. Appendix F explains the methodology used in allocating forage.

The most significant shortage of forage would occur northeast of the Roaring Fork River and northwest of the upper Colorado River. Both areas have moderate to high population densities. The initial forage allocation to big game in these areas would be from 4 to 58 percent short of meeting the current forage demand.

Additional big game forage gained through vegetation manipulation would provide sufficient forage to maintain the existing big game populations. Thus, a short-term decline in big game populations

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TABLE 5-23. WILDLIFE FORAGE ALLOCATION BY GAME MANAGEMENT UNIT

Game Management Unit	Existing Demand (AUMs)	Initial Allocation (AUMs)	Percent Change From Existing Demand	Projected Allocation (AUMs)	Percent Change From Existing Demand	Percent of Objective Met	Density of Animals ¹	Number of Animals ¹	Size of Area
15.....	965	769	-20	769	-20	69	High	Moderate	Small
25.....	4,907	2,979	-39	4,622	-6	78	Moderate	Moderate	Medium
26.....	4,220	1,758	-58	2,032	-52	41	Moderate	Low-moderate	Medium
32.....	3,181	3,699	+16	3,818	+20	88	Low-moderate	Moderate-high	Medium-large
33.....	7,246	6,933	-4	7,381	+2	77	Low-moderate	Large	Large
34.....	2,277	2,041	-10	2,117	-7	84	Low	Low	Small
35.....	5,291	5,522	+4	5,819	+10	92	Low	Moderate	Large
36.....	917	905	-1	1,134	+24	100	Moderate	Moderate-low	Medium
42.....	3,892	4,142	+6	4,389	+13	91	Low	Large	Large
43.....	4,597	4,662	+1	6,251	+36	88	Moderate-high	Large	Large
44.....	5,570	4,552	-18	5,877	+6	83	Moderate-high	Large	Large
444.....	1,596	937	-41	937	-41	44	High	Large	Medium
47.....	943	597	-37	930	-1	77	Moderate-high	Moderate	Small
Total.....	45,602	39,496	-13	46,076	+1	79			

¹Number of animals and density per square mile based on winter use periods (crucial period for wildlife).

would occur either from increased hunting authorized by the Colorado Division of Wildlife or from an accelerated decline in habitat condition. A decline in big game populations would be most significant in concentration areas. As big game populations declined, predator populations, carrion dependent species, and hunter success could also decline. The short-term impact could be a 13 percent decline in hunting and a corresponding decline in business income associated with hunting (see Impacts on Social and Economic Conditions).

Manipulating 18,200 acres of vegetation over a 10-year period would increase forage, improve big game health and productivity, and change wildlife species composition and density. This would allow overall big game populations to increase and exceed the existing population by 1 percent. The loss of bird and small mammal habitat in vegetation manipulation areas would be insignificant because of the small amount of acreage treated annually and the relatively quick revegetation of these areas. Benefits gained by manipulating vegetation would begin in about 2 years but would not be permanent unless regrowth was controlled. This applies to all types of vegetation treatments.

Identification of habitat suitable for and subsequent introductions of state-threatened (river otter) or federal-endangered species (peregrine falcon) would help maintain a viable population of these species within the state. Introductions of sage grouse, sharp-tail grouse, and turkey would increase these populations. They in turn could be used for other reintroductions, hunting, and increased gene pools. (See Map 3-12 for potentially suitable habitat for these introductions.)

Improvement of riparian habitat could result in local increases in waterfowl populations which would provide additional local hunting opportunities.

Water developments would increase the amount of available habitat allowing local wildlife populations to increase.

Wildlife habitat and populations could benefit somewhat from improved management of 58,820 acres that would occur in areas under cooperative management (see Map 3-12).

Hunting opportunities and success, and achievement of population goals would improve in areas identified for additional public access. Improved population control would result in healthier animals, improved productivity, and reduced game damage to privately-owned land.

Impacts from Water Yield Management. Removing oakbrush would result in better big game distribution by removing physical barriers to free movement. It would also create additional big game habitat. Thinning dense, overmature stands of sagebrush in summer sagegrouse range could increase nesting and brood areas and improve meadow habitats. These vegetation manipulations would also provide wildlife with additional and longer duration water sources.

Removing aspen stands would reduce thermal and hiding cover, calving or fawning areas, and essential nongame habitat. The application of project design features (Appendix B) and the small number of acres likely to be converted would reduce the significance of these impacts.

Impacts from Aquatic Habitat Management. Small riparian habitat improvements along 89.6

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miles of stream would result in locally insignificant increases in small game and nongame populations. Increased recreational use would not significantly stress wildlife or result in riparian vegetation losses.

Impacts from Livestock Grazing Management. Annually removing 5,243 acres of sagebrush, oak-brush, and pinyon-juniper vegetation to provide additional livestock forage would change vegetation composition, density, and form and age class thereby providing some additional big game forage and creating additional habitat for those species dependent upon the successional vegetation type. Species dependent on the original vegetation type would be displaced. These wildlife species changes would be insignificant. The Resource Area Profile (available in the Glenwood Springs Resource Area office) contains a list of wildlife species that would be affected.

Changing sagebrush on winter ranges to a grass-forb type would have a long-term adverse impact on big game, sage grouse, and many small game and nongame species that depend on sagebrush for many of their habitat requirements.

Because the resource area supports a diversity of vegetation, little overall change in wildlife populations would occur. Project design features would limit the size, location, and configuration to ensure minimal adverse impact on wildlife (see Appendix B). Improvements in wildlife habitat and increases in populations would be commensurate with improvement in rangeland condition.

Water developments for livestock grazing management would benefit local wildlife populations by providing additional water sources and by reducing vegetation damage from livestock concentrations.

Fencing would improve livestock management, protect water sources and riparian vegetation from trampling, and reduce overgrazing and competition with big game for forage. Benefits would be local and would only insignificantly affect total wildlife populations. Fences could physically restrict movement or result in entanglement of big game. This would be most severe on winter ranges and migration routes. Project design features (Appendix B) would reduce the significance of adverse impacts.

Impacts from Forest Management. Impacts of annually harvesting from 261 to 2,351 acres of timber, mostly in the King Mountain, Castle Peak, and Eagle-Vail Capability Units, would vary depending on harvest method, harvest season, length of contract, size, and location of the project.

Short-term adverse impacts would include a temporary loss of understorey, solitude, thermal and escape cover, and nesting habitat for many wildlife species. Wildlife would also be temporarily displaced during the harvest period. These losses

would be greater in clearcut than in selective cut areas. U. S. Forest Service land adjacent to timber stands on public land near Sunlight Peak and the Seven Hermits would reduce the severity of adverse impacts by providing alternate habitat during harvest periods. Harvesting timber on King Mountain would produce more severe short-term impacts because alternate cover areas are not locally available. However, localized long-term beneficial impacts to wildlife, especially big game, would result from the increased forage production, habitat diversity, and ease of movement.

Harvesting timber in or near elk calving areas would result in a significant long-term detrimental impact because elk are highly sensitive to disturbance during calving and because these areas are limited in number. Standard operating procedures (Appendix B) and site-specific management techniques would reduce specific detrimental impacts to wildlife. The small acreage of disturbance, generally good habitat conditions, and compliance with standard operating procedures would reduce the significance of all impacts.

The majority of the woodland stands in the resource area are located in either big game winter or crucial winter range. Annually harvesting from 268 to 1,440 acres of woodland would result in locally significant increases in big game forage and populations of wildlife species associated with more open stands of pinyon and juniper or brush piles.

Insignificant adverse impacts would include temporary loss of forage and thermal and hiding cover for big game species, and loss of nesting habitat and solitude for other wildlife species during harvest periods. The small amount of acreage disturbed in relation to the woodland habitat supply and the application of standard operating procedures for woodland harvesting (Appendix B) would reduce the significance of adverse impacts.

Impacts from Recreation Resource Management. Recreation management would increase the number of people in wildlife habitat. The resulting stress would be an insignificant short-term adverse impact because of the dispersed nature and relatively small amount of expected increase in public land use by recreationists.

Impacts from Visual Resource Management. Restrictions placed on vegetation manipulations in visual resource management Class II areas could increase project costs and thus reduce the number of projects that would be accomplished. This would reduce the amount of forage increase that could be gained through vegetation manipulation and consequently the number of additional big game animals an allotment could support. This means that the proposed allocation to big game may be optimistic.

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Impacts from Land Tenure Adjustments. Table 5-24 lists, by capability unit, the significant acreage of wildlife habitat that would be lost through sale or exchange. This acreage is composed mostly of large tracts of land that would provide viable habitat even if adjoined by developed tracts of private land. Small tracts (less than 100 acres) would not provide significant big game habitat if surrounded by developed private land thus they were not included in the totals on Table 5-24, but they would still provide open space and important habitat for nongame species.

TABLE 5-24. ACRES OF WILDLIFE HABITAT DISPOSALS

Capability Unit	Big Game Summer Range	Big Game Crucial Winter Range	Riparian Habitat
Garfield.....	800	7,510	275
Roaring Fork.....	120	14,980	0
Eagle-Vail.....	2,760	2,190	0
Castle Peak.....	0	240	69
King Mountain.....	400	2,570	0
Total.....	4,080	27,490	344

Loss of summer range could be locally significant, but because of the large amount and good condition of summer range throughout the resource area and because this type of habitat is not generally developed in an intensive manner, the overall adverse impact would be insignificant.

Disposal of 33,876 acres (12 percent) of the total crucial big game winter range within the resource area would have a very significant long-term impact resulting in an estimated 12 percent loss in big game populations. Loss of winter range is especially significant because its availability in this resource area limits big game populations. This loss is magnified by the expected 8 percent additional loss of crucial winter range on private land from development. Development in crucial winter range is usually very intensive—subdivisions and industrial parks, for example; thus remaining habitat is of little value, especially to big game.

Impacts of riparian habitat disposals would be insignificant except for the disposal of public land along the Colorado river west of New Castle. This area is very important to bald eagles, great blue heron, and waterfowl. There is little public land along the river, thus it becomes even more important as those surrounding private lands are developed. If the public land is disposed of, the only habitat protection afforded these wildlife species would be by local zoning ordinances.

Impacts from Off-Road Vehicle Management. Designation of intensive off-road vehicle (ORV) use areas in Yellow Slide Gulch (960 acres) and the Dry Lake-Blow Out area (5,000 acres) would substantially increase the number of people and dogs and the amount of noise in these areas. This would destroy the sense of solitude and cause a significant amount of vegetation destruction. Food and cover for wildlife would be destroyed and animals that do not tolerate noise, dogs or people would be forced to leave. It is expected that about 60 mule deer would be impacted in Yellow Slide Gulch and 230 mule deer and 55 elk in the Dry Lake-Blowout area during the fall and spring months. Concentrating use in two areas, however, could reduce somewhat the ORV impact in other areas. These impacts would be significant on a local basis; however, they would be insignificant when considered on a resource area basis.

Limiting snowmobile use on 56,868 acres of big game winter range would significantly reduce stress on local big game herds resulting in improved spring time health conditions and productivity, probably resulting in increased deer and elk populations.

Impacts from Transportation Management. Providing better access to public land would make big game herds more accessible to hunters thus increasing hunting success. This could reduce game damage on private land and reduce winter mortality and increase animal health and productivity. This would offset the adverse impacts of added stress resulting from the additional access to public land.

Impacts from Utility and Communication Facility Management. Designating sensitive and unsuitable zones would protect especially fragile wildlife habitats such as elk calving areas, sagegrouse strutting areas, and bald eagle roosting trees by either prohibiting siting of facilities or requiring adequate mitigation.

Impacts from Fire Management. Controlled use of fire to manipulate vegetation types would provide additional forage and improved habitat conditions, resulting in improved animal health and productivity. This would offset the significance of adverse impacts such as short-term habitat loss and fire caused mortality to small and nongame wildlife species.

Cumulative Impacts on Terrestrial Wildlife

Species such as sage and sharp-tail grouse, turkey, peregrine falcon, and river otter, whose populations are currently declining, would benefit from new introductions and populations would stabilize or increase. However, bighorn sheep populations

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would continue to decline. The proposed habitat improvement projects, seasonal ORV closures, cooperative management areas, and additional access would all provide long-term beneficial impacts to wildlife.

Theoretically, there would be a short-term 13 percent decrease in big game populations on public land as a result of initial forage allocations. In the next 10 years, approximately 160,000 acres of vegetation would be modified. The allocation of the increased forage resulting from the wildlife projects would mean a 1 percent increase in existing big game populations but it would still be 21 percent short of meeting the Colorado Division of Wildlife goals. Small game and nongame species composition and numbers would vary locally, but no significant long-term change would occur resource area wide because of the great habitat diversity offered by public and private lands in the resource area.

An estimated 8 percent of the big game crucial winter range occurring on private land could be lost to development in the next 10 years. An additional 27,490 acres (12 percent) of the big game crucial winter range occurring on public land would be lost through land tenure disposals. Therefore, in the next 10 years, an overall 19 percent decrease in existing big game populations could occur. This alternative would be 33 percent short of meeting the Colorado Division of Wildlife population goals.

In the long run, if the big game populations are not reduced to the allocated carrying capacity through intensive management, as forage demand exceeds availability, habitat conditions and fawn and calf production will decline, winter mortality will increase and there is a potential for increased game damage to private land. Declining habitat conditions will also have a long-term adverse affect on small and nongame species.

This means an overall decrease in hunting and viewing opportunities and consequently a decrease in business to those establishments such as restaurants, motels, sporting goods stores, and gas stations. See Impacts on Social and Economic Conditions for additional impacts to local communities.

IMPACTS ON LIVESTOCK GRAZING

Impacts from Proposed Management Actions

Impacts from Livestock Grazing Management. The initial allocation of 38,388 animal-unit months (AUMs) would result in a 2 percent increase over existing livestock use. Forage increases accrued through vegetation manipulation practices would result in a final allocation of up to 63,458 AUMs

providing for a 68 percent increase in livestock use. With the increase in AUMs from manipulations, the total AUMs provided would still remain 14 percent short of meeting the total preference objective of 73,868 AUMs. Table 5-25 shows this information by capability unit.

TABLE 5-25. RELATION OF LIVESTOCK FORAGE ALLOCATION TO EXISTING USE AND ALTERNATIVE OBJECTIVE

Capability Unit	Initial Allocation (AUMs)	Percent Change from Existing Use	Projected Allocation (AUMs)	Percent Change from Existing Use	Percent of Objective Met
Garfield	16,999	-4	34,745	+96	81
Roaring Fork ..	5,513	+30	9,008	+113	97
Eagle-Vall	4,111	+13	5,052	+38	88
Castle Peak.....	8,425	+5	9,838	+22	100
King Mountain.....	3,345	-17	4,815	+20	83
Total	38,388	+2	63,458	+68	86

The short-term impact from initial allocation would be an insignificant overall increase over existing livestock use. However, each capability unit and allotment can vary considerably. The 30 percent increase in the Roaring Fork Capability Unit may not be fully used since many of those allotments are spring-fall ranges with livestock numbers usually held to what U. S. Forest Service permits allow. The reductions in the King Mountain Capability Unit would be significant because they are confined to relatively few allotments.

The long-term projected increases over existing livestock use would be highly significant. The total amount may never be used on spring-fall ranges associated with U. S. Forest Service permits as mentioned above.

Range improvements, including vegetation manipulation, would improve livestock distribution, reduce livestock concentrations, and provide for more even use of forage. This would help to maintain those allotments in satisfactory range condition and improve those in unsatisfactory range condition. Improved range condition would increase forage quantity and quality thereby increasing the potential for improved livestock production.

Impacts from Water Yield Management. Converting mountain brush and trees to grass would benefit livestock through the additional forage that would be available in the long term. The 2-year restriction from livestock grazing would be more of an impact to management of livestock (how to keep them off the treated land) than the AUMs foregone.

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Any increase in duration of flow of streams or springs for late season livestock use would be beneficial.

Impacts from Critical Watershed Areas. All or portions of five allotments occur in debris flow hazard zones. Limiting these allotments to light use (approximately 30 percent utilization) would not significantly impact the permittees. Data indicates enough forage production is available on the allotments to graze at this level and meet AUM objectives.

Impacts from Minerals Management. The amount of surface disturbance potentially occurring might be moderately significant locally, but overall would be insignificant to livestock grazing.

Impacts from Aquatic Habitat Management. The amount of forage and water excluded from livestock use by riparian vegetation enclosures would be insignificant and thus would not impact livestock grazing. (See Standard Design Features, Appendix B).

Impacts from Terrestrial Habitat Management. The Basalt land exchange with the Colorado Division of Wildlife would have a potential adverse impact on one operator with 72 AUMs preference if the Colorado Division of Wildlife excludes livestock grazing. The Garfield Creek cooperative management with the Colorado Division of Wildlife would have no significant impact if livestock grazing continues at the level proposed. Vegetation manipulation would provide long-term benefits to livestock by increasing the amount of available forage. Though most of the increased forage developed for wildlife would accrue to wildlife, some would be available for livestock. The short-term impact (2 years) of keeping livestock off the vegetation treatment areas would depend on the size of the area treated and control of the stock.

Impacts from Forest Management. Slight to moderate beneficial impacts would result from woodland management where livestock forage production and animal distribution would be increased with the removal of pinyon-juniper. The exact extent of the beneficial impacts cannot be determined until management areas and sizes are determined.

Impacts from Wilderness Resource Management. Designation of 10 acres of Hack Lake as wilderness would have no impacts on allotment 8633. Designation of 330 acres at Eagle Mountain as wilderness would have no significant impact on allotment 8402. The majority of the usable grazing area would be outside the wilderness boundary.

Designation of 10,415 acres of Bull Gulch as wilderness would have not have a significant impact on allotment 8625. The majority of this allotment is steep and rocky, limiting potential range improve-

ments. There is sufficient existing forage production to meet allocation goals.

Impacts from Land Tenure Adjustments. Land disposals would involve approximately 32,400 acres and 4,187 AUMs on 66 allotments. Significance to each operation varies considerably; however, 17 allotments would lose all or most of their public land. While removing these lands from grazing may not cause anyone to leave the livestock business, it would certainly require adjustment in management and reduction of herd size or acquisition of replacement AUMs, all of which would be an adverse economic impact on the operations.

Impacts from Off-Road Vehicle Management. The Yellowstone and Dry Lake designated off-road vehicle (ORV) intensive use areas would significantly impact encompassing allotments. The Yellowstone area is in allotment 8903 which is used winter long by sheep and used for lambing in the spring. ORV use would significantly affect lamb crop percentages. The Dry Lake site is within allotments 8642 and 8643, both presently operating under allotment management plans. By directing increased numbers of people to this area, the potential for damage to expensive range improvements such as water catchments, pipeline systems, and fences would be substantially increased.

Impacts from Utility and Communication Facility Management. An insignificant beneficial impact of increased forage availability would result from reseeded rights-of-way through woodland or shrubland and from improved livestock movement along right-of-way routes.

Impacts from Fire Management. The impacts of fire management would be highly beneficial. Using wildfire to manipulate shrubland and woodland would increase livestock forage availability. The identification of areas for fire management around expensive range improvements helps limit potential fire losses. The extent of beneficial impacts cannot be determined until specific fire management plans are prepared.

Cumulative Impacts on Livestock Grazing

Significant beneficial impacts would result from vegetation manipulation through livestock grazing, water yield, forest, terrestrial habitat and fire management increasing forage availability for livestock. Over the 10-year implementation period, vegetation manipulation of at least 52,426 acres would provide an additional 68 percent increase in AUMs above existing livestock use.

The only significant adverse impact would be land tenure adjustments where 7 percent of the allotments would be adversely affected by disposals.

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The forage allocation objective of this alternative is to try to satisfy total livestock preference first. Lack of existing and potential forage production on some allotments with large reductions holds total allocation to 86 percent of preference. There is essentially no competition with wildlife for forage allocation in this alternative.

IMPACTS ON VEGETATION

Impacts from Proposed Management Actions

Management actions that would not result in conversions generally would have insignificant impacts on vegetation because large scale vegetation changes would not occur. Management actions such as clearcutting and vegetation manipulation for increased water yield, livestock, and wildlife forage production would reduce ground cover and disturb soils, resulting in localized adverse impacts. The localized significance of vegetation manipulations would be reduced by the 10-year implementation schedule, project dispersion throughout the resource area, and standard design features (Appendix B) for project implementation. Harvesting forest land and manipulating vegetation, as proposed by water yield, livestock grazing, terrestrial habitat, and forest management, would result in the following annual vegetation disturbances:

- Productive Forest Land Management—2,351 acres
- Woodland Management—1,440 acres
- Livestock Grazing Management—5,243 acres
- Terrestrial Habitat Management—1,820 acres
- Water Yield Management—10,439 acres

The acreage shown for productive forest land and woodland management is based on harvest level 2 allowable cut converted to acres. The annual acreage shown for livestock grazing, terrestrial habitat, and water yield management is 10 percent of the total proposed.

The figures shown are proposed by each resource management; however, in some cases, acreages proposed for management overlap and therefore cannot be totalled. For example, cutting firewood in pinyon-juniper would also meet livestock or wildlife needs for increased forage; likewise, oakbrush removal for additional forage could help increase water yield.

Site-specific impacts of vegetation changes are discussed under the resource affected. For example, the impacts of brush control on wildlife are discussed under Impacts on Terrestrial Wildlife.

Modifying mountain shrub, sagebrush, pinyon-juniper, and forest vegetation types in relative amounts indicated above for 10 years would not significantly affect vegetation types in the resource area. This is because of the tremendous variety of types and species diversity present since the resource area lies in the transition zone between two distinctly different physiographic regions—the Colorado Plateau and Southern Rocky Mountains.

No adverse impacts would occur to known occurrences of threatened or endangered plant species from any management action that has identified a site-specific project location. Threatened, endangered, or sensitive plant species would be protected from adverse impacts of management actions through activity plans and environmental assessments when specific site locations are identified.

Cumulative Impacts on Vegetation

Cumulative impacts on vegetation would be the same as those discussed under Impacts from Proposed Management Actions.

IMPACTS ON FORESTRY

Impacts from Proposed Management Actions

Impacts from Forest Management. Managing 17,350 acres of productive forest land and 61,150 acres of woodland (harvest level 1) would result in a potential annual allowable harvest of 1.75 million board feet and 3,695 cords, respectively.

Managing 62,675 acres of productive forest land and 152,675 acres of woodland (harvest level 2) would result in a potential annual allowable harvest of 6.3 million board feet and 7,950 cords, respectively.

Harvest practices such as clearcutting, shelterwood cutting, selective cutting, and commercial thinning would increase stand productivity thereby increasing revenues and improving wildlife habitat.

Forest development practices such as thinnings and plantings would increase vigor and growth in managed forest stands and thus increase forest production potential. Actual increased production is unknown but is considered significant because it would decrease disease and pest incidence in these stands.

Acquiring legal access into presently inaccessible forest stands would open these areas to public land management.

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Impacts from Critical Watershed Areas. Closing 525 acres of woodland in municipal watersheds and 655 acres of woodland in severe debris flow hazard zones would remove a total of 1,180 acres from the total woodland base of 189,500 acres. When compared with the total base, this loss is insignificant.

Impacts from Livestock Grazing and Terrestrial Habitat Management. Chaining and burning in the pinyon-juniper forest type would conflict with woodland management objectives for fuelwood sales. The impact area is unknown because the livestock grazing management objectives for chaining and burning cover other vegetation types. Woodland species would take 40 years to regenerate after chaining and 60 years to regenerate after burning. This loss would be considerable, especially if a degree of vegetation manipulation occurred on forest land suitable for forest management.

Minor beneficial impacts would be gained from chaining practices, such as increasing the available supply of fuelwood that could be offered for sale.

Construction of fences and water pipeline projects would destroy an insignificant amount of forest land.

Increased livestock numbers would increase damage to forest regeneration. Generally, such damage is insignificant. Exceptions would be where high-valued productive forest land reforestation at proper stocking levels is a requirement. Added reforestation cost would result if grazing use were allowed in these stands. Suspension of grazing or fencing in these areas (an average of 250 acres annually) would reduce potential adverse impacts.

Seeding and fertilizing on forest land to promote understory browse species would create added competition for moisture and nutrients, potentially reducing forest growth. The impact is considered insignificant.

Restricting motorized vehicle travel in forested big game crucial winter ranges and during elk calving season would increase logging costs. These added costs could be reduced by extending contract periods to compensate for expected lost harvest time, thus reducing the impacts significantly.

Impacts from Recreation Resource Management. Designating the Thompson Creek area as a natural environment area and prohibiting harvesting within Deep Canyon would reduce the forest land base by 580 acres and 80 acres, respectively. This loss would be relatively insignificant because the forest land lost is neither readily accessible nor economically harvestable.

Forest land affected by designation of recreation sites would result in a loss of 25 acres of forest land. This loss also would be insignificant. Less

preferred harvest methods would be implemented adjacent to such recreation sites; however, the few acres impacted would not have a significant impact on the forest land base.

The designation of approximately 13,000 acres for semi-primitive non-motorized recreation throughout the resource area would have a slight effect on the forestry program. Of this total, approximately 10,000 acres are woodland in the Bull Gulch area. However, the Bull Gulch area has rough terrain and no suitable access. Approximately 3,000 acres in Hack Lake would have high management costs resulting from the semi-primitive non-motorized management objectives.

An estimated 9.3 million board-feet of commercial spruce-fir on Hack Lake would be affected. However, the lack of physical access to the area creates a marginal forest sales program for Hack Lake reducing the significance of the adverse impact.

Restrictions on road construction in forest areas designated semi-primitive motorized would increase harvesting costs, which would be a minor impact.

Impacts from Wilderness Resource Management. Wilderness designations of Bull Gulch (10,500 acres), Eagle Mountain (190 acres), and Hack Lake (10 acres) would reduce the forest land base by 10,700 acres. The impact of these designations on forestry would be insignificant because the primary loss would be in presently inaccessible areas with woodland species.

Impacts from Visual Resource Management. The designation of Bull Gulch and Deep Creek as visual areas of environmental concern would result in a loss of 6,350 acres of forest land. This loss would be minimal as most of this forest is unsuitable for management.

Visual resource management Class II designations would occur on 45 percent of forest land. The impact would be moderate. Stipulations placed on harvesting in these Class II areas would be undesirable.

Class III designations would occur on 25 percent of forest land. The impacts would be slight as stipulations placed on harvesting would be less severe under this class.

Impacts from Land Tenure Adjustments. Disposal zones would affect 16,130 acres of forest land. The overall affect would be minimal, although loss of forest or woodland products may be important in localized areas.

Impacts from Off-Road Vehicle Management. Off-road vehicle (ORV) limitations proposed by critical watershed, recreation and wildlife management

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would impact forest management to a moderate degree. An estimated 2,500 acres would be affected by ORV limitations. Limitations would increase the already major problem of limited access to public land, especially important to the fuelwood sale program. Closing roads or limiting use to existing or designated trails and roads would slightly affect fuelwood collection. Such limitation, however, would help control wood trespass.

Seasonal limitations (see Impacts from Wildlife Management) would affect forest product sales as well as harvesting times and costs. These impacts would have the greatest impacts on fuelwood cutters and gatherers.

Impacts from Transportation Management. Any development of roads (upgrading, new construction, easement acquisitions) would greatly benefit forest management by reducing the cost of timber sales and administrative work in the forest management program.

Impacts from Fire Management. Fire exclusion areas would provide the forest land a certain degree of insurance against major disasters. Buildups of forest fuels are inevitable, however. Managing fires within fire management areas would reduce forest fuels and competitive vegetation, thereby increasing forest growth and productivity.

Cumulative Impacts on Forestry

By intensively managing forest lands, productivity and revenues would increase. Overall health and vigor of stands would be improved, and disease and insect problems would generally be reduced. In the long term (200 or more years for productive forest land), the annual allowable harvest would increase.

Designating fire management areas would reduce fuel buildups, competitive vegetation and wildfire risks and improve forest growth and productivity. Designating fire exclusion zones would reduce timber losses from wildfire.

Approximately 78,500 acres of forest land or 98 percent of the total existing resource area forest base would be managed under harvest level 1. This management would provide an annual allowable harvest of 1.75 million board feet of timber and 3,695 cords of fuelwood. This annual harvest rate is expected to meet the demand for wood products for the next 10 years.

Approximately 215,350 acres of forest land or 83 percent of the total potential resource area forest base would be managed under harvest level 2. This management would provide an annual allowable harvest of 6.3 million board feet of timber and 7,950 cords of fuelwood. This annual harvest rate

is expected to exceed the demand for wood products for the next 10 years.

IMPACTS ON RECREATION RESOURCES

Impacts from Proposed Management Actions

Impacts from Recreation Resource Management. Because existing recreation opportunity spectrum (ROS) settings and recreation opportunities would be maintained on approximately 449,208 acres (79 percent) in the resource area, a variety of opportunities would remain available.

Primitive and semi-primitive non-motorized ROS settings in Deep Creek, Hack Lake, and Bull Gulch (12,995 acres) would be protected by off-road vehicle (ORV) closures that would prevent conflicts between non-motorized and motorized activities. Recreation designations, withdrawals from mineral entry, and prohibition of mineral leasing and mineral sales would provide additional protection of unique and fragile resource values in Thompson Creek (4,286 acres) and Deep Creek (2,470 acres). The semi-primitive non-motorized ROS class in the Hack Lake area would also receive additional protection by the recreation lands designation (3,456 acres). The change of 6,545 acres on Castle Peak from the existing semi-primitive non-motorized class to the semi-primitive motorized class would help satisfy desires of the Colorado Division of Wildlife and hunters for additional motorized access in the area. The change of 2,698 acres in Thompson Creek from the existing semi-primitive non-motorized class to the semi-primitive motorized class would allow environmental education facilities that are more consistent with management objectives of the semi-primitive motorized class.

Maintenance of existing recreational facilities would prevent deterioration of these sites. The development of the 37 additional facilities would accommodate existing and expected future recreational use, prevent deterioration of the sites resulting from this use, and reduce visitor safety and health problems.

The changes of 21,390 acres from existing semi-primitive non-motorized classes to semi-primitive motorized classes would have low adverse impacts. Although these changes represent a substantial reduction of scarce semi-primitive non-motorized recreation opportunities on public lands, the significance is reduced because user preferences for hunting and hiking, the major activities in the affected areas, are equal for semi-primitive non-motorized and semi-primitive motorized settings.

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Impacts from Water Quality Management. Improvement in water quality would benefit aquatic habitat by decreasing sedimentation and salinity. The effects of aquatic habitat improvement on recreation are discussed in the Impacts from Aquatic Habitat Management section.

Impacts from Water Yield Management. Proposed vegetation manipulations, in combination with vegetation manipulations proposed by terrestrial habitat management and livestock grazing management and proposed timber harvesting would cause concentrations of vegetation and surface disturbances that would be inconsistent with management objectives for the existing semi-primitive non-motorized and semi-primitive motorized classes and result in changes, respectively, to the semi-primitive motorized and roaded natural classes. The impacts are quantified in the cumulative impacts section for this alternative.

Impacts from Critical Watershed Areas. ORV limitations in critical watershed areas would have adverse impacts on motorcycle and four-wheel drive use. Although the affected areas are generally near population centers, thus potentially increasing the significance, the overall adverse effect is low because ORV use on public land is a very small percentage of the total use in the region.

Impacts from Aquatic Habitat Management. Habitat improvement of 90 miles of streams in the resource area would increase fish populations and could enhance fishing opportunities by increasing the fishing success ratio. However, the effect cannot be quantified since fishing success is only one of several factors that affect a fishing experience.

Designation of Hack Lake as an area of critical environmental concern (ACEC) would protect habitat for the state listed threatened Colorado River cutthroat trout that is one of the resource values identified within the proposed Hack Lake recreation lands.

Impacts from Terrestrial Habitat Management. Manipulating 1,820 acres of vegetation per year would increase big game populations and could enhance hunting opportunities by increasing the hunting success ratio. However, the effect cannot be quantified since hunting success is only one of several factors that affect a hunting experience. See the Impacts from Water Yield Management section for adverse impacts of proposed vegetation manipulations.

Seasonal ORV limitations prohibiting snowmobile use would have low adverse impacts in most of the Roaring Fork Capability Unit and low to moderate adverse impacts in the Basalt Mountain area. The impacts are more significant in the Basalt Mountain

area because public lands are mainly used for access to national forest lands where most of the snowmobile use occurs. The impacts of the limitation on motorcycle and four-wheel drive use would be minimal.

Impacts from Forest Management. In addition to impacts discussed under Impacts from Water Yield Management, proposed timber harvesting in the Hack Lake area would cause a short-term change of the existing semi-primitive non-motorized ROS class (2,426 acres) to the semi-primitive motorized ROS class. However, the overall effect would be minimal since the long-term management objectives for the semi-primitive non-motorized ROS class would not be changed.

Impacts from Wilderness Resource Management. Designation of 10,755 acres in the Eagle Mountain, Hack Lake, and Bull Gulch Wilderness Study Areas (WSAs) would help maintain existing ROS settings and recreational opportunities in these areas. Designation of the 10,415 acres in the Bull Gulch WSA would protect identified ecological, geological, and scenic values, but would cause the proposed recreation lands designation to be duplicative of wilderness designation.

Impacts from Visual Resource Management. Designation of 12,102 acres in Thompson Creek, Deep Creek, and Bull Gulch as ACECs and management under visual resource management (VRM) Class I objectives would provide additional protection of primitive and semi-primitive non-motorized settings and fragile and unique resource values. VRM Class II objectives would protect semi-primitive non-motorized settings in Hack Lake, and the 2,452 acres of the Bull Gulch area outside of the proposed ACEC.

Impacts from Land Tenure Adjustments. The proposed disposals would have minimal to low adverse impacts on dispersed recreation opportunities, mainly hunting, because most of the tracts are small and many are currently inaccessible to the general public. Furthermore, the losses of opportunities would be offset by the increases in opportunities resulting from acquisitions of legal access (see Impacts from Transportation Management).

Impacts from Transportation Management. Legal access acquisitions would accommodate existing levels of recreation use and expected future demand for all recreational activities. These access acquisitions would result in a moderate to high increase in visitor use throughout the resource area. Acquisition of private land on the upper Colorado River near Burns and near Twin Bridges would allow the development of river access sites that would accommodate existing and future levels of floatboating use and reduce trespass problems on

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private land. Additional legal access to Thompson Creek would enhance recreational opportunities by allowing more complete use of the area.

Impacts from Utility and Communication Facility Management. The unsuitable and sensitive zoning classifications would help protect all developed recreation sites, all primitive and semi-primitive non-motorized ROS classes, the proposed Thompson Creek Natural Environment Area, and the entire upper Colorado River corridor between State Bridge and Dotsero by either precluding construction of such facilities or identifying areas where restrictive stipulations would be applied to reduce the impacts.

Impacts from Fire Management. Including all developed sites in the fire exclusion zones would help protect the sites from wildfire and decrease fire hazards to recreationists.

Cumulative Impacts on Recreation Resources

Existing ROS settings and recreation opportunities would be maintained on approximately 79 percent of the resource area; thus, a variety of settings would be maintained.

Recreation designations, withdrawals, ORV closures and limitations, VRM objectives and designation of ACECs, zoning for utility and communication facilities, and wilderness designation would protect primitive and semi-primitive non-motorized ROS classes, and unique and fragile resource values in Thompson Creek, Deep Creek, and Bull Gulch. Maintenance of existing recreational facilities would prevent deterioration of these sites. The development of 37 additional facilities would accommodate and prevent deterioration caused by existing and future levels of recreational use. Legal access acquisitions to currently inaccessible public lands would provide for future recreation demands for all activities. The acquisitions would result in moderate to high increases in recreational use throughout the resource area.

Concentrations of vegetation manipulations and timber harvesting would change 13,147 acres of existing semi-primitive non-motorized to semi-primitive motorized and 95,444 acres of existing semi-primitive motorized to roaded natural. Additional impacts to the physical settings could occur since any future proposals would be subject to the less restrictive management objectives of the proposed classes. The overall effects of the changes would be low, however, as approximately 12,955 acres of public land in the resource area would remain in the semi-primitive non-motorized class and approximately 240,021 acres would remain in the semi-primitive motorized class. Thus, supplies of semi-primitive non-motorized and semi-primitive motor-

ized recreational opportunities would remain available in the resource area and a variety of opportunities would also be available.

Changes of existing semi-primitive non-motorized classes to semi-primitive motorized would cause a loss of 21,390 acres of scarce semi-primitive non-motorized recreational opportunities. However, the overall adverse effects would be low because user preferences for the major activities that occur in the affected areas are equal for semi-primitive non-motorized and semi-primitive motorized settings.

IMPACTS ON SOCIAL AND ECONOMIC CONDITIONS

Impacts from Proposed Management Actions

Impacts from Water Quality Management. Efforts to monitor and address water quality problems might have some marginal social and economic impact. The quality of water for recreational use might be improved and water treatment costs could be slightly lowered.

Impacts from Water Yield Management. Demand for water locally and throughout the western United States promises to continue to grow. An anticipated increase in water yield of 13,200 to 14,940 acre-feet, equal to about 3 percent of annual use in the Colorado portion of the Colorado River drainage, would yield positive economic and social benefits.

Impacts from Critical Watershed Areas. Municipal watershed protection would probably lower water treatment costs. Reduced debris flow would prevent property loss or damage to private landowners. Off-road vehicle restrictions in erosion hazard areas would reduce sediment yield and prolong the useful life of downstream retention or diversion structures resulting in marginal economic benefits.

Impacts from Aquatic Habitat Management. Improved aquatic habitat and higher fish populations would increase the probability of catching fish which would improve the quality of the fishing experience with positive economic and social results.

Impacts from Livestock Grazing Management. Table 5-26 shows the estimated economic impacts of forage allocation under this proposal. The net effect of increasing animal-unit months (AUMs) by 679 would generate small increases in gross and net revenue. The effect on individual operations would be significant; however, as 69 ranches would lose a total of 6,401 AUMs and 89 ranchers would gain a total of 7,080 AUMs.

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TABLE 5-26. INCOME EFFECTS OF CHANGES IN FORAGE ALLOCATION

	Number of Ranches	Change in Forage Allocation (AUMs)		Change in Gross Revenue (dollars)		Change in Net Revenue (dollars)	
		Total	Average	Total	Average	Total	Average
Initial Allocation							
Reductions	69	-6,401	-93	-195,519	-2,834	-117,174	-1,698
Increases	89	+7,080	+80	+212,462	+2,387	+125,157	+1,406
Net	158	+679	+4	+16,943	+107	+7,983	+51
Potential Allocation							
Reductions	14	-724	-52	-21,869	-1,562	-12,699	-907
Increases	137	+26,473	+193	+856,735	+6,254	+543,042	+3,964
Net	151	+25,749	+171	+834,866	+5,529	-530,343	+3,512

The methodology used to assess the income effects of changes in forage allocation does not enable the evaluation of specific ranching operations. However, estimated changes in average net revenue (personal income) by ranch size suggest that several ranches would be significantly affected (see Appendix J, Table 3). Average net revenue changes for mid-size cattle ranches range from a reduction of \$4,500 per ranch to an increase of \$3,719. To the extent that individual operations would be economically affected, their social well-being and quality of life would also be affected.

Any adverse impacts would be mitigated by several factors. Forage would not be reduced until monitoring had verified the need for reductions. The monitoring period (5 years) would provide an opportunity to find alternate sources of forage and income and thus to avoid the full impact of forage reductions.

In addition, forage improvement projects would increase most permittees' livestock forage considerably in the long term. Successful implementation of proposed projects would increase available forage by 25,749 AUMs, 68 percent of current public land usage, stimulating an increase in gross revenue of \$834,866, 4 percent of current gross, and a 30 percent increase in net revenue.

Impacts from Terrestrial Habitat Management. Forage allocated to big game would increase by 1 percent in the long term. However, big game forage would be lost in some areas due to residential and commercial development of private land and of public land that had been sold. The net impact would be a 19 percent shortfall in forage available to big game.

The shortfall would translate into directly proportional reductions in deer and elk populations and in recreational uses of big game with adverse eco-

nomics impacts. Local expenditures in support of big game recreational activities would decrease by \$2.8 million from the current \$14.8 million. Employment would be reduced by 207 man-years. Direct and induced reductions in personal income would total \$1.4 million. The impact of these declines in income and employment would be strengthened because they would largely occur in the fall, a traditionally slow economic period.

The social well-being and quality of life of some area residents would also suffer because of economic loss and increased difficulty in successfully pursuing wildlife-related recreational activity.

Access recommendations under this proposal could result in some increase in hunter use of public land. To the extent this encouraged more hunting activity in the resource area, economic benefits would accrue. Most of the use would simply be movement from other parts of the resource area; however, access to or through public land would also diminish somewhat the income of those who charge gate fees for access through their property.

Impacts from Forest Management. Harvest level 1 would supply 1.75 million board feet and 3,695 cords of timber annually, which would yield a federal revenue of \$82,000 per year. Half of the fuelwood would be sold later by commercial cutters and all of the timber would be manufactured and sold as lumber, together generating sales of \$890,000 a year, about 10 percent of current wood product sales in the area generated by BLM and the U. S. Forest Service. Personal income of \$337,000 and 31 man-years of employment would be generated, although much of the impact would occur outside the resource area.

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The sale of 1,848 cords of fuelwood to the public would help offset residential energy costs as well as provide an opportunity for people to socialize and recreate with friends and family.

Of the 6.3 million board feet of timber that harvest level 2 would make available, only 3 million board feet is likely to be sold. Together with sales of 7,950 cords of fuelwood, \$156,000 in federal revenue would be created. Half of the fuelwood would be resold later by commercial cutters. With the manufacture and sale of 3 million board feet of lumber, local sales of \$910,000 would be generated. Those sales would in turn bring about \$1.8 million in total local economic activity, \$345,000 in local income, and 32 man-years of employment. Much of it would occur outside the resource area, however.

Impacts from Recreation Resource Management. The local economic and social impacts of recreation management activities would be minimal. An increased number of recreation facilities could improve the quality and hence the value of recreational experiences.

Impacts from Wilderness Resource Management. An insignificant quantity of commercial timber in the Bull Gulch Wilderness Study Area could be removed from the area's timber supply with no economic impact. Only low mineral values are affected one way or the other with no economic impact. There is unlikely to be any change in the total amount of recreation use in the resource area because of this recommendation and, hence, no economic impact due to changes in recreation use. The potential for increasing livestock forage would be reduced by limitations placed on vegetative manipulation but the economic impact would be minimal.

Impacts from Land Tenure Adjustments. The 37,550 acres that would be made available for sale are equivalent to slightly more than 5 percent of the private land base in the resource area. This increase in the supply of available land could have a downward effect on the price of other undeveloped land, particularly on nearby properties. Such an effect would benefit potential buyers but adversely affect landowners.

An increase in BLM administrative costs would be required to handle increased sales activity. However, clarification of the disposal status of public land in the resource area would reduce costs for both BLM and applicants.

Sales revenue could be as much as \$15 million based on estimated sales prices of \$200 to \$1,000 per acre. Receipts would go to the federal treasury. Local jurisdictions would benefit from increased property tax revenues, although their administrative

costs would increase by additions to the private land base.

The proposed sale and exchange tracts include a significant amount of crucial big game winter range, 27,490 acres. The average value of crucial winter range in the resource area has been estimated at \$176 to \$725 per acre (see Existing Management Situation, Wildlife, available for review at the Glenwood Springs Resource Area office). If, after disposal, that land is developed and lost forage is not replaced, adverse economic impacts would be felt. The economic analysis of the terrestrial habitat management proposals assumes such a loss.

The tracts also include land with 4,107 AUMs of livestock forage which could be transferred to private ownership and potentially lost as productive rangeland.

Cumulative Impacts on Social and Economic Conditions

Table 5-27 shows the cumulative annual impacts of the proposed management actions on personal income and employment. Net changes for both are small relative to resource area totals but individuals or certain groups may be significantly affected. Other proposed management actions would not have measurable economic impacts. Area population and the provision of public and social services would not be affected.

TABLE 5-27. CUMULATIVE IMPACTS ON PERSONAL INCOME AND EMPLOYMENT

Management Activity	Change Agent	Change in Personal Income (\$1000)	Change in Employment (man-years)
Livestock Grazing...	+679 AUMs.	+17.....	
Wildlife Habitat.....	-19 percent.	-1,400.....	-207
Forest Land.....	+3,598 to 6,975*.	+337 to 345.	+31 to 32
Net Change.....		-1,038 to 1,046.	-175 to 176

*thousand board feet

The impacts from terrestrial habitat and forest management would endure over the long term. The livestock grazing management impacts would be short term but are included here because it would be short-term forage allocation decisions which might be decisive to individual ranchers.

Social well-being and quality of life are unlikely to be significantly affected by proposals under this alternative.

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IMPACTS ON CULTURAL RESOURCES

Impacts from Proposed Management Actions

Impacts from Cultural Resource Management. Designation of the Blue Hill Archaeological District as an area of critical environmental concern and nomination to the *National Register of Historic Places* would help protect significant cultural resources and provide additional information about prehistoric cultures.

Actively managing high value cultural sites would substantially decrease the number of sites lost and would slow or prevent deterioration of the values present. Establishing and maintaining accurate and complete data about these sites would also significantly add to our knowledge of these past cultures.

Cultural resource inventories conducted for all surface-disturbing activities would result in increased information about the local cultural resources and thus contribute to our knowledge of the past.

No significant adverse impacts would occur from managing high value sites or from protecting the Blue Hill Archaeological District.

Impacts from Livestock Grazing. Livestock grazing would result in cultural resource loss or damage as a result of livestock trampling and rubbing. However, present information indicates these impacts would be insignificant because most sites are not susceptible to these impacts.

Cumulative Impacts on Cultural Resources

Cumulative impacts would be the same as those presented under Proposed Management Actions.

IMPACTS ON PALEONTOLOGICAL RESOURCES

Impacts from Proposed Management Actions

Proposed management actions would not adversely affect paleontological resources. Required paleontological resource clearances in areas with a high probability of fossil occurrence would prevent the accidental destruction of any fossils present.

Required paleontological resource clearances would result in beneficial impacts. Information would be collected about local paleontological resources. However, little information would be collected, as few projects are proposed in high occurrence areas.

Cumulative Impacts on Paleontological Resources

Cumulative impacts would be the same as those presented under Proposed Management Actions.

IMPACTS ON WILDERNESS VALUES

Impacts from Proposed Management Actions

Impacts from Wilderness Resource Management. Designating the entire Eagle Mountain Wilderness Study Area (WSA) (330 acres) and portions of the Hack Lake (10 acres) and Bull Gulch (10,415 acres) WSAs as wilderness would protect wilderness values and permit the natural ecological processes to continue. Protecting the wilderness values would in turn benefit related supplemental values such as wildlife, geological, ecological, and scenic values.

Diversity in the local wilderness supply would increase as a result of the designation of the Bull Gulch WSA because its ecosystem type is not locally represented.

Transferring administration of the entire Eagle Mountain WSA and the suitable portion of the Hack Lake WSA to the U. S. Forest Service would provide consistent management with the existing adjacent wildernesses.

Wilderness values would be adversely affected by nondesignation of the 19,875 acres recommended as nonsuitable since the areas would be open to development of other resources. These impacts are discussed below by resource activity and in the cumulative impacts section.

Impacts from Water Yield Management. Vegetation manipulations to increase water yield would impair naturalness throughout the Castle Peak WSA and in the nonsuitable portions of the Bull Gulch and Hack Lake WSAs.

Impacts from Aquatic Habitat Management. Designation of Hack Lake as an area of critical environmental concern (ACEC) and habitat improvement would protect habitat for the Colorado River cutthroat trout, a state threatened species and one of the supplemental values of the wilderness study area.

Impacts from Livestock Grazing Management. Vegetation manipulations would impair naturalness on 672 acres in the nonsuitable portion of the Bull Gulch WSA south of Alamo Creek.

Impacts from Forest Land Management. Commercial timber harvesting in the Castle Peak WSA

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and nonsuitable portions of the Hack Lake and Bull Gulch WSAs would impair the naturalness throughout these areas. Human activities and noise associated with timber harvesting would also reduce opportunities for solitude.

Impacts from Recreation Resource Management. The off-road vehicle (ORV) closure and long-term management under objectives for the semi-primitive non-motorized class would maintain primitive recreational opportunities in 3,108 acres of the nonsuitable portion of the Hack Lake WSA. The no surface facilities stipulation on oil and gas leasing in this semi-primitive non-motorized zone would also provide protection of the area's natural character. The ORV closure and management under semi-primitive non-motorized objectives would help maintain primitive recreation opportunities in the suitable portion of the Bull Gulch WSA; however, motorized use would be prohibited regardless upon designation. Motorized vehicle use would be allowed in the Castle Peak WSA and the nonsuitable portion of the Bull Gulch WSA and could conflict with and reduce opportunities for primitive types of recreation. However, the ORV limitation on approximately 6,200 acres of the Castle Peak WSA would reduce conflict and maintain some primitive recreation opportunities.

Impacts from Visual Resource Management. Designation of 6,714 acres within the suitable portion of the Bull Gulch WSA as an ACEC and management under visual resource management (VRM) Class I objectives would provide additional protection of the area's visual quality. However, all of the suitable areas would be managed under Class I objectives upon wilderness designation. All of the nonsuitable portion of the Hack Lake WSA and 9,314 acres of the Castle Peak WSA would be managed under VRM Class II objectives, which would protect their visual qualities. Visual quality could be degraded in the nonsuitable portion of the Bull Gulch WSA and the remaining 2,626 acres of the Castle Peak WSA because of the less restrictive VRM Class III and Class IV objectives.

Impacts from Utility and Communication Facility Management. Zoning all of the suitable areas and 6,207 acres of the Castle Peak WSA as unsuitable for utility and communication facilities would help protect the naturalness of the areas. Zoning the nonsuitable portion of the Hack Lake WSA and 429 acres of the nonsuitable portion of the Bull Gulch WSA as sensitive for such facilities would not eliminate but could reduce impacts on naturalness. The remaining 9,889 acres of the nonsuitable areas would be in the suitable zone for utility and communication facilities and would be adversely impacted if such facilities were located within the areas.

Cumulative Impacts on Wilderness Values

Wilderness values would be preserved in 10,755 acres in the Eagle Mountain, Hack Lake, and Bull Gulch WSAs. Preservation of wilderness values would in turn protect related supplemental values including wildlife, geological, ecological, and scenic values. Diversity in the local wilderness supply would be increased by designation of the suitable portion of the Bull Gulch WSA since its ecosystem type is not currently represented locally.

Wilderness values would be adversely affected by non-designation of the 19,875 acres recommended as nonsuitable. The areas would be open to development of other resources including mineral exploration and production, timber harvesting, and vegetation manipulation that would impair naturalness throughout the areas. A no surface facilities stipulation on oil and gas leasing in the Hack Lake area would provide some protection of the area's natural character. Vehicular use would be allowed in the Castle Peak WSA and nonsuitable portion of the Bull Gulch WSA and would reduce opportunities for primitive types of recreation. Human use associated with resource development activities and motorized recreation could eliminate the outstanding opportunities for solitude in these two areas. Opportunities for primitive recreation and solitude in the Hack Lake WSA would be maintained in the long term through the ORV closure and the ROS management objectives for the semi-primitive non-motorized class. However, the wilderness values in all the nonsuitable areas would be lost forever over the long term.

IMPACTS ON VISUAL RESOURCES

Impacts from Proposed Management Actions

Impacts from Visual Resource Management. Visual quality on approximately 511,970 acres (90 percent) of the resource area would be maintained, or improved by rehabilitation of the nine specific cultural modifications that have been identified as having rehabilitation potential. Rehabilitation of eight sites would reduce their visual contrast to conform with the visual resource management (VRM) objective for the class in which each is located. Rehabilitation of the old burn south of Battlement Mesa would result in a change of 173 acres from Class V to Class IV. Rehabilitation of the off-road vehicle (ORV) areas near Gypsum and Eagle would be the most significant since both areas are within the viewshed of Interstate 70.

Designation of 12,102 acres in the Thompson Creek, Bull Gulch, and Deep Creek areas as scenic

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of critical environmental concern (ACECs) and management under Class I objectives would provide additional protection of the visual qualities of these areas.

Impacts from Water Yield Management. Proposed vegetation manipulations, in combination with vegetation manipulations proposed by terrestrial habitat management and livestock grazing management, and proposed timber harvesting, would cause concentrations of vegetation and surface disturbances that would be inconsistent with VRM Class II objectives and result in changes to Class III. The impacts are quantified in the cumulative impacts section for this alternative.

Impacts from Critical Watershed Areas. The ORV limitations would help maintain visual quality in the restricted areas by reducing degradation from ORV use. The debris flow area near Glenwood Springs and the ORV areas near Gypsum and Eagle would be the most significant since these areas are within the viewshed of Interstate 70 and the limitations would be necessary for successful rehabilitation of the ORV areas.

Impacts from Recreation Resource Management. Management objectives for the primitive and semi-primitive non-motorized recreation opportunity spectrum (ROS) classes would help maintain visual quality. The proposed ACECs in Deep Creek and Bull Gulch and the Class A scenic quality areas on Hack Lake are within these ROS classes. ORV closures and limitations in the above areas would also help maintain visual quality.

Impacts from Wilderness Resource Management. Designation of 10,755 acres as wilderness would maintain the visual quality of the areas in a natural state. Designation of the suitable portion of the Bull Gulch WSA would help protect the visual quality of the proposed ACEC.

Impacts from Utility and Communication Facility Management. The unsuitable classifications would protect visual quality by precluding construction of utility and communication facilities. The three proposed ACECs (12,102 acres) are included in this classification. The sensitive classification would protect visual quality by identifying areas where restrictive stipulations would be applied to mitigate the impacts of such facilities in conformance with VRM objectives.

Cumulative Impacts on Visual Resources

Visual quality of approximately 90 percent of the resource area would be maintained, or improved by rehabilitation of cultural modifications. Designation of the three proposed ACECs and management under VRM Class I objectives would provide addi-

tional protection of the visual qualities of these areas.

Fifty-four thousand, seventy-two acres of tentative VRM Class II would be changed to Class III and managed under the less restrictive objectives. Visual quality in these areas would be degraded by concentrations of vegetation manipulations and timber harvesting. Additional degradation could occur since any future proposals would also be subject to the less restrictive Class III objectives. The overall detrimental effects would be low, except on approximately 7,700 acres near Wolcott and Eagle that are within the foreground of Interstate 70 and Colorado Highway 131 on which the manipulations would have a moderate to high impact on the visual quality.

IMPACTS ON TRANSPORTATION

Impacts from Proposed Management Actions

This alternative would provide greater access to public land. Traffic on roads and trails would increase as public access was obtained and road conditions improved. This would create some adverse impacts on the land itself due to resource degradation such as vandalism, littering, and ORV damage caused by the increased use.

This alternative would provide better quality roads, but more maintenance would be needed as economic development would place greater traffic on the transportation system. Many important resource programs would have two points of access which would spread out use and provide alternate ingress and egress in poor weather. This would help to prevent degradation to the transportation system.

The resource programs proposing management actions on the lands identified for access would benefit as it would help them accomplish their management objectives.

A substantial amount of access has been proposed in this alternative (an increase of approximately 100 miles of public roads and 42 miles of public trails) which should satisfy the public's demand for access and support all BLM resource programs.

Cumulative Impacts on Transportation

Cumulative impacts would be the same as those presented under Proposed Management Actions.

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IMPACTS ON AIR QUALITY

Impacts from Proposed Management Actions

Short term localized impacts to air quality would result from mechanical and burning vegetation manipulations. These impacts would be small in scale and dispersed throughout the resource area. These factors combined with standard design features for vegetation manipulations would reduce the significance of the impacts.

Somewhat intense development proposed under the Preferred Alternative and anticipated regional growth and energy minerals development would result in commensurately higher levels of air pollution. Emissions from primary sources would be minimized through applicable policies, regulations, and statutes.

Cumulative Impacts on Air Quality

Cumulative impacts would be the same as those discussed under Impacts from Proposed Management Actions.

IMPACTS ON SOILS

Impacts from Proposed Management Actions

Impacts from Water Quality Management. Proposals for maintaining or improving water quality might benefit soils. For example, measures to reduce sediment could also reduce erosion and measures to protect riparian areas could also improve soil productivity in those areas. The actions that would be taken are not yet known; consequently, impacts cannot be quantified.

Impacts from Water Yield Management. The impacts on soils from water yield management would be similar to those expected from range and wildlife vegetation treatments and from timber harvesting. The changes in erosion conditions expected from water yield mechanical treatments on typical sites would be initially 1.1 tons per acre per year (present erosion); increase to 6.8 tons per acre per year immediately following treatment (short-term erosion); and return to 1.1 tons per acre per year within 3-5 years (long-term erosion).

In the short term, treatment of 17,246 acres of aspen would increase soil loss by 9,830 tons per

year on the basis of the change in erosion rate mentioned above and implementation of 10 percent of the total treatment proposed each year. The significance of this increase is discussed in Impacts on Water Quality in terms of sediment yield.

Impacts from Critical Watershed Areas. Minimizing surface disturbance in critical watershed areas would prevent an increase in erosion and would probably protect soil productivity.

Impacts from Minerals Management. Surface disturbance resulting from mine development and operation would cause short-term increases in erosion. Impacts would continue until rehabilitation measures were completed. Road construction would have one of the greatest impacts on soils from minerals management. The impacts of road construction on soils are discussed in the Impacts from Forest Management section.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Implementation of grazing systems would have long-term beneficial impacts on soils. Rest from livestock grazing during critical growing periods would improve plant vigor, reproduction, and litter accumulation and increase the organic matter content in surface soils. This would cause beneficial changes in soil structure, permeability, and, potentially, the soil's productivity. Impacts from rest rotation grazing would be greater than from deferred rotation grazing because in the former system at least one pasture would be rested annually through the entire year whereas in the latter every pasture is grazed each year (see Appendix A for a description of grazing systems).

Mechanical vegetation manipulation would create localized short-term impacts on the soil resource. Disturbance caused by plowing or discing could increase the surface soil's permeability. The length of time during which measurable increases in permeability would be evident is unknown but permeability would decrease with time. Soil loss through wind and water erosion would increase until revegetation occurred. Compaction caused by mechanical equipment would be short-term and would not be significant.

Burning would cause localized short-term impacts on the soil's physical, chemical, and biological properties primarily through the loss of ground cover and litter accumulation. The severity of the impact would depend on the fuel type and the intensity of the fire. Burning might decrease soil infiltration rates in some soils which would result in accelerated erosion and the removal of some nutrients mineralized by the fire. After burning, concentrations of calcium and magnesium might be greater in the surface soils and the water-soluble potassium concentrates might be less. Total nitrogen

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could be lower in soils of the burned area, which would decrease soil productivity (BLM Grand Junction Grazing EIS 1979). The overall effect on plant production would depend on the initial concentration of these nutrients in the sites selected for burning. This data is not known at present.

Loss of vegetation would increase evaporation rates from the soil (Shown, Lusby, and Branson 1972) resulting in reduced soil moisture content. This would retard seedling emergence and plant growth. Data is not available to predict the magnitude of these changes.

Soil erosion from wildlife and livestock vegetation manipulation would increase during the short-term.

Erosion would be greatest immediately following disturbance. It would decline rapidly with the establishment of new vegetation during the next two to three years and then decline at a slower rate. In the long term, erosion probably would be less than current losses. This would be due to better livestock distribution and increased ground cover. Potential changes in soil erosion due to practices such as chalking, plowing, furrowing, brush beating, spraying, and burning are indicated in Table 5-28 for typical site conditions where treatments would be implemented.

TABLE 5-28. POTENTIAL SOIL LOSS FROM MECHANICAL TREATMENT AND BURNING

(in tons per acre per year)

Vegetation Type	Present Erosion		Short-Term Erosion		Long-Term Erosion	
	Mechanical Treatment	Burning Areas	Mechanical Treatment	Burning Areas	Mechanical Treatment	Burning Areas
Sagebrush.....	2.8	4.2	3.4	15.6	2.1	3.9
Mountain Brush.....	2.3	3.4	3.2	15.6	1.3	2.8
Pinon-Juniper.....	3.4	5.0	3.8	11.7	3.4	5.0

The sediment yield impacts from range and wildlife treatment on approximately 70,630 acres of the three vegetation types mentioned above over a 10-year period are discussed in Impacts on Water Quality.

Impacts from Forest Management. The greatest impact on soils from forest management is the road construction associated with harvest operations. Clearing and grubbing exposes the soil to accelerated erosion by various agents such as water, wind, and freeze/thaw cycles. Cut and fill excavation causes adverse impacts by altering the natural drainage from hillsides, exposing underlying soils to weathering actions, and removing lateral support for adjacent material, potentially causing slumps or landslides to occur. Blasting may cause fractures or settling of the soil and an increase in erosion. Depending on soil material, newly constructed fills having slopes greater than 2:1 or 3:1 are subject to failure and may contribute to increased erosion and sedimentation until stabilized. Additional sediment yield from these sources would shorten the useful life of downstream dams or other water diversion or retention structures.

The type of cutting practice selected can also affect soil conditions. Clearcutting results in the greatest increase in soil loss per acre and also in-

creases the potential for landslides on noncohesive soils. Thinning and selective cutting leave most of the ground cover intact and result in minimal soil exposure. Changes in erosion from harvest practices on typical sites in the resource area are indicated in Table 5-29.

The annual harvest of 1.8 million board feet of sawtimber and 3,695 cords of fuelwood would disturb 525 acres (if clearcut) and result in the loss of 3,171 tons of soil annually in the short term. In the long term, increases in vegetation cover in woodland areas would reduce soil losses by 280 tons per year. If selective cutting is the method used for harvest, 1,312 acres of productive forest land and woodland would be disturbed resulting in a short-term soil loss of 5,165 tons per year. In the long term, soil loss would be 700 tons per year less than existing conditions. The significance of sediment yield resulting from timber harvesting is discussed in Impacts on Water Quality.

Impacts from Off-Road Vehicle Management. Off-road vehicle (ORV) restrictions in 63,184 acres of municipal watershed areas, debris flow hazard zones, and erosion hazard areas should result in beneficial impacts on soils (see Impacts on Critical Watershed Areas for a discussion of the impacts of ORV use). Restrictions in these areas, particularly

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TABLE 5-29. EXPECTED SOIL LOSS FROM TIMBER HARVESTING

(in tons per acre per year)

	Present Erosion		Short-Term Erosion		Long-Term Erosion	
	Selective Cut Areas	Clear-cut Areas	Selective Cut Areas	Clear-cut Areas	Selective Cut Areas	Clear-cut Areas
Productive Forest Land						
Less than 40 percent slope	1.1	1.1	4.5	6.8	1.1	1.1
Woodland						
Less than 40 percent slope	6.8	6.8	11.3	13.2	5.7	5.7

erosion hazard areas that currently receive substantial ORV use, should result in improved vegetation cover and reduced erosion.

Limiting ORV use on 56,868 acres of crucial big game winter range in areas with erosion hazard ranging from low to high would have a beneficial impact. ORV use is generally low, but is expected to increase substantially in the Battlement Mesa area. The limitation period would be from January through April when soils are either frozen or wet. Soils are most susceptible to ORV damage when wet, consequently closures in these areas would protect the soils when they were most sensitive.

Restrictions to protect recreation resource values and in wilderness study areas would have minimal beneficial impacts due to the low level of current or projected ORV use.

Impacts from Utility and Communication Facility Management. Impacts would depend on the type and extent of surface disturbance. Impacts would probably be short term pending successful reclamation.

Cumulative Impacts on Soils

Short-term increases in erosion would result from mechanical treatments and burning associated with wildlife, water yield, and forestry management practices. In the long-term, improved vegetative cover conditions would be expected to bring erosion below its current level. Short-term increases in erosion would also result from soil disturbance associated with minerals, transportation, and utility and communication facility management. Road construction would be a major cause of erosion and impacts from this source would last until reclamation stipulations effectively stabilized these areas. Beneficial impacts on soils would be expected from ORV restrictions in erosion hazard areas.

Approximately 172,000 acres would be affected by ORV limitations. Limitations in erosion hazard areas where there is existing ORV use would pre-

vent further damage and result in some vegetation recovery. ORV use limitations in big game crucial winter range would protect watersheds when they were most susceptible to damage. Other ORV limitations would provide limited benefits because they are in areas with minimal existing or projected ORV use.

IMPACTS ON WATER QUALITY

Impacts from Proposed Management Actions

Impacts from Water Quality Management. Review of project proposals and the addition of stipulations to prevent adverse impacts would potentially minimize water quality degradation in the short term and maintain existing quality in the long term. Monitoring two areas where known water quality problems exist (see Map 3-1) to identify the problem source and feasibility of reducing the problem probably would result in beneficial impacts on water quality. The problems in these areas are listed in the Management Situation Analysis and include high sediment, sulfate, and salinity levels. The quantification of impact benefits cannot be determined until the problem sources are identified and measures to reduce the problem selected.

Impacts from Water Yield Management. Approximately 17,250 acres of aspen would be converted to increase water yield in this alternative. Patch cutting would be the preferred method of aspen conversion. Sediment during the 10-year implementation period would increase by about 3,200 tons per year. Sediment yield would be greatest immediately following disturbance and would decline rapidly as vegetation reestablished. In the long term, sediment yield would be expected to return to its original level.

Salinity impacts from vegetation manipulations would be proportional to runoff quantity and duration, mineral content of the soil, and the resultant

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soil disturbance and erosion. Excessive runoff and accelerated erosion would degrade water quality until the soils were stabilized or runoff velocities decreased. Impacts would be local and insignificant.

Impacts from Minerals Management. Impacts would depend on the mining method and type of mineral mined. Potential short-term, generally insignificant salinity and sediment impacts would continue to occur from existing mineral developments. Spoil pile runoff would increase surface water salinity and sediment. A secondary source of these impacts would include improperly designed or rehabilitated roads, pipelines, and drill pads. Impacts would continue until soils were stabilized by revegetation or other land treatments such as water bars, generally accomplished during rehabilitations.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Manipulating 48,540 acres of sagebrush, mountain brush, and pinyon-juniper to meet the forage requirements of wildlife and livestock would increase sediment yield by 1,100 to 23,400 tons per year during the 10-year implementation period. The range would be dependent on the type of manipulation selected, mechanical or burning. In the long term, ground cover on sagebrush and mountain brush manipulation areas would improve and, in turn, decrease sediment yield by 6,017 to 8,089 tons per year.

Burning as a management tool for implementing range and wildlife vegetation manipulations would cause several chemical reactions and nutrient losses in addition to increases in runoff and sediment that would adversely affect water quality (see Impacts on Soils). Short-term increases in salinity in local streams could be expected, and the potential for algae blooms in stock ponds from increased phosphorous levels would also exist. Impacts probably would not be significant and concentrations of nutrients and salts would decrease rapidly as watershed conditions stabilized.

Livestock grazing management involving proper stocking rates, seasons of use, and plant use would have no significant impact on salinity. Excessive grazing resulting in reduced ground cover and increased compaction would increase runoff, erosion, and salinity. Implementation of allotment management plans would minimize salinity impacts.

Little change in fecal coliform levels would be expected from livestock grazing management. The effects of an increase in livestock numbers should be offset by improved livestock distribution and by aquatic habitat improvements that protect riparian areas.

Impacts from Forest Management. Only one harvest level is recommended in this alternative. It would involve harvesting commercial species and

fuelwood on less than 40 percent slopes. Annual sediment yield resulting from harvesting 1.8 million board feet of sawtimber and 3,535 cords of fuelwood per year would range from 1,602 tons from clearcutting to 2,680 tons from selective cutting. Impacts per acre would be greater from clearcutting but total acres disturbed would be greater from selective cutting.

In the long-term, sediment yield from woodland harvest areas would decrease from 141 to 352 tons per year due to increases in cover conditions.

Impacts from Recreation Resource Management. Upgrading of floatboating access areas would include establishing sanitary facilities. This would decrease the amount of bacteria entering surface waters, thereby improving water quality. The impact would be localized, beneficial, and long term.

Impacts from Wilderness Resource Management. Recreational activity would impact bacteriological quality of water. Increased recreational use in wilderness study areas (WSAs) would result in a corresponding increase in bacteria due to lack of established sanitary facilities. The impact would be dispersed throughout the WSA and would be intermittent depending on recreational use patterns.

Impacts from Off-Road Vehicle Management. Off-road vehicle (ORV) activity would decrease ground cover and reduce infiltration by compaction resulting in accelerated runoff and erosion (see Impacts on Critical Watersheds). Limiting ORV use to areas of non-saline soils would minimize dissolved solid water quality degradation. Restrictions proposed to control ORV use in sensitive areas would somewhat reduce overall adverse impacts and would likely have an insignificant, localized, long-term beneficial impact on water quality.

Impacts from Fire Management. Sediment and turbidity are the most significant water quality responses associated with fire. Sediment and turbidity result primarily from overland flow, secondarily from channel scour caused by increased discharge. See Impacts from Wildlife Habitat and Livestock Grazing Management for estimates of sediment produced from burning.

Cumulative Impacts on Water Quality

The short-term increase in sediment yield from all vegetation manipulation proposals would range from 5,900 to 29,200 tons per year. These increases would be greatest immediately following disturbance and would decrease rapidly during the following two to three years as new vegetation became established. Sediment yield would decline more slowly thereafter. The increase in sediment

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yield over the entire resource area represents a 0.4 to 2 percent rise above existing levels and a per acre increase of less than 0.01 to 0.04 tons per acre per year which would not be significant. This alternative would not result in significant impacts at the individual watershed level even under the maximum disturbance level of vegetation manipulation.

In the long-term, increases in cover would reduce existing sediment yield by 8,800 to 12,300 tons per year, a decrease of 0.6 percent from existing conditions and a per acre decline of less than 0.01 tons per acre per year, which would not be significant.

IMPACTS ON WATER YIELD

Impacts from Proposed Management Actions

Impacts from Water Yield Management. The water yield increase expected from treatment would be 3-5 inches of runoff per acre per year. Treating 34,492 acres of aspen by patch clearcuts would increase water yield by an average of 5,748 acre-feet per year.

Debyle (1976) indicates that the increase in water yield from aspen clearcuts occurs as baseflow and interflow. The increase results from retention of greater quantities of water in the soil following each growing season in the postharvest situation. The additional water would benefit other BLM programs that use water such as aquatic habitat management and recreation and would be available for storage and later use or benefit downstream water rights.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Manipulating sagebrush and pinyon-juniper would have little effect on water yield. Sturgis (1975) indicates that sagebrush conversion increases water yield only when soils are sufficiently deep that roots of replacement vegetation are above soil occupied by the deeper roots of sagebrush (generally greater than 3 feet deep), and where precipitation is sufficient to wet the soil throughout its profile. These conditions would be met at very few sites within the resource area. Similarly, a review by Gifford (1975) indicates that little change in water yield can be expected from pinyon-juniper manipulation. Mountain brush conversion, however, could increase water yield by 1-3 inches per acre per year (Hibbert 1977). Mechanically manipulating 4,487 acres or burning 18,131 acres of mountain brush to increase forage available for livestock and wildlife would result in an average water yield increase ranging from 748 acre-feet per year through mechanical manipulation to 3,022 acre-feet per year through burning. These increases would be short-lived (3 to 5 years) if

shrub regrowth were not controlled. Information is lacking about the timing of water yield increases in oakbrush areas; however, Tew (1969) indicates that oakbrush eradication probably results in deep seepage which could ultimately appear as streamflow or recharge ground water.

Impacts from Forest Management. Maximum increases in water yield from timber harvesting in the Rocky Mountain subalpine forest result when 40 percent of a timbered watershed is harvested in a series of openings less than eight tree heights in diameter (Leaf 1975). Increased water yield of 1 to 3 inches would be expected. When timber harvest is conducted by selective cutting of individual trees, increases in water yield are much less. Selective cutting resulting in the uniform removal of 50 percent of canopy cover density in low elevation, south aspect lodgepole pine would increase water yield by 1 inch per acre per year. The same treatment of spruce-fir on north aspect slopes would reduce water yield by 0.5 inches per acre per year (Leaf 1975). Water yield changes from harvesting 1.8 million board feet of sawtimber annually would range from no change through selective cutting to an increase of 112 acre-feet annually through a series of patch clearcuts. Increases from patch clearcuts would endure for up to 30 years.

Timber harvest would also affect the timing of increased water yield. In conifer areas, Leaf (1975) indicates that snowmelt in clearcut openings is more rapid than in the uncut forest. This accelerated melt causes streamflow to be higher on the rising limb of the hydrograph than before harvest cutting. If there is natural regulation in the form of deep porous soils, recession flows are not changed appreciably and annual and daily peak flows are not significantly increased, provided the forest cover on no more than 50 percent of the watershed is removed in a system of small openings.

Cumulative Impacts on Water Yield

The cumulative impact of all vegetation manipulations in the Preferred Alternative would range from 6,500 acre-feet per year, if mountain brush were mechanically manipulated and timber were harvested by selective cutting, to 8,880 acre-feet per year if mountain brush were burned and timber were harvested in a series of small patchcuts. On the basis of an implementation schedule of 10 percent per year for water yield and range and wildlife vegetation manipulation projects, water yield would increase 650 to 890 acre-feet per year until all vegetation from projects were completed. Further water yield increases would be expected for any year in which the annual timber harvest were completed by a series of small clearcuts.

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The range of increase in water yield resulting from the Preferred Alternative represents an increase of 6 to 8 percent over existing water yield from public land and 43 to 58 percent of the total potential for increasing water yield in the resource area.

The additional water would be of benefit to local water users, mostly in the spring, but might also provide some additional water during low flow periods due to seepage into ground water and reappearance as baseflow from ground water discharge. BLM programs such as aquatic habitat, livestock grazing, and wildlife would also benefit from additional water for stockponds and reservoirs and by potentially prolonging the discharge period of springs. The additional water, although regionally insignificant, would also generally benefit the Colorado River Basin, whose existing supplies are over allocated and whose future development appears limited only by the availability of water.

IMPACTS ON CRITICAL WATERSHEDS (MUNICIPAL WATERSHEDS, DEBRIS FLOW HAZARD ZONES, AND EROSION HAZARD AREAS)

Impacts from Proposed Management Actions

Impacts from Critical Watershed Areas. Prohibitions on vegetation manipulation, timber harvesting, and surface facilities on oil and gas leases; inclusion in a fire exclusion area and a sensitive area for utility and communication facility developments; and restrictions on livestock grazing (less than 30 percent utilization with a turnout date no earlier than mid-July) and off-road vehicle (ORV) use would at the least prevent existing hazard conditions from deteriorating. In addition, designation as an area of critical environmental concern (ACEC) would enable prescription of special management, including applicable recommendations from the Glenwood Springs debris flow study, which would reduce the debris flow hazard and the potential for damage from debris flow incidents.

A high degree of protection for the quality of water derived from public land in municipal watersheds would be provided in the Preferred Alternative. No surface disturbance which would adversely affect water quality would be permitted. Activities such as vegetation treatments, timber harvest, surface facilities on oil and gas leases, and wildlife habitat manipulations would not be permitted. The watersheds would also be included in fire exclusion areas, which means that maximum effort would be expended to extinguish all wildfires as rapidly as possible, and in sensitive areas for new utility and

communication facility development, which means impacts of utility and communication facility development would have to be completely mitigated before they would be approved. ORV use limited to existing roads and trails would also prevent watershed degradation.

Eight erosion hazard areas that have existing ORV use would be managed to prevent further watershed damage by a seasonal ORV restriction in the spring when soils are wet (8,500 acres), limiting use to designated roads and trails (1,900 acres), or limiting use to existing roads and trails (40,100 acres). A spring ORV restriction would protect an area when soils are wet and are most susceptible to damage. Limiting use to designated roads and trails would prevent further damage and initiate a vegetation recovery process in damaged areas (see Continuation of Current Management Alternative, Impacts on Critical Watersheds for a discussion of damages). ORV use limited to existing roads and trails would provide less protection than the designated roads and trails classification. It would probably not result in recovery of existing use areas but would prevent damage from occurring in new areas.

Impacts from Utility and Communication Facility Management. Including debris flow hazard areas and municipal watersheds in areas classed as sensitive for utility development would ensure adequate protection from utility developments for these areas. A "sensitive" classification would require that development proposals demonstrate the ability to completely mitigate adverse effects of their proposal before approval were given.

Impacts from Fire Management. Including the debris flow hazard zones in a fire exclusion area would help to reduce debris flow hazard by minimizing the area affected by fire. Maximum effort is directed towards extinguishing wildfires as rapidly as possible in fire exclusion areas. A report prepared by the Colorado Geological Survey (Mears 1977) following the 1977 debris flow in Glenwood Springs indicates that a wildfire partially on public land above Glenwood Springs may have been responsible for increased runoff rates which may have in turn contributed to the debris flow in the city below.

Cumulative Impacts on Critical Watersheds

The Preferred Alternative is not as restrictive as the Resource Protection and Economic Development Alternatives but should nonetheless provide a high degree of protection for the quality of water originating on public land in municipal watersheds and some reduction in damage due to debris flow events from debris flow hazard areas.

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Restrictions on timber harvest, vegetation manipulation, livestock grazing, and ORV use as well as inclusion in a fire exclusion area and an area considered sensitive to utility and communication facility development should prevent adverse impacts from occurring, while special management resulting from ACEC designation in debris flow hazard areas should result in some reduction in the debris flow hazard.

ORV restrictions in this alternative in erosion hazard areas would provide less protection than the Resource Protection and Economic Development Alternatives. Restricting ORV use to existing roads and trails (rather than designated roads and trails) would prevent ORV damage from spreading but would not allow for recovery of already damaged areas.

IMPACTS ON MINERALS

Impacts from Proposed Management Actions

With the exception of wilderness, all restrictions and related impacts identified in the Continuation of Current Management Alternative would carry through to this alternative. The following impacts are in addition to those identified in the Continuation of Current Management Alternative.

Impacts from Minerals Management Identifying 28,500 acres of public and private lands as acceptable for further leasing consideration would make approximately 1.6 billion tons of coal available for future leasing. Identifying 1,560 acres as unacceptable would eliminate that acreage from further leasing consideration.

Impacts from Wilderness Resource Management. Closing 340 acres of preliminarily suitable wilderness areas to mineral location, sales, and oil and gas leasing would have an insignificant impact on mineral development because mineral exploration and development activities indicate a low potential for mineral development.

Impacts from Recreation Resource Management. Closing 2,470 acres in Deep Creek Canyon to mineral locations, sales, and oil and gas leasing would have an insignificant impact on mineral exploration and development because of a lack of industry interest and mineral bearing geologic formations.

Identifying 3,456 acres near Hack Lake as closed to oil and gas facility locations would increase cost because directional drilling would be required. This area is presently not under lease and is believed to have a low development potential for oil and gas production. The 3,456 acres near Hack Lake are

also closed to mineral sales. This is not a significant impact because few known salable minerals exist in this area.

Impacts from Critical Watershed Areas. Closing 5,858 acres of municipal watersheds for oil and gas surface facility location would result in higher costs for development of these areas. The oil and gas potential is considered high in these areas, with oil and gas activity occurring on private surface/private minerals.

Closing 7,126 acres in a severe debris flow hazard zone to oil and gas surface facilities would be insignificant because the area is not geologically favorable for oil and gas development.

Impacts from Wildlife Resource Management. Closing 1,000 acres on the lower Colorado River to mineral sales could have a significant impact because of the potential for sand and gravel along the river. However, based on current demands, supplies on private land should be sufficient.

Impacts from Land Tenure Adjustments. Disposing of 23,235 acres of public land would have an insignificant impact on mineral development because mineral rights would be retained on all areas containing significant development potential.

Cumulative Impacts on Minerals

Closing 98,852 acres of public and private land to mineral location would continue to prevent mineral development in those areas. However, the acreage, which is 13 percent of the resource area, is not significant when compared to the acreage available to entry.

Closing 55,770 acres of public and private land to oil and gas leasing, which is 7 percent of the resource area, would not be significant since most of the potentially valuable oil and gas reserves are already under lease.

Closing 42,344 acres to oil and gas surface facilities, which is 6 percent of the resource area, would continue to increase drilling costs and potentially exclude oil and gas development since directional drilling would be required.

There are 28,500 acres of public and private land identified for further coal leasing consideration. The impacts can not as yet be assessed.

Closing 11,552 acres to mineral sales, which is 1 percent of the resource area, would not be significant since ample supplies are available. The impacts of selling mossrock, top soil, sand and gravel, scoria and fill dirt in common use areas would have insignificant impacts as stated in site specific as-

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assessments. Table 5-30 summarizes the limitations on minerals.

TABLE 5-30. PROPOSED MINERAL LIMITATIONS

Limitation	Acres
Closed to mineral location	98,852
Closed to oil and gas surface facility location	42,844
Closed to oil and gas leasing	55,770
Open to oil and gas leasing.....	716,562
Acceptable for further consideration for coal leasing.....	28,520
Acres eliminated from leasing consideration.....	1,560
Closed to mineral sales.....	12,052

IMPACTS ON AQUATIC WILDLIFE

Impacts from Proposed Management Actions

Impacts From Aquatic Habitat Management.

Aquatic habitat improvements such as instream structures would increase aquatic invertebrate populations; lower water temperatures; improve spawning, resting, and holding areas for fish; allow for better fish migration; and reduce stream bottom siltation by increasing water velocities in riffles. Riparian habitat improvements such as fencing and vegetation reestablishment would reduce water temperatures and stream bank damage and increase terrestrial invertebrate populations which serve as a source of food for fish. This would occur on 60.2 miles of public stream and 2 lakes (5 surface acres). Minimum stream flow maintenance on 43 additional streams would provide conservation pools for fish during periods of low flow and would sustain riparian habitat during dry periods. These projects would improve fish condition, productivity, and longevity. These expected improvements would begin to occur about 2 years after project implementation and would last the life of the project. (This would also apply to projects proposed by other resources that would affect water quality or water yield.)

Legal access to an additional 24.8 miles of stream would increase fishing use. Increased use could cause localized insignificant riparian habitat damage from trampling and thus reduce fish populations somewhat.

Impacts from Water Quality Management. Water quality management for the Milk and Alkali Creek watersheds could improve fisheries habitat in the Eagle River by substantially reducing sediment load. This would increase overall production of fish and invertebrates in the Eagle River.

Impacts from Water Yield Management. In the short term, water yield vegetation manipulations would cause increased erosion and sediment yield. The increase in sediment would have adverse impacts on aquatic habitat condition. It would reduce fish production by reducing food supplies and by siltation of spawning areas. Long term, beneficial impacts could result from increased water yield. The effect of water yield management during the low flow period is uncertain. It is possible that oak-brush and aspen manipulations would increase flow during this period while conifer manipulations would not. Many of the streams in the Garfield Capability Unit are limited by low flows in the latter part of the summer. If these flows could be increased by water yield management, it would reduce or dilute siltation and benefit those streams where low flows and siltation are limiting factors on aquatic habitat condition.

Impacts from Terrestrial Habitat and Livestock Grazing Management. Increased erosion resulting from vegetation manipulations could cause localized short-term decreases in invertebrate populations in streams draining the area of disturbance. This would result in reduced fish production from reduced food supplies and siltation of spawning areas. Burning generally has a greater adverse impact than other manipulation methods because of the potential for greater loss of ground cover and the chance of significant quantities of ash entering the stream. Adverse impacts would be reduced by following the standard operating procedures listed in Appendix B.

Beneficial impacts would include long-term increases in water yield which would increase the level of stream flows and could increase their duration, resulting in better invertebrate and fish populations and better fish condition. The long-term increase in understorey vegetation on manipulated areas would improve water quality by reducing sedimentation.

Implementation of proper stocking rates and improved livestock distribution through monitoring, water development, fencing, and vegetation manipulation would benefit aquatic habitat by improving vegetation cover and reducing grazing pressure in riparian zones. These impacts would reduce erosion and bank damage and improve riparian vegetation which in turn would reduce water temperatures and improve stream quality for fish.

In conclusion, these long-term benefits would have a significant impact on aquatic conditions and associated fisheries.

Impacts Forest Management. In the short term, timber and fuelwood harvest would result in increased sediment yield which would adversely

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impact aquatic habitat in affected streams. Road construction associated with harvest activities would be the greatest single source of sediment. Application of standard operating procedures and proper road layout and design would minimize adverse impacts to the aquatic ecosystem.

Timber harvest, if implemented in a series of small patch clearcuts, would increase water yield. Timing of the increased yield from the subalpine forest zone would be such that increases in base-flow during low flow periods would not occur (Leaf 1975) and consequently would be of minimal benefit to the aquatic ecosystem.

Impacts from Recreation Resource Management. Increased fishing would increase fish harvest, reducing the chance of winter kill in overpopulated streams and lakes, and would cause an insignificant loss of riparian habitat from trampling and vehicle use.

Impacts from Areas of Critical Environmental Concern. Protection of aquatic habitat through area of critical environmental concern (ACEC) designations would reduce the level of adverse impacts from other resource activities thus reducing aquatic disturbance and resulting in long-term, beneficial impacts to aquatic habitat. Approximately 31.9 miles of stream habitat and 1 lake (2 surface acres) supporting state-threatened species would be protected through designation.

Impacts from Land Tenure Adjustments. Some very limited access to the Eagle River and other small streams would be lost. Most of the small parcels along the upper Colorado River do not supply access from roads but do provide boaters a place to land and fish.

Fisheries in the lower portion of the Colorado River could benefit from the protection and more intensive management of aquatic habitat anticipated under the cooperative management program. This area is currently being rapidly developed with significant losses of riparian habitat and increases in water degradation occurring.

Impacts from Off-Road Vehicle Management. Off-road vehicle (ORV) closures would reduce erosion where roads and trails cross streams. Where roads exist in closed areas, ground cover would increase and erosion would decrease.

Streams located in areas open to ORVs would continue to be damaged by vehicles crossing or driving down stream channels. Because existing and projected ORV use is low, no significant increase in impacts on aquatic habitat would occur.

Impacts from Transportation Management. Significant benefits would occur where access to public fishing streams were gained. This would

allow for better stream management and more fishing opportunities.

Cumulative Impacts on Aquatic Wildlife

In the short term, vegetation manipulation by the various resource programs would cause increases in sediment that would adversely affect aquatic habitat conditions. These increases would not exceed allowable departure levels, consequently significant impacts would not be expected.

In the long term, aquatic and riparian habitat improvements and vegetation manipulation projects could significantly increase invertebrate and fish populations and significantly improve stream quality, fish condition, and water quality. This would occur through increased water yield and possibly baseflows during low flow periods, and improved water quality after reestablishment of vegetation on disturbed sites. The significance of these impacts cannot be determined until actions are implemented and monitored.

Cooperative management could improve aquatic habitat on the lower Colorado River, increasing fish and invertebrate production.

All suitable aquatic and riparian habitat on public land would be managed to obtain optimal aquatic habitat conditions. Habitat currently in average to excellent condition would be maintained and potential fishery streams would be improved to support fish. Long-term beneficial impacts to aquatic habitat would result from maintaining optimal aquatic condition ratings.

These impacts would provide an undetermined increase in fish populations which in turn would provide more and better fishing opportunities.

TERRESTRIAL WILDLIFE

Impacts from Proposed Management Actions

Impacts from Terrestrial Habitat Management. The allocation of 36,157 animal unit months (AUMs) of existing forage to big game would be 21 percent (9,445 AUMs) short of meeting existing big game forage demands (the objective of this alternative) and 38 percent (22,167 AUMs) short of meeting the forage requirement of the Colorado Division of Wildlife's 1988 big game population goals. Annually manipulating 1,844 acres of pinyon-juniper, oak-brush-serviceberry, and sagebrush would provide an additional 618 AUMs each year, reducing both the shortage in meeting existing forage demand to 7 percent and the shortage in meeting Colorado Di-

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vision of Wildlife population goals to 27 percent over the 10-year implementation period. These shortages would be greatest in crucial winter range.

Forage allocation by game management unit is shown in Table 5-31. Appendix F explains the methodology used in allocating forage.

TABLE 5-31. WILDLIFE FORAGE ALLOCATION BY GAME MANAGEMENT UNIT

Game Management Unit	Existing Demand (AUMs)	Initial Allocation (AUMs)	Percent Change From Existing Demand	Projected Allocation (AUMs)	Percent Change from Existing Demand	Percent of Objective Met	Density of Animals ¹	Number of Animals ¹	Size of Area
15.....	965	655	-31	753	-22	78	High	Moderate	Small
25.....	4,907	3,125	-36	4,380	-11	89	Moderate	Moderate	Moderate
26.....	4,220	1,957	-54	2,879	-32	68	Moderate	Low-moderate	Medium-large
32.....	3,181	2,848	-10	2,988	-6	94	Low-moderate	Moderate-high	Medium-large
33.....	7,246	6,053	-16	6,875	-5	95	Low-moderate	Large	Large
34.....	2,277	1,912	-16	2,194	-4	96	Low	Low	Small
35.....	5,291	5,015	-5	5,141	-3	97	Low	Low	Small
36.....	917	777	-15	913	0	100	Moderate	Moderate-low	Medium
42.....	3,892	3,612	-7	3,686	-5	95	Low	Large	Large
43.....	4,597	3,998	-13	4,517	-2	98	Moderate-high	Large	Large
44.....	5,570	4,584	-18	5,530	-1	99	Moderate-high	Large	Large
444.....	1,596	974	-39	1,552	-3	97	High	Large	Medium
47.....	943	637	-32	933	-1	99	Moderate-high	Moderate	Small
Total.....	45,602	36,157	-20	42,341	-7	93			

The initial forage allocation would fall short of meeting the existing demand for big game forage resource area wide. The impacts would be most significant in two areas—northeast of the Roaring Fork River and northwest of the upper Colorado River. Both areas have moderate to high population densities. The initial forage allocation to big game in these areas would be from 31 to 54 percent short of meeting current forage demand.

Additional big game forage gained through vegetation manipulation would provide sufficient forage to maintain only 93 percent of the existing big game populations. Thus, a long-term decline in big game populations would occur either from increased hunting authorized by the Colorado Division of Wildlife or from an accelerated decline in habitat condition. A decline would be most significant in areas of concentrated big game populations. As big game populations declined, predator populations, carrion dependent species, and hunter success could also decline. The long-term impact could be a 7 percent decline in hunting with a corresponding decline in local business income associated with hunting (see Impacts on Social and Economic Conditions).

Manipulating 18,440 acres of vegetation over a 10-year period would increase forage, improve big game health and productivity, and change wildlife species composition and density. The short-term loss of bird and small mammal habitat in vegetation manipulation areas would be insignificant because of the small amount of acreage treated annually

and the relatively quick revegetation of these areas. Benefits gained by manipulating vegetation would begin in about 2 years but would not be permanent unless regrowth was controlled. This applies to all types of vegetation treatments.

Identification of habitat suitable for and subsequent introductions of state-threatened (river otter) or federal-endangered species (peregrine falcon) would help maintain a viable population of these species within the state. Introductions of sage-grouse, sharptail grouse, and turkey would increase these populations. They in turn could be used for other reintroductions, hunting, and increased gene pools. (See Map 3-13 for potentially suitable habitat for these introductions.)

Improvement of riparian habitat could result in local increases in waterfowl populations which would provide additional local hunting opportunities.

Water developments would increase the amount of available habitat, allowing local wildlife populations to increase.

Cooperative management of 62,170 acres of public and state lands, especially along the Colorado River below New Castle, would benefit bald eagles, great blue herons, and waterfowl.

Hunting opportunities and success, and achievement of population goals would improve in areas identified for additional public access. This would result in healthier animals, improved productivity,

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and reduced game damage to privately-owned land.

Impacts from Water Yield Management. Removing oakbrush would result in better big game distribution by removing physical barriers to free movement. It would also create additional big game habitat. Thinning dense, overmature stands of sagebrush in summer sagegrouse range could increase nesting and brood areas and improve meadow habitat. These vegetation manipulations would also provide wildlife with additional and longer duration water sources.

Removing aspen stands would reduce thermal and hiding cover, calving or fawning areas, and essential nongame habitat. The application of project design features (Appendix B) and the small amount of aspen that would be removed would reduce the significance of these impacts.

Impacts from Aquatic Habitat Management. Small riparian habitat improvements along 60 miles of stream would result in locally insignificant increases in small game and nongame populations. Increased recreational use would not significantly stress wildlife or result in riparian vegetation losses.

Impacts from Livestock Grazing Management. Annually removing 2,980 acres of sagebrush, oakbrush, and pinyon-juniper vegetation to provide additional livestock forage would change vegetation composition, density, form and age class thereby providing some additional big game forage and creating additional habitat for wildlife species dependent on the successional vegetation type. Species dependent on the original vegetation type would be displaced. These wildlife species changes would be insignificant. The Resource Area Profile (available in the Glenwood Springs office) contains a list of the wildlife species that would be affected.

Changing sagebrush on winter ranges to a grass-forb type would have a long-term adverse impact on big game, sage grouse, and many small game and nongame species that depend on sagebrush for their habitat requirements.

Because the resource area supports a diversity of vegetation, little overall change in wildlife populations would occur. Project design features would limit the size, location, and configuration to ensure minimal adverse impact on wildlife (see Appendix B).

Improvements in wildlife habitat and increases in populations would be commensurate with improvements in rangeland condition.

Water developments for livestock grazing management would benefit local wildlife populations by providing additional water sources and by reducing vegetation damage from livestock concentrations.

Fencing would improve livestock management, protect water sources and riparian vegetation from trampling, and reduce overgrazing and competition with big game for forage. Benefits would be local and would only insignificantly affect total wildlife populations. Fences could physically restrict movement or result in entanglement of big game. This would be most severe on winter ranges and migration routes. Project design features would reduce the significance of adverse impacts.

Removing livestock from summer and high winter ranges by November 15 and from crucial big game winter range by October 15 or when browse utilization reaches 20 percent would reduce competition between livestock and big game for browse. Big game would then have more and better feed going into the winter resulting in less winter mortality and better fawn and calf survival.

Delaying spring livestock turnout until key species of grass reach an average of 6 inches in height would reduce harmful effects of livestock grazing on big game forage and would increase early spring feed for big game. Early green grass and forbs are very important to lactating does and cow elk and therefore to fawn and calf survival.

Impacts from Forest Management. Impacts of annually harvesting 269 to 672 acres of timber, mostly in the King Mountain, Castle Peak, and Eagle-Vail Capability Units, would vary depending on the harvest method, harvest season, length of contract, size, and location of the project.

Short-term adverse impacts would include a temporary loss of understory, thermal and escape cover, and nesting habitat for many wildlife species. Wildlife would also be temporarily displaced during the harvest period. These losses would be greater in clearcut than in selective cut areas. U. S. Forest Service land adjacent to timber stands on public land near Sunlight Peak and the Seven Hermits would reduce the severity of adverse impacts by providing alternate habitat during harvest periods. Harvesting timber on King Mountain would produce more severe short-term impacts because alternate cover areas are not locally available. However, localized long-term beneficial impacts to wildlife, especially big game, would result from the increased forage production, habitat diversity, and ease of movement.

Harvesting timber in or near elk calving areas would result in a significant long-term detrimental impact because elk are highly sensitive to disturbance during calving and because these areas are limited in number. The small acreage of disturbance, generally good habitat conditions, and compliance with standard design features would reduce the significance of all impacts.

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The majority of the woodland stands in the resource area are located in either big game winter or crucial winter range. Annually harvesting from 256 acres to 640 acres of woodland would result in locally significant increases in big game forage and populations of wildlife species associated with more open stands of pinyon and juniper or brush piles.

Insignificant adverse impacts would include temporary loss of forage and thermal and hiding cover for big game species, and loss of nesting habitat and solitude for other wildlife species during harvest periods. The small amount of acreage disturbed in relation to the woodland habitat supply in the resource area and the application of standard design features for woodland harvesting (Appendix B) would reduce the significance of adverse impacts.

Impacts from Recreation Resource Management. Recreation Management would increase the number of people in wildlife habitat. The resulting stress would be an insignificant short-term adverse impact because of the dispersed nature and relatively small amount of expected increase in public land use by recreationists.

Impacts from Visual Resource Management. Restrictions placed on vegetation manipulations in visual resource management Class II areas could increase project costs and thus reduce the number of projects that would be accomplished. This would reduce the amount of forage increase that could be gained through vegetation manipulation and consequently the number of additional big game animals an allotment could support. This means that the proposed allocation to big game may be optimistic.

Impacts from Land Tenure Adjustments. Table 5-32 lists, by capability unit, the significant acreage of wildlife habitat that would be lost through sale or exchange. (Nothing smaller than 100 acres was considered except for riparian habitat.) These large tracts would provide viable habitat even if adjoined by developed tracts of private land. Small tracts (less than 100 acres) would not provide significant big game habitat if surrounded by developed private land but they would still provide open space and important habitat for nongame species.

Loss of summer range could be locally significant; however, because of the large amount and good condition of summer range throughout the resource area and because this type of habitat is not generally developed in an intensive manner, the overall adverse impact would be insignificant.

Disposal of 14,730 acres (6 percent) of the total crucial big game winter range within the resource area would have a very significant long-term adverse impact resulting in an estimated 6 percent loss in big game populations. Loss of winter range

TABLE 5-32. ACRES OF WILDLIFE HABITAT DISPOSALS

Capability Unit	Big Game Summer Range	Big Game Crucial Winter Range	Riparian Habitat
Garfield.....	0	3,770	0
Roaring Fork.....	120	6,190	0
Eagle-Vall.....	2,760	2,190	0
Castle Peak.....	0	240	0
King Mountain.....	400	2,340	0
Total.....	3,280	14,730	0

is especially significant because its availability in the resource area limits big game populations. This loss is magnified by the expected 8 percent additional loss of crucial winter range on private land from development. Development in crucial winter range is usually very intensive—subdivisions and industrial parks, for example; thus, remaining habitat is of little value, especially to big game.

Impacts of riparian habitat disposals would be insignificant on a resource area wide basis; however, detrimental impacts to local populations could be significant because of the diversity of wildlife species supported by riparian vegetation.

Impacts from Off-Road Vehicle Management. Limiting snowmobile use on 75,463 acres of big game winter range would significantly reduce stress on local big game herds resulting in improved spring time health conditions and productivity, probably resulting in increased deer and elk populations.

Impacts from Transportation Management. Providing better access to public land would make big game herds more accessible to hunters thus increasing hunting success. This could reduce game damage on private land and winter mortality and increase animal health and productivity. This would offset the adverse impacts of added stress resulting from the additional access to public land.

Impacts from Utility and Communication Facility Management. Designating sensitive and unsuitable zones would protect especially fragile wildlife habitat such as elk calving areas, sagegrouse strutting areas, and bald eagle roosting trees by either prohibiting siting of facilities or requiring adequate mitigation.

Impacts from Fire Management. Controlled use of fire to manipulate vegetation types could provide additional forage and improved habitat conditions, resulting in improved animal health and productivity. This would offset the significance of adverse impacts such as short-term habitat loss and fire-

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caused mortality to small and nongame wildlife species.

Cumulative Impacts on Terrestrial Wildlife

Species such as sage and sharptail grouse, turkey, peregrine falcon, and river otter, whose populations are currently declining, would benefit from new introductions and populations would stabilize or increase. The proposed habitat improvement projects, seasonal off-road vehicle closures, cooperative management areas, and additional access would all provide long-term beneficial impacts to wildlife.

Theoretically, there would be a short-term 21 percent decrease in big game populations on public land as a result of initial forage allocations. In the next 10 years, approximately 80,000 acres of vegetation would be manipulated. The allocation of the increased forage resulting from the wildlife projects would still mean a 7 percent decrease in existing big game populations or a 28 percent shortfall in meeting the Colorado Division of Wildlife goals. Small game and nongame species composition and numbers would vary locally but no significant long-term change would occur resource area wide because of the great habitat diversity offered by public and private lands.

An estimated 8 percent of the big game crucial winter range occurring on private land could be lost to development in the next 10 years. An additional 14,730 acres (6 percent) of big game crucial winter range occurring on public land would be lost through land tenure disposals.

Therefore, in the next 10 years, an overall 21 percent decrease in existing big game populations could occur. This alternative would be 33 percent short of meeting the Colorado Division of Wildlife population goals.

In the long run, if the big game populations are not reduced to the allocated carrying capacity through intensive management, as forage demand exceeds availability, habitat conditions and fawn and calf production will decline, winter mortality will increase and there is potential for increased game damage to private land. Declining habitat conditions will also have a long-term adverse affect on small and nongame species.

This means fewer hunting and viewing opportunities and consequently a decrease in business to those establishments such as restaurants, motels, sporting goods stores, and gas stations. See Impacts on Social and Economic Conditions for additional impacts to local communities.

IMPACTS ON LIVESTOCK GRAZING

Impacts from Proposed Management Actions

Impacts from Livestock Grazing Management. The initial allocation of 38,726 animal-unit months (AUMs) would be a 3 percent increase over existing use. Forage increases through vegetation manipulation practices would bring final allocation up to 51,724 AUMs which is 37 percent greater than existing use but still 8 percent short of the active preference objective of 56,301 AUMs. Table 5-33 shows this information by capability unit.

TABLE 5-33. RELATION OF LIVESTOCK FORAGE ALLOCATION TO EXISTING USE AND ALTERNATIVE OBJECTIVE

Capability Unit	Initial Allocation (AUMs)	Percent Change from Existing Use	Projected Allocation (AUMs)	Percent Change from Existing Use	Percent of Objective Met
Garfield.....	18,733	+6	27,427	+54	92
Roaring Fork.....	4,682	+11	7,041	+67	91
Eagle-Vail....	3,790	+4	4,081	+12	87
Castle Peak.....	8,593	+7	9,448	+17	98
King Mountain.....	2,648	-34	3,727	-7	86
Total	38,726	+3	51,724	+37	92

The short-term impact from initial allocation would be slight to moderate increases from actual use in all capability units except King Mountain which would have a highly significant reduction. The impacts would vary by allotment with lower elevation allotments encompassing crucial wildlife range being reduced while higher elevation allotments would show increases. The increases indicated would not be used on spring-fall ranges where the numbers of stock are limited by U. S. Forest Service permits. Permittees in the King Mountain Capability Unit would have to acquire 1,380 AUMs of forage or reduce their herd sizes 34 percent in the short term and would still have a slightly significant reduction in the long term. The long-term impact would be moderately to highly significant increases in all but King Mountain Capability Unit.

Setting turnout dates back in the spring, if necessary following monitoring, would have highly significant adverse impacts on permittees. Spring public range is needed to move livestock off private meadows that produce hay for the following winter.

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ter's feed. Permittees generally have an established time to enter summer range and shortening of the spring season would not allow full use of their AUMs.

Range improvements, including vegetation manipulation, would improve livestock distribution, reduce livestock concentrations, and provide for more even use of forage. This would help to maintain those allotments in satisfactory range condition and improve those in unsatisfactory range condition. Improved range condition would increase forage quantity and quality thereby increasing the potential for improved livestock production.

Impacts from Critical Watershed Areas. Holding mid-July utilization to less than 30 percent may have an impact on allotments with debris flow hazards. Data indicate there might be enough production to use active AUMs without exceeding this level; however, monitoring would be necessary.

Impacts from Aquatic Habitat Management. The amount of forage and water excluded from livestock use by riparian vegetation enclosures would be insignificant and thus would not impact livestock grazing (see Standard Design Features, Appendix B).

Impacts from Terrestrial Habitat Management. The Basalt land exchange with the Colorado Division of Wildlife would have a potential adverse impact on one operator with 72 AUMs preference if the Colorado Division of Wildlife excludes livestock grazing. The Garfield Creek cooperative management with the Colorado Division of Wildlife would have no significant impact if livestock grazing continues at the level proposed. Vegetation manipulation would provide long-term benefits to livestock by increasing the amount of available forage. Though most of the increased forage developed for wildlife would accrue to wildlife, some would be available for livestock. The short-term impact (2 years) of keeping livestock off the vegetation treatment areas would depend on the size of the area treated and control of the stock.

Forty-four allotments with late fall grazing would be affected by the October 15 cut-off date and 9 by the November 15 date. The November 15 cut-off date would be insignificant. The October 15 cut-off would require taking stock home up to 6 weeks early and providing additional feed, either grown or purchased hay, which could be highly significant depending on the amount required. See Table F-3, Appendix F for current season-of-use by allotment. It is not known how many more might be affected by the 20 percent browse utilization cut-off criterion.

Allotments Affected by the October 15 Cut-off Date—8005, 8011, 8012, 8103, 8107, 8112, 8115, 8117, 8118, 8120, 8121, 8125, 8213, 8218,

8219, 8316, 8321, 8322, 8331, 8342, 8343, 8349, 8352, 8504, 8506, 8602, 8612, 8632, 8635, 8642, 8647, 8649, 8654, 8655, 8657, 8658, 8659, 8661, 8667, 8668, 8672, 8901, 8907, 8920.

Allotments Affected by the November 15 Cut-off Date—8506, 8601, 8653, 8656, 8662, 8663, 8665, 8666, 8701.

Impacts from Forest Management. Slight to moderate beneficial impacts would result from woodland management where livestock forage production and animal distribution would be increased with the removal of piñon-juniper. The exact extent of the beneficial impacts cannot be determined until management areas and sizes are determined.

Impacts from Visual Resource Management. Visual resource management Class II objectives potentially would increase the costs of vegetation manipulation projects because of limitations on size, shape, location and treatment methods resulting in low cost-benefit ratios. The extent of the adverse impacts cannot be determined until site-specific locations and needs are determined.

Impacts from Land Tenure Adjustments. Land disposals would involve approximately 13,800 acres and 2,268 AUMs on 45 allotments. Significance to each operation varies considerably; however, 9 allotments would lose all or most of their public land. While removing these lands from grazing may not cause anyone to leave the livestock business, it would certainly require adjustment in management and reduction of herd size or acquisition of replacement AUMs, all of which would be an adverse economic impact on the operations.

Impacts from Utility and Communication Facility Management. An insignificant beneficial impact of increased forage availability would result from reseeding rights-of-way through woodland or shrubland, and from improved livestock movement along right-of-way routes.

Impacts from Fire Management. The impacts of fire management would be highly beneficial. Using fire to manipulate shrubland and woodland would increase livestock forage availability. The identification of areas for fire management around expensive range improvements helps limit potential fire losses. The extent of beneficial impacts cannot be determined until specific fire management plans are prepared.

Cumulative Impacts on Livestock Grazing

Significant beneficial impacts would result from vegetation manipulation through livestock grazing, water yield, forest, terrestrial habitat and fire management increasing forage availability for livestock.

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Over the 10-year implementation period, vegetation manipulation of at least 29,800 acres would provide an additional 12,998 AUMs. This is approximately a 37 percent increase in AUMs above existing livestock use.

Forty-five allotments would be adversely affected by land tenure disposals, 44 by the October 15 cut off date, and 8 would be adversely affected by both actions. Seven allotments would be significantly affected by the combination of action.

The forage allocation objective of this alternative is to try to satisfy active preference for livestock and current demand for wildlife. If there were insufficient production, proportionate reductions to both livestock and wildlife would be made. Potential production increases would be allocated proportionately or to whichever still had not attained its goal. Forage production potential on crucial wildlife ranges would be a limiting factor for not reaching livestock grazing objectives.

IMPACTS ON VEGETATION

Impacts from Proposed Management Actions

Management actions that would not result in conversions generally would have insignificant impacts on vegetation because large scale vegetation changes would not occur. Management actions such as clearcutting and vegetation manipulation for increased water yield, livestock, and wildlife forage production would reduce ground cover and disturb soils, resulting in localized adverse impacts. The localized significance of vegetation manipulations would be reduced by the 10-year implementation schedule, project dispersion throughout the resource area, and standard design features (Appendix B) for project implementation. Harvesting forest land and manipulating vegetation, as proposed by water yield, livestock grazing, terrestrial habitat, and forest management, would result in the following annual vegetation disturbances:

Productive Forest Land Management—672 acres

Woodland Management—640 acres

Livestock Grazing Management—2,980 acres

Terrestrial Habitat Management—1,844 acres

Water Yield Management—1,725 acres

The acreage shown for productive forest land and woodland management is the allowable cut converted to acres. The annual acreage shown for livestock grazing, terrestrial habitat, and water yield management is 10 percent of the total proposed.

The figures shown are proposed by each resource, however, in some cases, acreages proposed for management overlap and therefore cannot be totalled. For example, cutting firewood in pinyon-juniper would also meet livestock or wildlife needs for increased forage; likewise, oakbrush removal for additional forage could help increase water yield.

Site-specific impacts of vegetation changes are discussed under the resource affected. For example, the impacts of brush control on wildlife are discussed under Impacts on Terrestrial Habitat Management.

Modifying mountain shrub, sagebrush, pinyon-juniper, and forest vegetation types in relative amounts indicated above for 10 years would not significantly affect vegetation types in the resource area. This is because of the tremendous variety of types and species diversity present since the resource area lies in the transition zone between two distinctly different physiographic regions—the Colorado Plateau and Southern Rocky Mountains.

No adverse impacts would occur to known occurrences of threatened or endangered plant species from any management action that has identified a site-specific project location. Threatened, endangered, or sensitive plant species would be protected from adverse impacts of management actions through activity plans and environmental assessments when specific site locations are identified.

Cumulative Impacts on Vegetation

Cumulative impacts on vegetation would be the same as those discussed under Impacts from Proposed Management Actions.

IMPACTS ON FORESTRY

Impacts from Proposed Management Actions

Impacts from Forest Management. Managing 17,905 acres of productive forest land would result in a potential annual allowable harvest of 1.8 million board feet.

Managing 58,555 acres of suitable woodland would result in a potential annual harvest of 3,535 cords.

Harvest practices such as clearcutting, shelterwood cutting, selective cutting, and commercial thinning would increase stand productivity thereby increasing revenues and improving wildlife habitat.

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Forest development practices such as thinnings and plantings would increase vigor and growth in managed forest stands and thus increase forest production potential. Actual increased production is unknown but is considered significant because it would decrease disease and pest incidence in these stands.

Acquiring legal access into presently inaccessible forest stands would open these areas to public land management.

Impacts from Critical Watershed Areas. Closing 525 acres of woodland in municipal watersheds and 655 acres of woodland in severe debris flow hazard zones would remove a total of 1,180 acres from the total woodland base of 189,500 acres. When compared with the total base, this loss is insignificant.

Impacts from Livestock Grazing and Terrestrial Habitat Management. Chaining and burning in the pinyon-juniper forest type would conflict with woodland management objectives for fuelwood sales. The impact area is unknown because the livestock grazing management objectives for chaining and burning cover other vegetation types. Woodland species would take 40 years to regenerate after chaining and 60 years to regenerate after burning. This loss would be considerable, especially if the degree of vegetation manipulation occurred on forest land suitable for forest management.

Minor beneficial impacts would be gained from chaining practices, such as increasing the available supply of fuelwood that could be offered for sale.

Construction of fences and water pipeline projects would destroy an insignificant amount of forest land.

Increased livestock numbers would increase damage to forest regeneration. Generally, such damage is insignificant. Exceptions would be where high-valued productive forest land reforestation at proper stocking levels is a requirement. Added reforestation cost would result if grazing use were allowed in these stands. Suspension of grazing or fencing in these areas (an average of 250 acres annually) would reduce potential adverse impacts.

Seeding and fertilizing on forest land to promote understory browse species would create added competition for moisture and nutrients, potentially reducing forest growth. The impact is considered insignificant.

Restricting motorized vehicle travel in forested big game crucial winter ranges and during elk calving season would increase logging costs. These added costs could be reduced by extending contract periods to compensate for expected lost harvest time, thus reducing the impacts significantly.

Impacts from Recreation Resource Management. Designating the Thompson Creek area as a natural environment area and prohibiting harvesting within Deep Canyon would reduce the forest land base by 560 acres and 80 acres, respectively. This loss would be relatively insignificant because the forest land lost is neither readily accessible nor economically harvestable.

Designation of recreation sites would result in a loss of 25 acres of forest land. This loss also would be insignificant. Less preferred harvest methods would be implemented adjacent to such recreation sites, however, the few acres impacted would not have a significant impact on the forest land base.

The designation of approximately 15,000 acres for semi-primitive non-motorized recreation throughout the resource area would have a slight effect on the forestry program. On Sunlight Peak, restrictions placed on harvesting and road building would make harvesting economically marginal on 2,000 acres. Approximately 910 acres are woodland in the Bull Gulch area. However, the Bull Gulch area has rough terrain and no suitable access.

Restrictions on road construction in forest areas designated semi-primitive motorized would increase harvesting costs, which would be a minor impact.

Designating Hack Lake as a recreation management area would reduce the forest base by approximately 3,456 acres. Of this lost acreage, 1,800 acres are commercial forest land supporting an estimated 9.3 million board-feet of spruce-fir and 1,656 acres are noncommercial forest land supporting aspen. Loss of acreage and volume from the forest base would be considerable. However, the lack of physical access to the area creates a marginal forest sales program for Hack Lake reducing the significance of the adverse impact.

Impacts from Wilderness Resource Management. Wilderness designations of Eagle Mountain (190 acres) and Hack Lake (10 acres) would reduce the forest land base and management opportunities by 200 acres. The impacts of these designations on forestry would be insignificant because of the small amount of forest base that would be lost.

Impacts from Visual Resource Management. The designation of Bull Gulch and Deep Creek as visual areas of environmental concern would result in a loss of 6,350 acres of forest land. This loss would be minimal as most of this forest is unsuitable for management.

Visual resource management Class II designations would occur on 35 percent of forest land. The impact would be moderate. Stipulations placed on

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harvesting in these Class II areas would be undesirable.

Class III designations would occur on 25 percent of forest land. The impacts would be slight as stipulations placed on harvesting would be less severe under this class.

Impacts from Land Tenure Adjustments. Disposal zones would affect 3,425 acres of forest land. Approximately 2,200 acres of pinyon-juniper and less than 1,500 acres of commercial sawtimber species would be lost in disposal. The overall affect would be minimal, although loss of forest or woodland products may be important in localized areas.

Impacts from Off-Road Vehicle Management. Off-road vehicle (ORV) limitations proposed by critical watershed, recreation and wildlife management would impact forest management to a moderate degree. An estimated 2,500 acres would be affected by ORV limitations. Limitations would increase the already major problem of limited access to public land, especially important to the fuelwood sale program. Closing roads or limiting use to existing or designated trails and roads would slightly affect fuelwood collection. Such limitations, however, would help control wood trespass.

Seasonal limitations (see Impacts from Wildlife Habitat Management) would affect forest product sales as well as harvesting times and costs. These impacts would have the greatest impacts on fuelwood cutters and gatherers.

Impacts from Transportation Management. Any development of roads (upgrading, new construction, easement acquisitions) would greatly benefit forest management by reducing the cost of timber sales and administrative work in the forest management program.

Impacts from Fire Management. Fire exclusion areas would provide the forest land with a certain degree of insurance against major disasters. Buildups of forest fuels are inevitable, however. Managing fires within fire management areas would reduce forest fuels and competitive vegetation thereby increasing forest growth and productivity.

Cumulative Impacts on Forestry

By intensively managing forest lands, productivity and revenues would increase. Overall health and vigor of stands would be improved, and disease and insect problems would generally be reduced. In the long term (200 or more years for productive forest land), the annual allowable harvest would increase.

Designating fire management areas would reduce fuel buildups and wildfire risks and improve forest

growth and productivity. Designating fire exclusion zones would reduce timber losses from wildfire.

Approximately 76,500 acres of forest land or 96 percent of the total existing resource area forest base would be managed. This management would provide an annual allowable harvest of 1.8 million board feet of timber and 3,535 cords of fuelwood. This annual harvest rate is expected to meet the demand for wood products for the next 10 years.

IMPACTS ON RECREATION RESOURCES

Impacts from Proposed Management Actions

Impacts from Recreation Resource Management. Because existing recreation opportunity spectrum (ROS) settings and recreational opportunities would be maintained on approximately 492,828 acres (87 percent of the resource area), a variety of settings would remain available.

Primitive and semi-primitive non-motorized ROS settings (15,110 acres) would be protected by off-road vehicle (ORV) closures and limitations that would prevent conflicts between non-motorized and motorized uses. Identification of recreation management areas, withdrawals, and prohibition of mineral leasing and mineral sales would further protect ROS settings and unique and fragile resource values in Thompson Creek (4,286 acres) and Deep Creek (2,470 acres). The semi-primitive non-motorized class in the Hack Lake area would also receive additional protection by its identification as a recreation management area and the associated non-surface facilities stipulation on mineral leasing and prohibition of mineral sales. The change of 2,698 acres in Thompson Creek from the existing semi-primitive non-motorized class to the semi-primitive motorized class would allow environmental education opportunities that are more consistent with management objectives for the semi-primitive motorized class.

Maintenance of existing recreational facilities would prevent deterioration of these sites. The development of 24 additional facilities would accommodate existing and expected future recreational use occurring in these areas, prevent deterioration of the sites caused by such use, and reduce visitor safety and health problems.

The changes of 19,275 acres from existing semi-primitive non-motorized classes to semi-primitive motorized classes would have low adverse impacts. Although these changes represent a substantial reduction of scarce semi-primitive non-motorized recreational opportunities on public land, the signifi-

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cance is reduced because user preferences for hunting and hiking, the major activities in the affected areas, are equal for semi-primitive non-motorized and semi-primitive motorized settings. In addition, the ORV limitation on Castle Peak would maintain opportunities for non-motorized recreation.

Impacts from Water Quality Management. Improvement in water quality would benefit aquatic habitat by decreasing sedimentation and salinity. The effects of aquatic habitat improvement on recreation are discussed in Impacts from Aquatic Habitat Management.

Impacts from Water Yield Management. Proposed vegetation conversions, in combination with vegetation manipulations proposed by terrestrial habitat management and livestock grazing management, and proposed timber harvesting would cause concentrations of vegetation and surface disturbances that would be inconsistent with management objectives for the existing semi-primitive non-motorized and semi-primitive motorized classes and result in changes, respectively, to the semi-primitive motorized and roaded natural classes. The impacts are quantified in the cumulative impacts section for this alternative.

Impacts from Critical Watershed Areas. ORV limitations in critical watershed areas would have adverse impacts on motorcycle and four-wheel drive use. Although the affected areas are generally near population centers, the overall adverse effect is insignificant because ORV use on public land is a very small percentage of the total use in the region.

Impacts from Aquatic Habitat Management. Habitat improvement of 60 miles of streams in the resource area would increase fish populations and could enhance fishing opportunities by increasing the fishing success ratio. However, the effect cannot be quantified since fishing success is only one of several factors that affect a fishing experience.

Designation of Hack Lake as an area of critical environmental concern (ACEC) would protect habitat for the state listed threatened Colorado River cutthroat trout, one of the resource values identified within the proposed Hack Lake recreation management area.

Impacts from Terrestrial Habitat Management. Manipulating 1,844 acres of vegetation per year would increase big game populations and could enhance hunting opportunities by increasing the hunting success ratio. However, the effect cannot be quantified since hunting success is only one of several factors that affect a hunting experience.

Seasonal ORV limitations prohibiting snowmobile use would have low adverse impacts on such use in most of the resource area because of the low

amount of use that presently occurs, but would have low to moderate impacts on snowmobile use in areas south of Parachute and Rifle and in the Basalt Mountain area. The impacts on these areas would be more significant because public land in these areas is used for access to adjacent national forest land where most of the snowmobile use occurs and this access would be reduced. The impacts of the limitations on motorcycle and four-wheel drive use would be minimal since use would be allowed on existing roads and trails.

Impacts from Wilderness Resource Management. Designation of 340 acres in the Eagle Mountain and Hack Lake Wilderness Study Areas would help maintain existing ROS settings and recreational opportunities in these areas.

Impacts from Visual Resource Management. Designation of 9,184 acres in Deep Creek and Bull Gulch as ACECs and management under visual resource management (VRM) Class II objectives would provide additional protection of primitive and semi-primitive non-motorized settings and fragile and unique resource values. VRM Class II objectives would protect semi-primitive non-motorized settings in Hack Lake and the 2,452 acres of the Bull Gulch area outside of the proposed ACEC.

Impacts from Land Tenure Adjustments. The proposed disposals would have minimal to low adverse impacts on dispersed recreation opportunities, mainly hunting, because most of the tracts are small and many are currently inaccessible to the general public. Furthermore, the loss of opportunities would be offset by the increase in opportunities resulting from acquisitions of legal access (see Impacts from Transportation Management).

Impacts from Transportation Management. Legal access acquisitions would accommodate existing levels of recreation use and expected recreation demand for all recreational activities. These access acquisitions would result in moderate to high increases in visitor use throughout the resource area. Acquisition of private lands on the upper Colorado river near Burns and near Twin Bridges would allow the development of river access sites that would accommodate existing and future levels of floatboating use and reduce trespass problems on private land.

Impacts from Utility and Communication Facility Management. The unsuitable and sensitive zoning classifications would help protect all developed recreation sites, all primitive and semi-primitive non-motorized ROS classes, the proposed Thompson Creek Natural Environment Area, and the entire upper Colorado River corridor between State Bridge and Dotsero by either precluding construction of such facilities or identifying areas where

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restrictive stipulations would be applied to reduce the impacts.

Impacts from Fire Management. Including all developed recreation sites in the fire exclusion zones would help protect the sites from wildfire and decrease fire hazards to recreational users.

Cumulative Impacts on Recreation Resources

Existing ROS settings and recreational opportunities would be maintained on approximately 87 percent of the resource area. Thus, a variety of opportunities would remain available.

Identification of recreation management areas, ORV closures and limitations, withdrawals, VRM objectives, designation of ACECs, and zoning for utility and communication facilities would protect primitive and semi-primitive non-motorized ROS classes and unique and fragile resource values in Thompson Creek, Deep Creek, Hack Lake, and Bull Gulch.

Maintenance of existing developed recreational facilities would prevent deterioration of these sites. The development of 24 additional facilities would accommodate existing and expected future recreational use in high use areas and would prevent deterioration caused by this use. Acquisition of legal access to currently inaccessible public land would provide for future recreation demands for all activities. The access acquisitions would result in moderate to high increases in recreational use throughout the resource area.

Concentrations of vegetation manipulations and timber harvesting would cause changes of 16,577 acres from the existing semi-primitive non-motorized class to semi-primitive motorized and 53,939 acres from existing semi-primitive motorized to roaded natural. Additional impacts to the physical settings could occur since any future proposals would be subject to the less restrictive objectives of the proposed classes. The overall effects would be low as approximately 15,110 acres in the resource area would remain in the semi-primitive non-motorized class and approximately 279,411 acres would remain in the semi-primitive motorized class. Thus, supplies of semi-primitive non-motorized and motorized recreational opportunities would remain available in the resource area and a variety of opportunities would also be available.

Changes of existing semi-primitive non-motorized classes to semi-primitive motorized would cause a loss of 19,275 acres of scarce semi-primitive non-motorized recreation opportunities. However, the overall adverse effect would be low because user preferences for the major activities which occur in

the affected areas are equal for semi-primitive non-motorized and semi-primitive motorized settings.

IMPACTS ON SOCIAL AND ECONOMIC CONDITIONS

Impacts from Proposed Management Actions

Impacts from Water Quality Management. Efforts to monitor and address water quality problems may have some marginal economic and social impact. The quality of recreation use of water may be improved and water treatment costs could be slightly lowered.

Impacts from Water Yield Management. Demand for water locally and throughout the western United States promises to continue to grow. An increase in water yield of 6,500 to 8,880 acre feet, equivalent to about 2 percent of annual use in the upper Colorado River drainage, would yield positive economic and social benefits.

Impacts from Critical Watershed Areas. Municipal watershed protection should result in lower water treatment costs. Reduced debris flow would prevent property loss or damage to private landowners. Off-road restrictions in erosion hazard areas would reduce sediment yield and prolong the useful life of downstream retention or diversion structures resulting in marginal economic benefits.

Impacts From Aquatic Habitat Management. Improved aquatic habitat and higher fish populations would increase the probability of catching fish which would improve the quality of the fishing experience with positive social and economic results.

Livestock Grazing Management. Table 5-34 shows the estimated economic impacts of forage allocation proposals. The net effect of the initial forage allocations would be minimal, the addition of 1,017 animal-unit months (AUMs) generating only small increases in gross and net revenue. The effect on individual ranching operations could be significant, though. Seventy-seven operators would receive allocation reductions totalling 6,037 AUMs while 80 operators would receive a total increase of 7,054 AUMs.

The methodology used to assess the income effects of changes in forage allocation does not enable the evaluation of specific ranching operations. However, estimated changes in average net revenue (personal income) by ranch size suggest that several ranches would be significantly affected (see Appendix J, Table 4). Average net revenue changes for mid-size cattle ranches range from a drop of \$1,475 per ranch, a 13 percent reduction,

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TABLE 5-34. INCOME EFFECTS OF CHANGES IN FORAGE ALLOCATION

	Number of Ranches	Change in Forage Allocation (AUMs)		Change in Gross Revenue (dollars)		Change in Net Revenue (dollars)	
		Total	Average	Total	Average	Total	Average
Initial Allocation							
Reductions.....	77	-6,037	-78	-189,465	-2,461	-113,569	-1,475
Increases.....	80	+7,054	+88	+217,223	+2,715	+129,396	+1,617
Net.....	157	+1,017	+6	+27,758	+177	+15,827	+101
Potential Allocation							
Reductions.....	41	-1,285	-31	-38,277	-934	-22,411	-547
Increases.....	112	+15,280	+136	+504,953	+4,509	+314,675	+2,610
Net.....	153	+14,015	+92	+466,676	+3,050	+292,264	+1,910

to an increase of \$1,617 per ranch, a 15 percent increase. To the extent that individual operations would be economically affected, their social well-being and quality of life would also be affected.

Any adverse impacts would be mitigated by several factors. No forage allocation changes would take place until monitoring had verified the need for such changes. The monitoring period (5 years) would provide an opportunity to restructure a ranching operation or to find alternate sources of forage and income, thus avoiding the full impact of any forage reductions.

In addition, forage improvement projects would in the long term provide a considerable increase in livestock forage to two thirds of area ranches. Successful implementation of proposed projects would increase livestock forage by 14,015 AUMs, a 37 percent increase, stimulating a 2 percent increase in gross revenue and a 17 percent increase in average net revenue.

Impacts from Terrestrial Habitat Management. Forage allocated to big game would be reduced in the long term by 7 percent. Additional big game forage would be lost in some areas due to residential and commercial development of private land and public land that had been disposed of. The net effect would be a long-term shortfall in big game forage of 21 percent.

The shortfall would translate into directly proportional reductions in deer and elk populations and in recreational uses associated with big game. Local expenditures in support of big game recreational activities would decline \$3.1 million from the current \$14.8 million. Employment would drop by 202 man-years. Personal income in the resource area would decrease by \$1.6 million. Although this is less than 1 percent of the area's total personal income, it becomes significant because much of the reduction would take place in the fall, a traditionally slow eco-

nomical period. Moreover, the changes would be focused on those businesses which rely on hunting and other big game-related recreational activities.

The social well-being and quality of life of some area residents would be adversely affected due to reduced income and the marginally increased difficulty with which big game recreational activities could be pursued.

Access recommendations under this proposal could result in some increase in hunter use of public land. To the extent this encouraged more hunting activity in the resource area, economic benefits would accrue. Most of the use would simply be movement from other parts of the resource area, however. Access to or through public land would also diminish somewhat the income of those who charge gate fees for access through their property.

Impacts from Forest Management. Providing 1.8 million board feet of sawtimber and 3,535 cords of fuelwood annually would yield a federal revenue of \$81,000 per year. Half of the fuelwood would be resold by commercial cutters and all of the timber would be manufactured and sold as lumber, together generating sales of \$890,000. This is about 10 percent of current wood product sales generated in the area by BLM and the U. S. Forest Service. Direct and induced growth in personal income of \$337,000 and 31 man-years of employment would result.

The sale of 1,768 cords of fuelwood to the public would help offset residential energy costs as well as provide an opportunity for people to socialize and recreate with friends and family.

Impacts from Recreation Resource Management. The local economic and social impacts of recreation management activities would be minimal. An increase in the number of recreational facilities

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would improve the quality and hence the value of recreational experiences. Designation of the Hack Lake Recreation Management Area would remove 9.3 million board feet of commercial timber from available supply; however, the economic impact of that lost supply would be minimal.

Impacts from Wilderness Resource Management. Only low mineral values are affected one way or the other with no economic impact. There is unlikely to be any net change in the amount of recreation use in the resource area because of this recommendation and, hence, no social or economic impact due to changes in recreation use.

Impacts from Land Tenure Adjustments. Approximately 11,025 acres would be added to the private land base in the resource area, an increase of 1.5 percent. An additional 12,220 acres could also be disposed of through sales, although exchange proposals would have priority on these tracts. The combined acreage of 23,245 would be a 3.3 percent addition to the private land base. This increase in the supply of available land could have a downward effect on the price of other undeveloped land, particularly on nearby properties. Such an effect would benefit potential buyers, but would adversely affect landowners.

An increase in BLM administrative costs would be required to deal with increased sales activity. However, clarification of the disposal status of public land in the resource area would reduce costs for both BLM and applicants.

Sales revenue could be from \$10 to \$12 million, based on estimated sales prices ranging from \$200 to \$1,000 per acre. Receipts would go to the federal treasury. Local jurisdictions would benefit from increased property tax revenues, although their administrative costs would increase by additions to the private land base.

The proposed sale and exchange tracts include 14,730 acres of crucial big game winter range. The average value of such land in the resource area has been estimated at \$176 to \$725 per acre of crucial winter range (see Existing Management Situation, Wildlife, available for review at the Glenwood Springs Resource Area office). If, after disposal, that land is developed and lost forage is not replaced, adverse economic impacts would be felt. The economic analysis of the terrestrial habitat management proposals assumes such a loss.

The tracts also include land with 2,268 AUMs of livestock storage which could be transferred to private ownership and potentially lost as productive rangeland.

Cumulative Impacts on Social and Economic Conditions

Table 5-35 shows the cumulative annual impacts of proposed management actions on personal income and employment. Net changes for both are minimal but individuals or certain groups might be significantly affected. Other proposed management actions would not have measurable economic impacts. Area population and the provision of public and social services would be unaffected.

TABLE 5-35. CUMULATIVE IMPACTS ON PERSONAL INCOME AND EMPLOYMENT

Management Activity	Change Agent	Change in Personal Income (\$1,000)	Change in Employment (man-years)
Livestock Grazing	+1,017 AUMs.	+35	.....
Wildlife Habitat	-21 percent..	-1,600	-202
Forest Land	+3,568*	+337	+31
Net Change.....	.....	-1,228	-171

*thousand board feet

The impacts from terrestrial habitat and forest management would endure over the long term. The livestock grazing management impacts are short term but were included because it would be short-term forage allocation decisions which might be decisive to individual ranches.

Social well-being and quality of life are unlikely to be significantly affected by proposals under this alternative.

IMPACTS ON CULTURAL RESOURCES

Impacts from Proposed Management Actions

Impacts from Cultural Resource Management. Designation of the Blue Hill Archaeological District as an area of critical environmental concern and nomination to the *National Register of Historic Places* would help protect significant cultural resources and provide additional information about the prehistoric cultures.

Actively managing high value cultural sites would substantially decrease the number of sites lost and would slow or prevent deterioration of the values present. Establishing and maintaining accurate and complete data about these sites would also significantly add to our knowledge of these past cultures.

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Cultural resource inventories conducted for all surface-disturbing activities would result in increased information about the local cultural resources and thus contribute to our knowledge of the past.

No significant adverse impacts would occur from managing high value sites or from protecting the Blue Hill Archaeological District.

Impacts from Livestock Grazing Management. Livestock grazing would result in cultural resource loss or damage as a result of livestock trampling and rubbing. However, present information indicates these impacts would be insignificant because most sites are not susceptible to these impacts.

Cumulative Impacts on Cultural Resources

Cumulative impacts would be the same as those presented under Proposed Management Actions.

IMPACTS ON PALEONTOLOGICAL RESOURCES

Impacts from Proposed Management Actions

Proposed management actions would not adversely affect paleontological resources. Required paleontological resource clearances in areas with a high probability of fossil occurrence would prevent the accidental destruction of any fossils present.

Required paleontological resource clearances would result in beneficial impacts. Information would be collected about local paleontological resources. However, little information would be collected, as few projects are proposed in high occurrence areas.

Cumulative Impacts on Paleontological Resources

Cumulative impacts would be the same as those presented under Proposed Management Actions.

IMPACTS ON WILDERNESS VALUES

Impacts from Proposed Management Actions

Impacts from Wilderness Resource Management. Designating the Eagle Mountain Wilderness Study Area (WSA) (330 acres) and a portion (10 acres) of the Hack Lake WSA as wilderness would have long-term beneficial impacts to wilderness

values. It would provide additional protection to the values and permit the natural ecological processes to continue. Protecting the wilderness values would in turn benefit related supplemental values such as wildlife, geological, ecological, and scenic values.

Transferring administration of these two areas to the U. S. Forest Service would provide consistent management with the existing adjacent wilderness areas.

Diversity in the local wilderness supply would not be increased. Wilderness values could be adversely affected by non-designation of the 30,290 acres recommended as nonsuitable since these areas would be open to development of other resources. These impacts are discussed below by resource activity and in the cumulative impacts section.

Impacts from Water Yield Management. Vegetation manipulations to increase water yield in the Castle Peak WSA would impair the area's natural character.

Impacts from Aquatic Habitat Management. Designation of Hack Lake as an area of critical environmental concern (ACEC) and habitat improvement would protect habitat for the Colorado River cutthroat trout, a state threatened species and one of the supplemental values of the wilderness study area.

Impacts from Forest Management. Commercial timber harvesting in the Castle Peak WSA and on 4,585 acres of the Bull Gulch WSA would impair the naturalness of these areas. Human activities and noise associated with timber harvesting would also reduce opportunities for solitude.

Impacts from Recreation Resource Management. Off-road vehicle (ORV) closures and long-term management under semi-primitive nonmotorized class objectives would maintain primitive recreational opportunities in the nonsuitable portion of the Hack Lake WSA and 10,214 acres in the Bull Gulch WSA. The ORV limitation on Castle Peak would maintain primitive recreation opportunities since use would be mainly limited to designated roads east of the wilderness study area. The no surface occupancy stipulation on oil and gas leasing on 3,118 acres of the Hack Lake WSA would also provide protection of the area's natural character. The remaining 4,786 acres of the Bull Gulch WSA would be open to ORV use which could conflict with and reduce opportunities for primitive types of recreation.

Impacts from Visual Resource Management. Designation of 6,714 acres within the Bull Gulch WSA as an ACEC and management under visual resource management (VRM) Class II objectives would protect the visual quality. Visual quality of an

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additional 3,099 acres of the Bull Gulch WSA, all of the nonsuitable portion of the Hack Lake WSA, and 10,513 acres of the Castle Peak WSA also would be protected under VRM Class II objectives.

Visual quality could be degraded in the remaining 5,187 acres of the Bull Gulch WSA and 1,427 acres of the Castle Peak WSA because of the less restrictive VRM Class III and Class IV objectives.

Impacts from Utility and Communication Facility Management. Zoning all of the Eagle Mountain and Hack Lake WSAs and 10,214 acres of the Bull Gulch WSAs as unsuitable for utility and communication facilities would help protect the naturalness of the areas. Zoning all of the Castle Peak WSA and 4,786 acres of the Bull Gulch WSA as sensitive for such facilities would not eliminate, but could reduce, impacts on naturalness.

Cumulative Impacts on Wilderness Values

Wilderness values would be preserved in 340 acres in the Eagle Mountain and Hack Lake WSAs. Preservation of wilderness values would in turn protect the scenic values of the areas.

Wilderness values would be adversely affected by non-designation on the 30,290 acres recommended as nonsuitable. These adverse impacts would be low on approximately 13,550 acres, but wilderness values would be lost forever on 16,740 acres. The impacts would be minimal in the Hack Lake WSA as a no surface facilities stipulation on mineral leasing, unsuitable zoning for utilities, off-road vehicle closure, prohibition on timber harvesting, and the management objectives for the semi-primitive non-motorized class would provide protection of the area's natural character and opportunities for solitude and primitive recreation. Approximately 10,214 acres of the Bull Gulch WSA would be similarly protected by an off-road vehicle closure, unsuitable zoning for utilities, and semi-primitive non-motorized management objectives. Six thousand seven hundred fourteen (6,714) acres within this area would be further protected through designation as an ACEC for scenic values and managed under VRM objectives for Class II. However, the entire WSA including this area would remain open to mineral exploration and development which could impair the naturalness. Naturalness in the remaining 4,786 acres of the Bull Gulch WSA would be impaired because of timber harvesting. Adverse impacts would be most significant in the Castle Peak WSA since timber harvesting and vegetation manipulations to increase water yield would impair naturalness in the entire WSA. In addition, the WSA could remain open to mineral exploration and development which could further impair the naturalness. Limiting ORV use to designated

roads and trails would maintain opportunities for primitive recreation and solitude.

IMPACTS ON VISUAL RESOURCES

Impacts from Proposed Management Actions

Impacts from Visual Resource Management. Visual quality on approximately 519,345 acres (92 percent) of the resource area would be maintained. Designation of Deep Creek and Bull Gulch as areas of critical environmental concern (ACECs) and management under visual resource management (VRM) Class II objectives would provide protection of the visual qualities of these areas.

Thompson Creek would not be designated as an ACEC; however, the area would be managed under VRM Class II objectives which would protect its visual quality. One thousand three hundred sixty-five (1,365) acres in the Parachute Creek area would be managed under Class IV objectives instead of Class III. The effect of this change would be minimal because of the small acreage involved.

Impacts from Water Yield Management. Proposed vegetation conversions, in combination with vegetation manipulations proposed by terrestrial habitat management and livestock grazing management, and proposed timber harvesting, would cause concentrations of vegetation and surface disturbances that would be inconsistent with VRM Class II objectives and result in changes to Class III. The impacts are quantified in the cumulative impacts section for this alternative.

Impacts from Critical Watershed Areas. The off-road vehicle (ORV) limitations would help maintain visual quality in the restricted areas by reducing degradation from ORVs. The debris flow area near Glenwood Springs and the ORV areas near Gypsum and Eagle would be the most significant since these areas are within the watershed of Interstate 70.

Impacts from Recreation Resource Management. Management objectives for the primitive and semi-primitive nonmotorized recreation opportunity spectrum (ROS) classes would help maintain visual quality. The two proposed ACECs and Class A scenic quality area on Hack Lake are within these ROS classes. ORV closures and limitations in the above areas would also help maintain visual quality.

Impacts from Wilderness Resource Management. Designation of 340 acres of wilderness would maintain the visual quality of the areas in a natural state.

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Impacts from Utility and Communication Facility Management. The unsuitable classifications would protect visual quality by precluding construction of utility and communication facilities. The two proposed ACECs (9,184 acres) and Thompson Creek are included in this classification. The sensitive classification would protect visual quality by identifying areas where restrictive stipulations would be applied to mitigate the impacts of such facilities in conformance with VRM objectives.

Cumulative Impacts on Visual Resources

Visual quality of approximately 92 percent of the resource area would be maintained. Designation of Deep Creek and Bull Gulch as ACECs and management under VRM Class II objectives would provide protection of the areas' visual qualities.

Thompson Creek would not be designated as an ACEC but its visual qualities would be protected by management under VRM Class II objectives. Forty-five thousand, three hundred thirty-two (45,332) acres of tentative VRM Class II would be changed to Class III and managed under the less restrictive objectives. Visual quality in these areas would be degraded by concentrations of vegetation manipulations and timber harvesting. An additional 1,365 acres of tentative Class III would be changed to Class IV and managed under the less restrictive objectives. Visual quality could be further degraded on the total 46,697 acres which would be managed under lower VRM objectives since any future proposals would also be subject to the less restrictive objectives. The overall detrimental effects would be low as the changes generally occur outside of the foregrounds of major viewsheds.

IMPACTS ON TRANSPORTATION

Impacts from Proposed Management Actions

This alternative would provide greater access to public land. Traffic on roads and trails would increase as public access was obtained and road conditions improved. This would create some adverse impacts on the land itself due to resource degradation such as vandalism, littering, and off-road vehicle damage caused by the increased use.

This alternative would provide better quality roads. More maintenance would be required from increased traffic. Many important resource programs would have two points of access which would spread out use and provide alternate ingress and egress in poor weather. This would help to prevent degradation to the transportation system.

The resource programs proposing management actions on the lands identified for access would benefit as it would help them accomplish their management objectives.

A great deal of new access would be proposed in this alternative (an increase of approximately 50 miles of public roads and 40 miles of public trails) to serve both large and small tracts of public land. This should satisfy most demands for access by the public and BLM.

Cumulative Impacts on Transportation

Cumulative impacts would be the same as those presented under Proposed Management Actions.

SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY

This section identifies the trade-offs between short-term use and long-term productivity of the resources involved in the four alternatives. For this analysis, short term refers to the period of implementation of the plan within about 10 years, and long term refers to the period 20 years or beyond in which the proposals' adverse or beneficial impacts would still occur.

SOILS

In the short term, soil loss would increase slightly under all the alternatives from vegetation manipulation, timber harvesting, and mineral development. The most short-term soil loss would occur in the Economic Development Alternative. The least loss would result in the Continuation of Current Management Alternative. In the long term, increased erosion would be expected in intensive off-road vehicle (ORV) use areas. ORV use is proposed in all alternatives, but is most extensive in the Economic Development Alternative. Also, in the long term, for all alternatives, increased vegetation production and ground cover would significantly reduce soil loss, thus providing long-term net improvements on the soils resource.

VEGETATION

Vegetation in the short term, for all alternatives, would be disturbed on vegetation manipulation

SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY

areas, timber harvest sites, and mineral, utility or transportation site development locations. Vegetation disturbance would occur on more acreage in the Economic Development and Resource Protection Alternatives. There should be a significant long-term increase in vegetation production for all the alternatives. Vegetation cover would reestablish on disturbed areas, and there would be an increase in plant vigor, forest growth and reproductions, seedling establishment, litter accumulation, and overall vegetation improvement. The improvement to the vegetation would be most significant in the Resource Protection and Economic Development Alternatives and least observable in the Continuation of Current Management Alternative.

LIVESTOCK GRAZING

In the short term, initial forage allocations of animal-unit months (AUMs) would be decreased because of vegetation manipulation projects. The decreases would be most observable in the Resource Protection and Economic Development Alternatives and least observable in the Continuation of Current Management Alternative. In the long term, as vegetation cover is reestablished, forage productivity would increase allowing for increased allocation of AUMs. This increase would not occur in the Continuation of Current Management Alternative, but would occur in the other alternatives, with the greatest increase in the Resource Protection Alternative.

TERRESTRIAL WILDLIFE

In the short term, big game forage and habitat would decrease because of vegetation manipulation projects. The Resource Protection Alternative proposes the most acres for manipulation; the Economic Development and Preferred Alternatives are approximately equal; and the Continuation of Current Management Alternative identifies the least acres. In the long term, as vegetation for forage and habitat reestablishes, only the Resource Protection Alternative proposes a significant increase in big game populations. The Economic Development Alternative identifies an increase of 1 percent. Both the Continuation of Current Management and Preferred Alternatives identify declines in big game populations. The decline would be partially due to loss of habitat through land disposals and private land development.

WATER RESOURCES

Water quality conditions in the short term would decline under all alternatives because of vegetation manipulations and other soil disturbing activities. The Resource Protection and Economic Development Alternatives propose the most manipulation projects. In the long term, for all alternatives, increases in water yield and improvement in quality would be expected because of water treatment projects and vegetation reestablishment. The Economic Development Alternative identifies the most projects that would increase water yield and quality. The Continuation of Current Management Alternative would produce the least increases in yield and quality because no specific projects are proposed.

RECREATION RESOURCES

In the short term, recreational activities on public land such as camping, hunting, fishing, and boating would remain constant in all the alternatives. In the long term, however, recreational opportunities would be increased in all alternatives except Continuation of Current Management which proposes no additional recreational facilities. The increases would result through more access, better developed sites, increases in water yield and quality, and better big game habitat resulting in increased game population. The Economic Development Alternative proposes the largest number of additional facilities, twice as many as the Preferred and two thirds more than Resource Protection.

VISUAL RESOURCES

Over the short term, vegetation manipulations, timber harvesting, and energy, utility and transportation development will create some visual intrusions. These impacts would be greatest in the Economic Development Alternative and least in the Continuation of Current Management Alternative. In the long term, revegetation of manipulated and harvested areas would lessen the visual impacts, resulting in little loss of the visual quality to the resource area. Areas affected by energy, utility, or transportation development would create visual intrusions, but if the projects were constructed in harmony with the natural environment, it would lessen their long-term decrease to the visual resources.

ENVIRONMENTAL CONSEQUENCES

MINERALS

Mineral development would be restricted by withdrawals proposed by water, cultural, recreation, and wilderness resource management. These restrictions would create long-term adverse effects on mineral development. However, due to the limited amount of acreage affected, there would be no significant limitations on exploration or development.

CULTURAL RESOURCES

In the short term, for all alternatives, cultural resources could benefit because the increased project work would create the need for cultural inventories and clearances on the land to be affected by the projects. The Blue Hills Archaeological District and identified high-value sites would benefit in the short term and long term in all alternatives except Continuation of Current Management. All other long-term effects to cultural resources would be insignificant.

SOCIAL AND ECONOMIC CONDITIONS

In the short term, social and economic conditions in the area would not be significantly affected by management proposals under any of the alternatives. Individual ranching operations, however, could be significantly affected in the short-term, particularly under the Continuation of Current Management and Resource Protection Alternatives. Many of those adversely affected in the short term would be economic beneficiaries in the long term because of improved livestock forage conditions. Forage allocations to wildlife would have primarily long-term effects as deer and elk populations adjust to new forage levels and as expenditures for wildlife-related recreation adjust to the new population levels. Increases in sales of forest land products would produce long-term economic benefits by assuring a lasting supply of improved quality timber.

WILDERNESS VALUES

In the short term and long term, any wilderness designation within existing wilderness study areas would restrict potential productivity of mineral development, timber harvesting, motorized recreational opportunity, or any other use restricted in wilderness areas.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

This section identifies the extent to which the four alternatives would irreversibly limit potential uses of the land and resources. Irreversible and irretrievable commitments of resources occur when a wide range of future options are foreclosed.

SOILS

Minor soil loss would be irretrievably committed in areas of vegetation manipulation, timber harvesting, and minerals development. However, new soil would develop naturally at a very slow rate.

VEGETATION

In areas of vegetation manipulations, land and vegetation would be committed for the lives of the projects.

LAND TENURE

Disposal of public land would result in an irreversible and irretrievable loss of administrative control and public use for all resource values except mineral values on those parcels.

WILDERNESS VALUES

The nondesignation of existing wilderness study areas would result in an irreversible and irretrievable loss of wilderness values in those areas.

MINERALS

The designation of existing wilderness study areas for wilderness would result in the irreversible and irretrievable loss of mineral development in those areas. The leasing and mining of coal deposits would result in the irreversible and irretrievable loss of the coal that is extracted and the coal which would remain as unrecoverable in the mine.

NET ENERGY ANALYSIS

FORESTRY

The designation of existing wilderness study areas for wilderness would result in the irreversible and irretrievable loss of harvest potential in those areas.

RECREATION RESOURCES

The designation of existing wilderness study areas for wilderness would result in the irreversible and irretrievable loss of motorized recreation opportunities in those areas. Changes of recreation opportunity spectrum classes toward the facility dependent end of the spectrum (semi-primitive motorized to roaded natural) would result in irreversible and irretrievable losses of the resource-dependent recreational experience opportunities in the affected areas. Loss of recreation opportunities are tied to the loss of game wildlife habitat. Loss of habitat would result in a permanent loss of hunting opportunities.

TERRESTRIAL WILDLIFE

Wildlife habitat lost through land tenure proposals, energy development, urban expansion, and

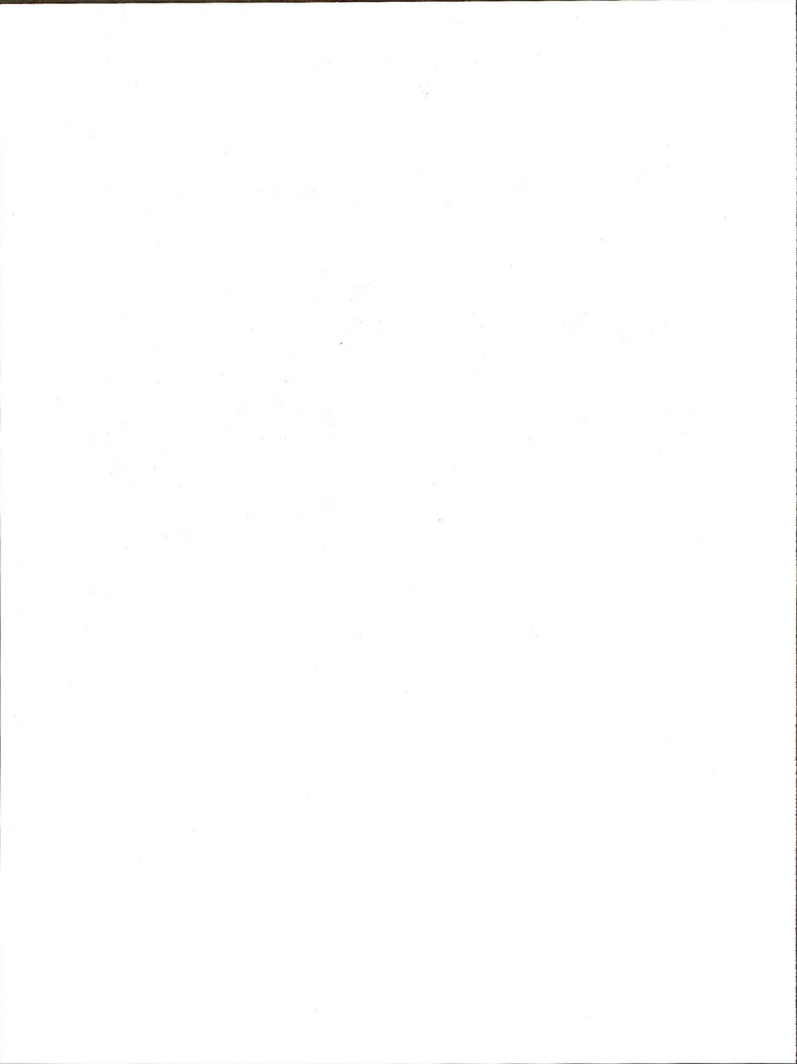
project implementation would be irretrievably and irreversibly lost.

NET ENERGY ANALYSIS

A specific energy analysis was not performed for this environmental impact statement because no major actions affecting specific sites are being proposed. A site-specific energy analysis will be included in the environmental document prepared for any major site specific actions. A meaningful net energy analysis requires that a specific action be analyzed and some preliminary engineering data be available.

On a national average, the ratio of principal energy out to external energy in for crude oil is 19.2:1. However, because of technical and economic constraints, only 30.6 percent of the available resource is extracted. The primary energy types needed for crude oil production, transportation, and upgrading are diesel fuel, electricity, and natural gas.

Net energy analyses completed for Western Colorado indicate that, for surface coal mines, the ratio of energy out to energy in averages 12.1:1 while underground mines average 10.6:1. Resource recovery varies significantly according to geologic formations and mining type used. The primary energy types required for coal production are electricity and diesel fuel.



CHAPTER 6

DOCUMENT PREPARATION, CONSULTATION, AND COORDINATION

DOCUMENT PREPARATION

This draft environmental impact statement and the planning documentation upon which it is based

were prepared by a team of natural resource specialists, economist, editor, illustrator, and clerks. Table 6-1 lists the names and qualifications of these team members.

TABLE 6-1. GLENWOOD SPRINGS PLANNING AND ENVIRONMENTAL IMPACT STATEMENT TEAM

Name	Position	Qualifications
Alfred W. Wright	Project Manager	B.S. Agriculture, 10 years area manager, 6 years natural resource specialist
David B. Mensing	Team Leader	B.S. Outdoor Recreation Resources, M.A. Geography, 2½ years team leader, BLM—7 years outdoor recreation planner.
Joann Graham	Editor	BLM—5 years technical editor, USFS—3 years administrative assistant, DOD—10 years secretary/editorial clerk
James Abbott	Technical Coordinator	B.S. Recreation Administration, BLM—6 years recreation planner
Doug Huntington	Planning Coordinator	M.A. Planning, BLM—1 year planner, OSM—3 years reclamation specialist
Grant Loomis	Hydrology and Soils	B.A. Economics, 2 years graduate education in water resources administration. Water Resources Research Center, University of Arizona—1 year, BLM—2 years economist, 1 year hydrologist
Scott Archer	Air Quality	B.S. Environmental Science and Chemistry, BLM—1 year air quality specialist, EPA—4½ years consultant
*Kerry Sundeen	Hydrology and Air Quality	B.S. Hydrology, M.A. Hydrology, BLM—1½ years hydrologist
James Scheidt	Hydrology and Soils	B.S. Agriculture, BLM—2 years soil scientist, 6 years hydrologist
John Kornfeld	Soils	B.S. Watershed Science, BLM—6 years soil scientist, USFS—4 years soil scientist
*Gary Roberts	Geology and Minerals	B.S. Geology, BLM—3 years geologist, USFS—7 years project engineer
Elizabeth McRaynolds	Minerals and Paleontology,	B.S. Geology, BLM—3 years geologist, 1½ years paleontologist
Leonard Coleman	Wildlife	B.S. Wildlife/Range, BLM—6½ years wildlife biologist, 2 years range conservationist
Mark O'Meara	Fisheries	B.S. Fishery Biology, BLM—3 years fishery biologist
Steve Moore	Economics	M.S. Agricultural Economics, BLM—3 years economist, U. S. Senate—1 year economist, USDA 4 years economist
*David Smith	Fisheries	B.S. Fisheries, BLM—5 years fishery biologist, U.S. Army Corps of Engineers—2 years
Langley E. Ligon	Vegetation, Livestock Grazing	B.S. Range Management, BLM—9 years range conservationist
*Gene Kinch	Livestock Grazing	B.S. Range Conservation, BLM—10 years manager, 9 years range conservationist
*David Vesterby	Forestry	B.S. Forest Management, BLM—2 years forester, USFS—12 years forester, private industry—5 years logging

CHAPTER 6

TABLE 6-1. GLENWOOD SPRINGS PLANNING AND ENVIRONMENTAL IMPACT STATEMENT TEAM—
Continued

Name	Position	Qualifications
James Byers	Forestry	B.S. Forest Management, BLM—4 years forester
Rex Wells	Recreation, Visual Resources, Wilderness, Off-Road Vehicles	B.S. Outdoor Recreation, BLM—5 years outdoor recreation planner
*Rob Cleary	Visual Resources	M.L.A. Landscape Architecture, BLM—7 years landscape architect
*Paul Bradley	Recreation, Visual Resources, Wilderness	B.S. Zoology, M.A. Outdoor Recreation Planning, USFS—2 years outdoor recreation planner, BLM—2 years outdoor recreation planner
John Crouch	Cultural Resources	B.A. Anthropology, BLM—10 years archaeologist
*Stuart Hirsch	Land Tenure, Utilities and Communications	B.S. Forestry, M.A. Recreation Planning and Natural Resources, BLM—1 year forester, 6 years realty specialist
Tom Folks	Land Tenure, Utilities and Communications	B.S. Recreation Park Planning and Resource Management, BLM—1½ years realty specialist, 2 years outdoor recreation planner/wilderness specialist, USFS—forestry technician/civil engineering technician/landscape architect aid
Don Owen	Land Tenure, Utilities and Communications,	B.S. Psychology, graduate program in Natural Resource Planning, BLM—3 years realty specialist, USFS—3 years realty specialist
Roy Johnson	Fire	B.S. Physical Science/Education, BLM—11 years fire management, USFS—4 years fire management
Joe Kaelin	Transportation, Engineering	B.S. Civil Engineering, BLM—2 years engineer, BOR—2 years engineer
Jeb Stuart	Transportation	B.S. Wildlife Management, BLM—1 year realty specialist, USFS—2 years realty specialist, New Mexico GEF—wildlife biologist
*Pete Montoya	Transportation, Engineering	B.S. Wildlife, BLM—7 years atrow/range conservationist, realty specialist, USFS—4 years range conservationist
Lee Meydrecht	Illustrator	BLM—1 year illustrator, USFS—19 years engineering technician, 3 years cultural resource specialist
Ethel McMillin	Lead Clerk	BLM—3 years lead clerk, USAF—10 years clerical assistant
Gail Petry	Editorial Clerk/Typist	B.A. Rhetoric, BLM—6 months
*Carolyn Cordova	Editorial Clerk/Typist	BLM—1½ years

*Planning Documents Only

CONSULTATION AND COORDINATION

During preparation of the planning documents and draft environmental impact statement, federal, state, county and local agencies were contacted to gain information and close data gaps. These agencies are listed in Chapter 1, Interrelationships section.

PUBLIC PARTICIPATION

To keep the public informed and to solicit comments on the planning progress, newsletters were published in February 1980, August 1980, August 1981, and April 1982. Over 1,000 copies were mailed to various agencies and individuals who requested information on the Glenwood Resource Management Plan.

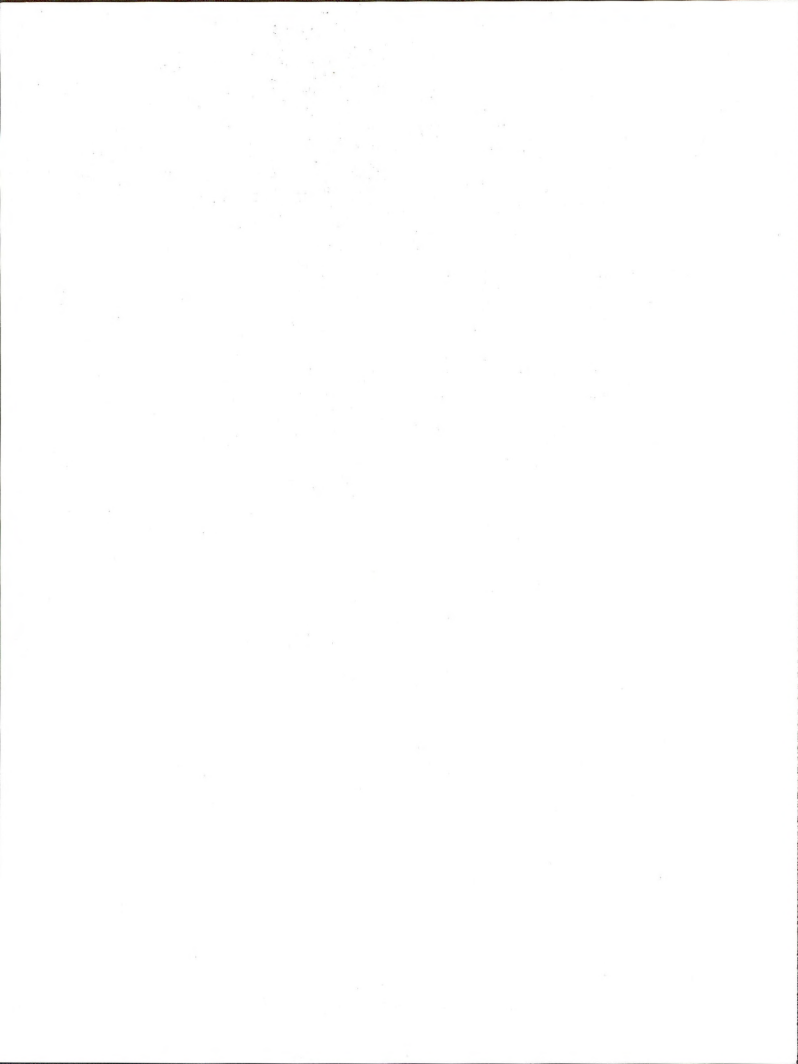
In addition to the newsletters, public workshops were held in November and December 1979, and in

PUBLIC PARTICIPATION

May 1982. The workshops in 1979 were held to give interested agencies and citizens an opportunity to voice their concerns and identify issues for consideration in the resource management plan. The May workshops were held to present and receive comments on the Continuation of Current Manage-

ment, Resource Protection, and Economic Development Alternatives.

News releases and two *Federal Register* notices concerning the resource management plan were also published during the planning process in addition to the many news broadcasts.



APPENDIX A

POSSIBLE MANAGEMENT PRACTICES

Following are lists of possible practices that could be used in the management of the various resources. These lists should not be considered comprehensive lists of all management practices.

WATER QUALITY

BACTERIA CONTROLS

1. Livestock and wildlife management:
 - reduced stocking
 - fencing
 - water developments
 - other range improvements
 - buffer zones in riparian areas
2. Construction of sanitary facilities in heavy use recreation areas

SEDIMENT AND SALINITY CONTROLS

1. Land treatment:
 - conversion of sagebrush to grass
 - ripping, pitting, contour furrows, and trenches
 - revegetation and rehabilitation of disturbed areas
 - rehabilitation or improvement of riparian areas
2. Control Structures:
 - water bars
 - gully plugs
 - water spreaders
 - retention/detention dams
 - gabions
 - jetties
3. Management Consideration:
 - proper livestock and wildlife grazing management
 - adequate drainage and protection on all roads and surface disturbances

timber management controls

fire management controls

TEMPERATURE AND DISSOLVED OXYGEN CONTROLS

improve riparian vegetation

increase base flow levels

WATER YIELD

BIG SAGEBRUSH ZONE

Water yield could be increased by converting shrub-type vegetation into grasses and forbs. Type conversion could be conducted by burning, plowing, disking, or spraying. The technique selected would depend on conditions at the site.

Snowfence construction is a second feasible technique for increasing water yield from the sagebrush zone. Good fence sites have—

1. ridge crest locations,
2. upslope or level windward approach to the fence,
3. good orientation to prevailing drifting winds,
4. upslope or level terrain to the lee of the accumulation area,
5. at least 500 feet of contributing area,
6. little natural accumulation upwind of the fence, and
7. northerly to northeasterly exposure.

At good sites, from 60 to 120 feet of fence would be needed to produce an extra acre-foot of snow-melt, based on fences 10 to 12 feet tall, 40 percent fence density, and bottom gaps of 2 to 4 feet. At such sites, the melt season would be prolonged 1 to 3 weeks.

APPENDIX A

MOUNTAIN BRUSH ZONE

Water yield in the mountain brush zone can be increased by type conversion to grasses and forbs. Mountain brush control can be conducted through a number of approaches. It can be clearcut or it can be patch cut in order to preserve and enhance wildlife habitat. It can also be controlled by burning, cutting, or spraying. The effects from burning or cutting will be shorter lived than those from spraying due to rapid shrub regrowth.

PHREATOPHYTE INFESTATION AREAS

Management for maximum water yield in this zone would involve eradication of saltcedar and replacement with less water consumptive species, e.g., willows. Saltcedar can be removed by root-ploping or antitranspirant sprays.

MIXED CONIFER ZONE

Highest increases in water yield from the mixed conifer zone result when the forest is harvested in a system of small forest openings. An optimum pattern of snow accumulation results when openings are (1) less than eight tree heights in diameter, (2) interspersed so that they are five to eight tree heights apart, and (3) protected from wind. Maximum water yield results when approximately 40 percent of the watershed is occupied by these small openings and 60 percent is left uncut.

ASPEN ZONE

Water yield management in the aspen zone can be conducted either by type conversion to grassland or by patch cutting in a manner similar to that in the mixed conifer zone. In both the aspen and mixed conifer zones, windrowing slash can augment water yield by providing an area protected from the wind which enables snowdrifts to build up. The decision to windrow slash is an option that is open for water yield management but may not be economically feasible.

CRITICAL WATERSHED AREAS

Management practices that would be useful in protecting critical watersheds follow:

- Access road construction
- Alternative water source development
- Brush control
- Buffer strips
- Contour furrows and trenches
- Critical area planting
- Debris basins
- Dikes
- Fencing
- Firebreaks
- Floodwater control structures
- Grazing land mechanical treatments
- Livestock exclusion
- Planned grazing systems
- Pond sealing or lining
- Range seeding
- Rehabilitation of disturbed areas
- Rehabilitation or improvement of wetland areas
- Spring development
- Stocktrail and walkway development
- Stream channel stabilization
- Streambank protection
- Tree planting
- Trough or tank installation
- Waterspreading
- Wildlife upland habitat management
- Wildlife watering facilities
- Woodland improved harvesting
- No development
- Development with mitigation measures

WATER YIELD

AQUATIC HABITAT

HABITAT IMPROVEMENT MEASURES

Reservoir Flood Basins:

- Selective clearing
- Brush shelters
- Tire shelters
- Other fish shelters
- Exposed area planting
- Raised spillways

Reservoir Conservation Pools:

- Stage filling
- Fluctuation control
- Seasonal manipulation
- Minimum pools
- Aeration-destratification

Dam Discharge Systems:

- Low-level intakes
- Multi-level intakes
- Spillway deflectors
- Stilling basins

Streamflows, Riffles and Pools:

- Minimum flows
- Fluctuation control
- Reregulating dams
- Maximum flows
- Current deflectors
- Check dams
- Other instream devices
- Artificial meanders
- Isolated oxbows

POPULATION IMPROVEMENT MEASURES

Fish Propagation:

- Fish hatcheries
- Nursery and rearing ponds
- Nursery cove barriers
- Spawning bottom and marsh
- Spawning riffles
- Artificial spawning channels

Fish Passage:

- Trap and haul systems
- Fishways
- Conduits and culverts
- Turbine bypasses

Fish Stocking and Control:

- Fish stocking
- Fish screens
- Barrier dams
- Other control devices
- Fish eradication

GRAZING SYSTEMS

Livestock are selective grazers. The most palatable plants and the most accessible areas are grazed first and heaviest. Plants grazed heavily one year are usually grazed heavily the following year, which leads to their gradual loss. This is also the trend for the preferred areas. When forage production of the most desirable plants falls below their needs, livestock will start grazing the less desirable species or areas, which leads to an ever enlarging area of range deterioration (Stoddart Smith, and Box 1975; Hormay 1970). Grazing systems are prescribed in allotment management plans (AMPs) to regulate livestock grazing, to alleviate a particular problem, or give a desired result.

The harmful effects of selective grazing of preferred plants can be reduced by resting the range at appropriate intervals. An allotment is usually fenced into pastures to control pasture grazing and

APPENDIX A

pasture resting. A grazing formula is tailored for each allotment; the number of pastures and amount and timing of pasture grazing and resting are based on key forage plant physiological needs, existing range conditions, and potential for improvement.

Grazing treatments are the building blocks of the grazing formula or grazing system. Treatments specify periods of grazing use or rest from grazing for a specific reason during the year. Selected treatments are then chosen for each allotment, depending on the goal for the allotment, and applied to the pastures in a formula which becomes the system. The following descriptions of treatments includes dates of plant phenological occurrences. The dates used are typical for the resource area but could vary by allotment based on elevation, climate, and key species used. The letter designation of treatments is used only for differentiation and enumeration.

Treatment A

Treatment A consists of grazing a pasture for livestock production in the spring (5/01 to 6/15) and then resting the pasture for the remainder of the year. Grazing may extend to the flowering of key species (mid-July) to support livestock while allowing for treatment B in other pastures.

Treatment B

Treatment B consists of resting or deferring a pasture from livestock grazing until after the key species flower (mid-July) and then allowing it to be grazed by livestock to the end of the grazing season. By the time the pasture is grazed, plants have completed over half their food storage for the season and have extended roots. This is especially useful following treatment D, as it allows new seedlings time to develop grazing tolerance.

Treatment C

Treatment C consists of resting or deferring pasture from livestock grazing until after seedripeness of the key grass and forbs species and then allowing it to be grazed by livestock to the end of the grazing season. Seedripeness occurs from around the end of July to mid-August. By that time, winter carbohydrate storage should be adequate in most key plants and seed should have matured sufficiently to produce seedlings (the trampling by livestock would aid in the planting of seeds). With this treatment, growing season rest is provided for all plants.

Treatment D

Treatment D consists of resting a pasture from livestock grazing for the entire year. This allows the seeds to germinate and plants to store carbohydrate reserves, extend roots and increase vigor. It often follows treatment C to take advantage of seeds buried by trampling.

Treatment E

Treatment E consists of resting a pasture from livestock grazing during the growing season and then allowing it to be grazed by livestock during the winter and early spring. This is primarily winter sheep use on shrub rangelands.

Treatment F

Treatment F consists of grazing the pasture for the entire grazing period of the allotment.

REST-ROTATION GRAZING

Under a rest-rotation grazing system, grazing is deferred on various parts of an allotment during succeeding years, and the deferred parts are allowed complete rest for one or more years (Society for Range Management 1974). The allotment is divided into two or more pastures, usually with comparable grazing capacities. Each pasture is systematically grazed and rested, providing for livestock production and other resource values, while simultaneously maintaining or improving the vegetation cover, hence providing greater protection of the soil resource against wind and water erosion (Hormay 1970; Ratliff et al. 1972).

Rest rotation grazing systems may include several treatments depending upon the objectives for the allotment and the number of pastures. Rest-rotation grazing is a useful system to aid in the rehabilitation of depleted rangelands.

DEFERRED GRAZING

Deferred grazing is delay or discontinuance of grazing on an area for an adequate period of time to provide for plant reproduction, establishment of new plants, or restoration of vigor of existing plants (Society for Range Management 1974).

To be most effective, deferment should be used in conjunction with some other type of grazing

RANGE IMPROVEMENTS

system, such as rotation to make a deferred-rotation system.

DEFERRED-ROTATION GRAZING

Deferred rotation is the discontinuance of grazing on various parts of an allotment in succeeding years. This allows each part or pasture to rest successively during the growing season to permit seed production, establishment of seedlings, and restoration of plant vigor (Society for Range Management 1974). One or more pastures are grazed during the spring, while the remaining one or more pastures are rested until after seed ripe of key species and then grazed. Deferred-rotation grazing differs from rest-rotation grazing in that there is no yearlong rest provided for any part of the allotment.

Deferred rotation grazing systems are useful for minor improvement or maintenance of range condition.

SEASONAL GRAZING

Seasonal grazing is restricted to a specific season (Society for Range Management 1974). Allotments are not necessarily divided into pastures but are grazed at a moderate rate during the same period of time each year. For from 7/1 to 9/15 annually. Seasonal grazing could be proposed on allotments or pastures with a moderate stocking rate usually for short periods (2 to 3 weeks) during spring and longer periods for late summer and fall.

RANGE IMPROVEMENTS

VEGETATION MANIPULATIONS

Mechanical Plant Control

- Anchor chaining
- Cabling
- Bulldozing, disking

Herbicidal Control (ground and air)

Prescribed Burning

REVEGETATING DISTURBED AREAS

Reseeding

- Natural reseedling
- Broadcast reseedling
- Drilling
- Transplanting

RANGE FACILITIES

Water Developments

- Watersavers (catchments)
- Spring developments
- Reservoirs
- Pipeline systems
- Wells

Water Spreading or Concentrating

- Contour furrowing and trenching
- Pitting

Livestock Management Facilities

- Cattle guards
- Fences
- Corrals
- Stock trails

FOREST MANAGEMENT

PRODUCTIVE FOREST LAND SPECIES

Lodgepole Pine

- Clearcutting
- Shelterwood/group selection cutting

APPENDIX A

Spruce/Fir

- Clearcutting
- Shelterwood/group selection cutting

Douglas-Fir

- Clearcutting
- Shelterwood/selection cutting

Aspen

- Clearcutting

Ponderosa Pine

- Clearcutting
- Shelterwood/selection cutting

WOODLAND SPECIES

Pinyon Pine and Juniper

- Selection cutting
- Seed tree cutting
- Clearcutting

CULTURAL RESOURCES

- PRESERVE
- RESTORE OR STABILIZE
- ANALYZE OR EXCAVATE—RECORD FOR ARCHIVES
- INTERPRET
- PATROL
- ACKNOWLEDGE AND USE DATA—NO FURTHER ACTION NECESSARY
- UPGRADE DATA AND RESEARCH—EVALUATE
- PROTECT AND MAINTAIN
- DEMOLITION

FIRE MANAGEMENT

SUPPRESSION EQUIPMENT

Power Equipment

- Plows
- Rotary trencher
- Pumper
- Portable equipment
- Fixed-wing support aircraft
- Fixed-wing tactical aircraft
- Helicopters

APPENDIX B

PROJECT DESIGN FEATURES AND STANDARD OPERATING PROCEDURES

The following stipulations will be included in project designs and are considered standard operating procedures.

AIR QUALITY MANAGEMENT STIPULATIONS

1. Controlled burns and any other open burning would comply with BLM Manual Section 7723, *Air Quality Maintenance Requirements*, to minimize air quality impacts from resulting particulates.
2. Stipulations protecting air quality from development would be included in leases, rights-of-way, and other BLM use permits.
3. All applicable local, state, and federal air quality policies, regulations, and statutes would be followed.

WATER YIELD MANAGEMENT STIPULATIONS

Water yield vegetation conversion projects would be designed as follows:

1. In aspen areas, 50 percent of the watershed would be harvested in a series of small clearcuts.
2. In conifer areas, 40 percent of the watershed would be harvested in a series of small clearcuts.
3. In mountain brush areas, 50 percent of the watershed would be harvested in a series of small clearcuts or by burning.

AQUATIC AND RIPARIAN HABITAT STIPULATIONS

1. Surface-disturbing activities would be restricted in or near riparian areas.

2. Fences should be constructed to minimize impact to significant riparian and aquatic habitat.
3. Equipment would not be allowed to move up or down stream channels. Heavy equipment would cross streams only at designated or constructed crossings with culverts and bridges designed to allow upstream migration of fish.
4. Fire retardant should not be dropped within 100 yards of any wetland riparian area. Drops of retardant would be made parallel to and not across drainages.
5. Fire lines, angular or perpendicular to a drainage, would not be allowed within 300 feet of a drainage to reduce soil movement into the drainage system.
6. If visitor use caused adverse impacts on critical riparian habitat, the visitor use would be reduced until the vegetative conditions are restored.

TERRESTRIAL HABITAT STIPULATIONS

1. Primary timber harvesting haul roads would be avoided on ridgelines, on straight stretches over one-quarter mile in length, in elk calving areas, in meadows, and in other natural forest openings.
2. Primary timber harvesting haul roads would be seasonally or permanently closed following timber harvesting if disturbance to big game became excessive. Skid trails and secondary roads would be physically closed following timber removal.
3. Roadways, landings, and other heavily-disturbed sites would be reclaimed by establishing a vegetative cover.
4. Adequate snags for cavity-dwelling wildlife species would be left at forest edges, adjacent to aquatic and riparian areas, and near clearcut boundaries.

APPENDIX B

5. Buffers would be maintained around raptor nest sites.
6. Clearcuts would be restricted to 40 acres or less and would be designed with irregular boundaries.
7. Forty percent of an elk summer range would be maintained in a forested type with a 75 percent tree canopy.
8. Specific harvest operations would be carried out in the shortest time and least amount of area possible.
9. Timber harvesting would be prohibited in elk calving areas between May 1 and June 15.
10. Woodland harvest occurring in crucial big game winter range would be restricted from January 16 to April 30.
11. Powerlines would be constructed as described in *Suggested Practices for Raptor Protection or Powerlines the State of the Art 1981*.
12. On reservoirs one-half surface acre or larger in size, fencing would be included to provide for development of aquatic and riparian habitat vegetation. Where fencing is included, water would be piped to drinking tanks or water gaps provided to facilitate livestock watering. When feasible, islands would be included as part of the reservoir development.
13. Spring development would generally require excavation for spring box and waterline installation with water going to livestock drinking tanks. Wildlife escape ramps would be installed on all livestock drinking tanks. Seep areas would be fenced at the spring source, and overflow water would be piped away from the livestock tanks. Where adequate water flow exists and terrain allows, overflow would be piped to a small fenced retention pond to create riparian habitat.
14. Normally, allotment boundary and road right-of-way-fences would be 4-strand barbed wire with spacing 16, 6, 8, and 12 inches. Interior pasture fences would generally be 3-strand barbed wire with spacing 16, 10, and 12 inches unless special circumstances would require a tighter fence. Wire spacings would be from the ground up.
15. The *Recommended Guidelines for the Maintenance of Sage Grouse Habitat* promulgated by the Western Association of State Game and Fish Commissioners would be followed when planning and conducting sagebrush control projects within occupied sage grouse habitat. Major points in the guidelines include consultation with the Division of Wildlife, protection of breeding complexes (and nesting areas), winter concentration areas, and design of control areas.
16. The following criteria would be followed when manipulating pinyon-juniper woodlands.
 - a. Adequate hiding and resting cover for deer or elk would be retained in or adjacent to treatment areas. Treatment areas would be irregular in shape to enhance edge effect and would be limited in width to 400 yards. Areas at least as wide as the treated areas would be left for hiding cover.
 - b. Buffer areas of no treatment would be retained on the edge of pinyon-juniper type.
 - c. Areas receiving moderate to high soil disturbance during treatment or an understory ground cover less than 10 percent would be seeded with a mixture of grass, forb, and browse species. Seeded areas would not be grazed by livestock for two growing seasons.
 - d. New roads or trails leading to or on treatment areas would normally be physically closed following completion of the project. Activities occurring during the winter or early spring would be completed in the shortest period and number of seasons possible in critical deer and elk winter range.

APPENDIX C

COAL UNSUITABILITY CRITERIA

President Carter, in a May 24, 1977, memorandum, instructed the Secretary of the Interior to lease only those areas where mining is environmentally acceptable and compatible with other land uses. In addition, the *Surface Mining Control and Reclamation Act of 1977 (SMCRA)* required the Secretary to review federal lands to determine whether they contained areas unsuitable for all, or certain types of, surface coal mining operations. SMCRA also contains a requirement for the states to undertake a similar program for non-federal lands if they wish to assume primary regulatory authority under the Act. A list of standards to be used by the States is identified in Section 522(a)(3) of the Act. These same standards must also be applied to federal lands as well as private surface lands overlying federal coal.

Criteria have been developed to implement SMCRA, other federal laws, and the directives in the President's Environmental Message of May 23, 1979. The criteria, applied to medium and high potential coal lands, aid land managers in identifying those areas with key features and environmental sensitivities that cannot properly be protected if subjected to mining. Application of the unsuitability criteria ensures the most sensitive and valuable environmental features of federal lands are protected in a consistent, uniform, and objective manner so that coal development planning is concentrated in areas where environmental conflicts are less likely to add delay, cost, or conflict to production efforts.

The unsuitability criteria (exceptions and exemptions not listed) protect the following lands and resource values:

1. All federal land included in the following land systems or categories: National Park System, National Wildlife Refuge System, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers System, National Recreation Areas, lands acquired with money derived from the Land and Water Conservation Fund, National Forests, and federal lands in incorporated cities, towns and villages.
2. Federal lands within rights-of-way or easements or included in surface leases for residential, commercial, industrial, or other public purposes, or federally-owned surface used for prime agricultural crop production.
3. Lands within 100 feet of the outside line of the right-of-way of a public road or within 100 feet of a cemetery, or within 300 feet of any public building, school, church, community, or institutional building.
4. Federal lands designated as wilderness study areas and under review by the Administration and the Congress for possible wilderness designation.
5. Scenic federal lands designated by visual resource management analysis as Class I (areas of outstanding scenic quality or high visual sensitivity).
6. Federal lands under permit by the surface management agency that are being used for scientific studies involving food and fiber production, natural resources, or technology demonstrations and experiments (except where mining could be conducted in such ways as to enhance, not jeopardize, the purposes of the study).
7. All districts, sites, buildings, structures, and objects of historic, architectural, archaeological, or cultural significance on federal lands are included in, or eligible for, inclusion in the *National Register of Historic Places*, and an appropriate buffer zone around the outside boundary of the designated property.
8. Federal lands designated as natural areas or as National Natural Landmarks.
9. Federally-designated critical habitat for threatened or endangered plant or animal species and habitat for federal threatened or endangered species which is determined by the U. S. Fish and Wildlife Service and the surface management agency to be of essential value and where the presence of threatened or endangered species has been scientifically documented.
10. Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as endangered or threatened.
11. An active bald or golden eagle nest site on federal lands and an appropriate buffer zone around the nest site.

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12. Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering.
13. Federal lands containing an active falcon (excluding kestrel) cliff nesting site and a buffer zone of federal land around the nesting site.
14. Federal lands that are high priority habitat for a migratory bird of high federal interest on a regional or national basis as determined jointly by the surface management agency and the U. S. Fish and Wildlife Service.
15. Federal lands which the surface management agency and the state jointly agree are fish and wildlife habitat for resident species of high interest to the state and which are essential for maintaining these priority wildlife species.
16. Federal lands in riverine, coastal, and special floodplains (100-year recurrence interval).
17. Federal lands which have been committed by the surface management agency to use as municipal watersheds.
18. Federal lands with national resource waters as identified by states in their water quality management plans.
19. Federal lands identified by the surface management agency, in consultation with the state in which they are located, as alluvial valley floors where mining would interrupt, discontinue, or preclude farming.
20. Federal lands in a state to which is applicable a criterion (1) proposed by that state and (2) adopted by rulemaking by the Secretary.

SMCRA mandates that the Secretary of the Interior review all federal lands for unsuitability and that citizens be allowed to petition for and against designation of lands as unsuitable. Consequently, under SMCRA, the Department has procedures to apply unsuitability criteria both as part of a comprehensive federal lands review and as part of a petition process.

The Office of Surface Mining (OSM) has the responsibility to administer the statutory petition process. OSM will only make a formal designation of federal lands as unsuitable in response to a petition to designate under Section 522(c) of SMCRA. Anyone can submit either of two kinds of petitions. One is a petition to designate land unsuitable for mining. The other is a petition to terminate a designation of unsuitability. Section 522 of SMCRA requires that the petitioner be adversely affected by potential mining of the lands in question and provide facts supporting the allegation. Petitions submitted to OSM will be reviewed and forwarded with recommendations to the authorized surface management agency (e.g., BLM). A public hearing will then be held to present to the public the reviews of the OSM and the surface management agency. These reviews will describe (1) potential coal resources of the area; (2) the demand for coal resources; and (3) the impact of such designation on the environment, the economy, and the supply of coal. A decision to designate land unsuitable, to reject the petition, or to terminate a prior designation will occur within 60 days of the hearing.

APPENDIX D

WILDERNESS REVIEW REPORTING PROCESS

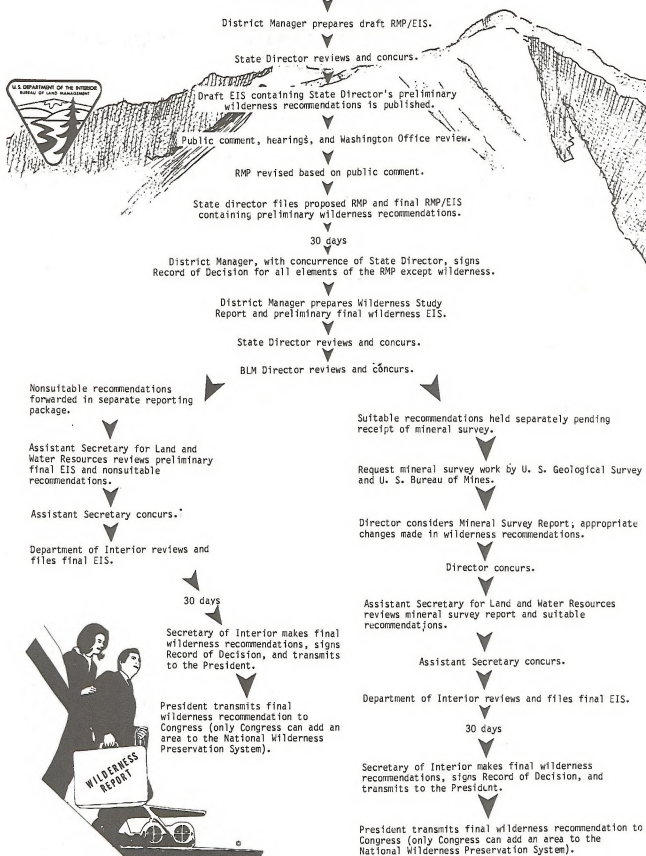
The wilderness study process for the wilderness study areas in the Glenwood Springs Resource Area will end with the Colorado State Director's decision adopting the preliminary wilderness recommendations for submission to the BLM Director. The wilderness reporting process represents the roles of the BLM Director, the Secretary of the Interior, and the President in acting upon the Colorado

State Director's preliminary wilderness recommendations. The only wilderness recommendations that can be termed final are those adopted by the Secretary of the Interior and the President.

Figure D-1 is a flow chart of the wilderness reporting process. Detailed information on the process is contained in the BLM's Wilderness Study Policy.

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FIGURE D-1
WILDERNESS REVIEW REPORTING PROCESS FOR THE WILDERNESS STUDY AREAS
IN THE GLENWOOD SPRINGS RESOURCE AREA



APPENDIX E

RECREATION OPPORTUNITY SPECTRUM (ROS) CLASSES

Table E-1 describes each of the six ROS classes in terms of (1) experience opportunities, (2) setting opportunities, and (3) activity opportunities. These descriptors provide a general overview of the opportunities included in each class. These overview statements do not describe each class in detail but rather provide a point of departure from which the

planner or manager can develop more precise prescriptions for each class based on specific situations encountered in field operations. The listing of activity opportunities is provided for illustrative purposes. It is not an all-inclusive list of activity opportunities on the public lands.

TABLE E-1. RECREATION OPPORTUNITY SPECTRUM CLASS DESCRIPTIONS

Opportunity Class	Experience Opportunity	Setting Opportunity	Activity Opportunity
Primitive	Opportunity for isolation from the sights and sounds of man, to feel a part of the natural environment, to have a high degree of challenge and risk, and to use outdoor skills.	Area is characterized by essentially unmodified natural environment of fairly large size. Concentration of users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of man-induced restrictions and controls. Only facilities essential for resource protection are used. No facilities for comfort or convenience of the user are provided. Spacing of groups is informal and dispersed to minimize contacts between groups. Motorized use within the area is not permitted.	Camping, hiking, climbing, enjoying scenery or natural features, nature study, photography, spelunking, hunting (big game, small game, upland birds, waterfowl) ski touring and snowshoeing, swimming, diving (skin and scuba), fishing, canoeing, sailing, and river running (non-motorized craft).
Semi-Primitive Non-motorized	Some opportunity for isolation from the sights and sounds of man, but not as important as for primitive opportunities. Opportunity to have high degree of interaction with the natural environment, to have moderate challenge and risk, and to use outdoor skills.	Area is characterized by a predominantly unmodified natural environment of moderate to large size. Concentration of users is low, is often evidence of other area users is present. On-site controls and restrictions may be present but are subtle. Facilities are provided only for the protection of resource values and the safety of users. Formal spacing of groups may be made to disperse use and limit contacts between groups. Motorized use is not permitted.	Camping, hiking, climbing, enjoying scenery or natural features, nature study, photography, spelunking, hunting (big game, small game, upland birds, waterfowl), ski touring and snowshoeing, swimming, diving (skin and scuba), fishing, canoeing, sailing, and river running (non-motorized craft).
Semi-Primitive Motorized	Some opportunity for isolation from the sights and sounds of man, but not as important as for primitive opportunities. Opportunity to have high degree of interaction with the natural environment, to have moderate challenge and risk, and to use outdoor skills. Explicit opportunity to use motorized equipment while in the area.	Area is characterized by a predominantly unmodified natural environment of moderate to large size. Concentration of users is low, but often there is evidence of other area users present. On-site controls and restrictions may be present, but are subtle. Facilities are provided for the protection of resource values and safety of users only. Formal spacing of groups may be made to disperse use and limit contacts between groups. Motorized use is permitted.	Same as the above, plus the following: off-road vehicle use, four-wheel drive, dune buggy, dirt bike, snowmobile, power boating.

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TABLE E-1. RECREATION OPPORTUNITY SPECTRUM CLASS DESCRIPTIONS—Continued

Opportunity Class	Experience Opportunity	Setting Opportunity	Activity Opportunity
Roaded Natural	<p>About equal opportunities for affiliation with other user groups and for isolation from sights and sounds of man. Opportunity to have a high degree of interaction with the natural environment. Challenge and risk opportunities are not very important except in specific challenging activities. Practice of outdoor skills may be important. Opportunities for both motorized and non-motorized recreation are present.</p>	<p>Area is characterized by a generally natural environment with moderate evidence of the sights and sounds of man. Resource modification and use practices are evident but harmonize with the natural environment. Concentration of users is low to moderate with facilities sometimes provided for group activity. On-site controls and restrictions offer a sense of security. Rustic facilities are provided for user convenience as well as for safety and resource protection. Conventional motorized use is provided for in construction standards and design of facilities.</p>	<p>All activities listed previously plus the following: picnicking, rock collecting, wood gathering, auto touring, downhill skiing, snowplay, ice skating, water skiing and other water sports, hand gliding, interpretive use, rustic resorts and organized camps.</p>
Semi-Urban (also called Rural)	<p>Opportunities to experience affiliation with individuals and groups are prevalent as is the convenience of sites and opportunities. These factors are generally more important than the natural setting. Opportunities for wildland challenges. Risk taking and testing of outdoor skills are unimportant, except in those activities involving challenge and risk.</p>	<p>Area is characterized by substantially modified natural environment. Resource modification and use practices are obvious. Signs and sounds of man are readily evident and the concentration of users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for specific activities. Developed sites, roads and trails are designed for moderate to high use. Moderate densities are provided far away from developed sites. Facilities for intensive motorized use are available.</p>	<p>All activities used previously plus the following: competitive games, spectator sports, bicycling, jogging, outdoor concerts, and modern resorts.</p>
Urban	<p>Opportunities to experience affiliation with individuals and groups are prevalent as is the convenience of sites and opportunities. Experiencing the natural environment and the use of outdoor skills are largely unimportant.</p>	<p>Area is characterized by a highly modified environment, although the background may have natural elements. Vegetation is often exotic and manicured. Soil may be protected by surfacing. Sights and sounds of man, on-site, predominate. Large numbers of users can be expected. Modern facilities are provided for the use and convenience of a large number of people. Controls and restrictions are obvious and numerous. Facilities for high intensity motor use and parking are present with forms of mass transit often available.</p>	<p>All activities listed previously.</p>

APPENDIX F

RANGELAND

This appendix contains descriptions of (1) allocation objectives and methodology, (2) allotment categorization, (3) allocation implementation and monitoring, (4) methodology used for vegetation inventory and forage allocation, (5) vegetation manipulation potential and need, and (6) methodology for determining big game populations. It also contains three tables following the descriptions: Table F-1, Livestock Forage Allocation and Impacts; Table F-2, Wildlife Forage Allocation; and Table F-3, Existing Livestock Grazing Use.

The vegetation production data displayed and used in this environmental impact statement were collected during the 1979 field season, using accepted BLM methods. These data were needed to help determine areas suitable for continued livestock grazing and to provide the basis for developing a rangeland management program and management alternatives. The vegetation production data have also been used to identify and analyze impacts and mitigation of the proposed action and alternatives. Reviewers of this environmental impact statement, however, should recognize the limitations of vegetation inventory data. While these data are adequate for purposes of planning and analysis, they must be supported by the results of monitoring studies before making forage allocation decisions.

ALLOCATION OBJECTIVES AND METHODOLOGY

Allocation objectives for each alternative are based on livestock and wildlife needs and goals. Allocations are limited by initial stocking rate guides for each species and by the objective. If the initial stocking rate limited the allocation to a species, the excess forage goes to meet the demand of the remaining species.

Under the Continuation of Current Management Alternative, forage would be allocated to meet the big game 5-year average demand first, with the remaining forage allocated to meet livestock's 5-year average use. If a shortage existed in the initial allocation, any increased forage production gained through vegetation manipulation would first be allocated to meet the wildlife objective, and then to livestock. If the initial allocation satisfied the wildlife

objective, then any excess forage would go to livestock.

Under the Resource Protection Alternative, allocation objectives are to meet the forage needs of the big game populations established by the Colorado Division of Wildlife as goals for 1988 and to meet total preference livestock use. Forage would first be allocated to meet big game goals and then to meet total preference livestock use. Allocation of forage produced through vegetation manipulation would first be allocated to meet unsatisfied big game goals and then to meet livestock objectives.

The Economic Development Alternative objective is the same as the Resource Protection Alternative objective; except the allocation is reversed. Forage would be allocated to meet livestock total preference first. Any remaining forage would be allocated to meet the needs of Colorado Division of Wildlife big game population goals. Additional forage produced through vegetation manipulation would first meet livestock objectives. Once they were met, any remaining forage would go to satisfy big game goals. After all objectives were met, additional forage potential would be available for others to develop.

The Preferred Alternative objectives for wildlife are the same as the Continuation of Current Management Alternative. The objective for livestock is active preference rather than total preference. Forage would be allocated proportionately to livestock and wildlife based on the objective. Additional forage produced through vegetation manipulation would be allocated first to get livestock to their objective except on crucial big game winter ranges where there was a shortage for game.

Tables F-1 and F-2 at the end of this appendix show livestock and wildlife forage allocations, respectively.

ALLOTMENT CATEGORIZATION

Concurrent with development of the Glenwood Springs Environmental Impact Statement Resource Management Plan, grazing allotments are being categorized. This will help establish priorities for achieving cost-effective improvement of rangeland condition and production by concentrating efforts in

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the areas where grazing management action is most needed to improve the basic resources or resolve serious resource use conflicts. This policy is detailed in Washington Office Instruction Memorandum 82-292, dated March 5, 1982.

We will solicit comments from the general public, ranchers, and the District's Grazing Advisory Board to help refine the BLM's five standard criteria to fit the local situation and develop other site-specific criteria as necessary.

The five standard criteria are range condition, resource potential, presence of resource use conflicts or controversy, opportunity for positive economic return on public investment, and present management situation. Using the criteria developed, the BLM will place grazing allotments into one of three categories named for their objectives: (1) *Maintain* current satisfactory condition, (2) *improve* current unsatisfactory condition, and (3) manage *custodially* while protecting existing resource values.

Following is an evaluation scheme for the criteria.

1. Maintain Category Criteria:

Present range condition is satisfactory.

Allotments have moderate or high resource production potential and are producing near their potential (or trend is moving in that direction).

No serious resource-use conflicts or controversy exist.

Opportunities may exist for positive economic return from public investments.

Present management appears satisfactory.

Other criteria are appropriate to environmental impact statement area.

2. Improve Category Criteria:

Present range condition is unsatisfactory.

Allotments have moderate to high resource production potential and are producing at low to moderate levels.

Serious resource-use conflicts or controversy exist.

Opportunities may exist for positive economic return from public investments.

Present management appears unsatisfactory.

Other criteria appropriate to environmental impact statement area.

3. Custodial Category Criteria:

Present range condition is not a factor.

Allotments have low resource production potential and are producing near their potential.

Limited resource-use conflicts or controversy exist.

Opportunities for positive economic return from public investments do not exist or are constrained by technological or economic factors.

Present management appears satisfactory or is the only logical practice under existing resource conditions.

Other criteria are appropriate to environmental impact statement area.

The categorization of allotments will be presented in the *Rangeland Program Summary* published within five months of the final environmental impact statement and following rancher consultation.

Grazing decisions will be issued on a schedule based on the categories. The first priority will be the maintain category within 9 months of the final environmental impact statement; the second, custodial category within 12 months; and the third, improve category within 17 months.

The categories will also be used to guide funding of rangeland improvements and development of allotment management plans. First priority for these will be allotments in improve category, second will be in maintain category, and third will be in custodial category.

ALLOCATION IMPLEMENTATION AND MONITORING

Soil Vegetation Inventory Method (SVIM) and Initial Stocking Rate programs were used to develop BLM estimated initial stocking rates for each allotment. Prior to issuing grazing decisions, consultation with each permittee will occur.

Grazing will begin at the agreed upon level and be monitored for two years. Prior to the third season, adjustments (up or down) will be made, if necessary, based on the monitoring. Following two more seasons of grazing and prior to the fifth year, further adjustments will be made, if necessary, and stated in a final grazing decision.

Monitoring studies will include forage use, actual use reports from each permittee, precipitation data and vegetation condition and trend studies. The use studies will include browse use in wildlife ranges. Pellet group transects may also be used to help determine the amount of wildlife using the areas.

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Wildlife habitat monitoring will enable BLM to make big game population adjustment recommendations to the Colorado Division of Wildlife.

METHODOLOGY FOR VEGETATION INVENTORY AND FORAGE ALLOCATION

A soil and vegetation field inventory was conducted in the Glenwood Springs Resource Area from July to October, 1979, to collect data used in determining the amount of forage available for allocation. The methods used for the inventory are described in BLM Draft Manual 1731, *Soil Vegetation Method* (SVIM). All data, maps, and references pertinent to the inventory and forage allocation process are available for inspection at the Glenwood Springs Resource Area office.

Sample unit stratification was based on a third order soil survey done by the Soil Conservation Service in 1976 and 1979. Soil mapping units were delineated and described in the survey. Soil mapping units were correlated to a range site by the Soil Conservation Service based on their range site descriptions, and each individual mapping unit was assigned a site write-up area (SWA) number. Range sites served as the basis for determining range condition (U.S. Department of Agriculture 1976). A field survey to determine range condition was conducted from May to October 1978 and June to September 1979. The range condition is determined by comparing the present plant community with that of the climax plant community and using the four condition classes—poor, fair, good, and excellent—to represent that the present community is a percent—0-25, 26-50, 51-75, or 76-100, respectively—of the climax community. Each condition class for each range site was considered a stratum, such as brushy loam range site in fair condition was a stratum. Site write-up areas were randomly selected to represent each stratum and then they were sampled using transects, plots, and techniques described in the SVIM Manual and our inventory narrative.

Data processing was conducted by the Denver Service Center, Bureau of Land Management. All sampled vegetation production data was adjusted to a yearly maximum using data from SVIM phenology data and a 1978 Glenwood Springs Resource Area plant phenology study. Vegetation data was also adjusted to a normal precipitation year using a climatic adjustment factor derived from precipitation data collected at various stations in the Glenwood Springs Resource Area over a period of years (Na-

tional Oceanic and Atmospheric Administration 1980).

Vegetation production data were used to determine forage allocation using a linear programming model. The forage allocation model maximized the use of forage available for grazing subject to proper use factor constraints, plant maintenance or allowable use factor constraints, dietary constraints, and animal numbers.

An allowable use factor (AUF) for each type of grazing animal was applied to the production of each plant species to arrive at the total pounds of herbage and the percent of the plant that could be removed by grazing animals without affecting the viability of the plant. The AUFs were weighted to the season of use as follows:

Spring: March 21 through June 20

Summer: June 21 through September 20

Fall: September 21 through December 20

Winter: December 21 through March 20

Yearlong: March 21 through March 20

In addition, proper use factors (PUFs) were applied to each plant. Proper use factors include the amount of herbage that can be removed without damaging the plant and the preference of the grazing animal for that particular species. PUFs vary with the season of use because plant defoliation anytime during the growing period is harmful to the plant. Also, production figures are based on mature dry weights. PUFs did not exceed 50 percent of the current year's growth. PUFs used in the determination of forage allocation were obtained from PUF tables prepared by the Glenwood Springs Resource Area staff with review and comment from other agencies including BLM Districts, U. S. Forest Service, Soil Conservation Service, and the Colorado Division of Wildlife.

By limiting PUFs, at least 50 percent of available annual growth of forage plants and 100 percent of annual growth of non-forage plants are reserved for plant physiological needs, other wildlife, and watershed protection.

The amount of feed or forage required by various ungulates for one month (AUM) is shown below:

Animal and Forage Required (pound/month):

Cattle—800

Domestic Sheep—160

Mule deer—84

Elk—276

These figures were used in the forage allocation process to determine total AUMs and pounds of

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forage consumed in each allotment. Big game figures were derived from data supplied by the Colorado Division of Wildlife.

Six runs through the allocation model were made for each allotment using different parameters for livestock and big game numbers. These runs produced various combinations of livestock and big game based on the allotment production.

BLM also used the Ecological condition class/estimates stocking rate program. This program is based on Soil Conservation Service stocking rate guides expressed in acres per AUM for each range site and condition class. These data were run with the stratum acreage for each allotment to get estimated stocking rates. The Soil Conservation Service had stocking rate guides for cattle for most of the range sites in the resource area; however, BLM had to develop some, primarily for the draft pinyon-juniper range sites.

Comparative data for big game was needed to allocate forage in an allotment and was developed in the following manner.

The range site descriptions developed by the Soil Conservation Service form the basis for big game estimated stocking rate development. These descriptions list the most common plant species present and a range of total production based on good, average, and poor years for a range site in excellent condition.

Descriptions (plant species composition and production) were developed for range sites in good, fair, and poor condition by extrapolating data from the excellent condition range site and stratum average information from the field transects.

The initial stocking rate for an animal on a specific range site condition class was developed by multiplying the percent composition of the available forage species by the percent eaten by the animal (similar to a proper use factor). This was totaled for all plant species and multiplied times the total plant production for that condition class to determine total usable forage production for that big game species. This was then multiplied by .5 (to follow the principle of take $\frac{1}{2}$ leave $\frac{1}{2}$) to get available forage production.

The forage requirement for the species (mule deer=84 pounds and elk=276 pounds air dry forage per month) which was obtained from Colorado Division of Wildlife was then divided into the available forage to determine the acres per AUM (the estimated stocking rate) for deer or elk.

These estimated stocking rates were for cattle or deer or elk, but not a combination. In order to get a common unit for comparison and allocation, deer and elk AUMs were converted to cattle AUMs strictly on a weight basis by dividing forage require-

ments for deer and elk into that for cattle. This then gave us an estimated stocking rate for each animal on an allotment expressed in cattle AUMs.

Dietary overlap is less than 100 percent for cattle, sheep, deer, and elk; therefore, a factor was applied to represent the noncompetitive use an additional species could make in an allotment.

This represents the total forage production in the allotment that was available for allocation to livestock and big game. The estimated stocking rate was considered an upper limit for each species to be used in the initial allocation.

Those portions of the allotments over 50 percent slope were considered unsuitable for cattle grazing. Therefore, estimated stocking rates were reduced by that percentage of the allotment.

These estimated stocking rates were used as an initial stocking rate subject to modification (see Monitoring Section).

VEGETATION MANIPULATION POTENTIAL AND NEED DETERMINATION

Each allotment was analyzed for potential to support vegetation manipulation practices and the expected subsequent increase in vegetation production. Each allotment was also analyzed to determine whether or not production increases were needed to reach objectives for each alternative. Methodology for each of these is as follows.

Interpretation for potential to support vegetation manipulation practices was done by the Grand Junction District soil scientist from the third order soil surveys prepared for the resource area by the Soil Conservation Service in 1976 and 1979. Soils were determined to be suitable, marginally suitable, or unsuitable for mechanical manipulation based on soil depth, texture, erodibility, productivity, and surface rock. Also, slopes over 30 percent were considered unsuitable for the operation of equipment.

Soils were determined to be either suitable, marginally suitable, or unsuitable for burning based on soil depth, surface texture, infiltration and permeability, erodibility, and soil hydrologic group. In addition, the suitable soils were determined to be either productive or marginally productive based on range site vegetation production potential. Those with potential production of more than 1,000 pounds per acre (air dry) were considered productive; those with potential of less than 1,000 pounds per acre (air dry) were considered marginally productive.

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Allotments were determined as to have potential for either high or low increases in production through vegetation manipulation. This was based primarily upon range site production and precipitation. Range sites having higher production generally occur above the 15-inch precipitation zone. The climate overlay (in the Glenwood Springs Resource Area office) shows a 16-inch isohyet. Allotments with the majority of the area receiving less than 16 inches of precipitation were considered to have low production potential and those with the majority of the area occurring at or above 16 inches were considered to have high potential. Range sites were converted to vegetation types according to the predominant vegetation in the site description. The following table shows the expected increase in forage through treatment by vegetation types.

EXPECTED INCREASE IN PRODUCTION THROUGH VEGETATION MANIPULATION

Vegetation Type	Minimum Forage Increase (pounds per acre)
Pinyon-Juniper ¹	400
Sagebrush.....	100
Low Potential.....	800
High Potential.....	1,000
Oakbrush ²	1,000

Note: Manipulation techniques include mechanical and prescribed burnings. These are the expected increases if areas were seeded.

¹Assumed that all pinyon-Juniper occurs in zones with less than 16 inches precipitation.

²Assumed that all oakbrush occurs in zones with more than 16 inches precipitation.

Parcels of land less than 40 acres in size were not considered to have potential for manipulation unless two or more parcels totaling at least 40 acres were in close proximity to each other making the projects cost effective.

The need for increased production on an allotment was determined during the allocation of existing forage to livestock and big game. If existing forage or the initial stocking rate were insufficient to meet the objective for the allotment in that alternative, a need existed.

Allocation of the potential production, where the need existed, was made in accordance with the criteria for allocation listed in Allocation Objectives and Methodology above.

METHODOLOGY FOR DETERMINING BIG GAME POPULATIONS

Wildlife populations used in the forage allocation process were derived from data supplied by the Colorado Division of Wildlife based on their population model. Seasonal use areas were mapped cooperatively with the District Wildlife Managers. The size of the seasonal use areas in each game management unit was then determined.

Population numbers for each game management unit were extrapolated from data analysis unit populations generated through the population model. Game management unit populations were determined by dividing the size of the data analysis unit by the size of the game management unit. Population densities were determined for each seasonal use area in the same manner and then extrapolated down to an allotment based on the size of each seasonal use area in the allotment. The forage requirement of the big game populations on each allotment is expressed in cattle AUMs and is based on estimated forage consumption of each wildlife species for one month. The number of animals in each seasonal range (time period) was calculated and then multiplied by the forage consumption rate to determine the AUM requirement for deer and elk on each allotment, each game management unit, and finally for the resource area. The existing use AUM requirement is a combination of total deer and elk forage requirements for the resource area averaged over the five year period from 1976 to 1980. The AUM forage requirement needed to support the Colorado Division of Wildlife population goals is based on their projected population goals for 1988. This population forage requirement was determined the same as were existing population requirements; however, the forage requirement was increased to show the AUMs public land would have to supply if the Colorado Division of Wildlife goals were to be met and the anticipated 8 percent loss of habitat on private land occurred.

This habitat loss on private land is based on 1979 zoning maps and the amount of crucial winter range zoned for development. Detailed methodology and correspondence with the Colorado Division of Wildlife can be found in the big game inventory files in the Glenwood Springs Resource Area office.

TABLE F-1. LIVESTOCK FORAGE ALLOCATION AND IMPACTS

(in animal-unit months)

Allotment Number	Existing Livestock Use ¹	Continuation of Current Management				Resource Protection				Economic Development				Preferred Alternative			
		Objective ²	Initial Allocation ³	Change in Existing Use versus Initial Allocation	Projected Allocation ⁴	Objective ²	Initial Allocation ³	Change in Existing Use versus Initial Allocation	Projected Allocation ⁴	Objective ²	Initial Allocation ³	Change in Existing Use versus Initial Allocation	Projected Allocation ⁴	Objective ²	Initial Allocation ³	Change in Existing Use versus Initial Allocation	Projected Allocation ⁴
Garfield Capability Unit																	
8001	15	15	15	0	15	15	15	0	15	15	15	0	15	15	0	-15	15
8002	0	0	0	0	0	50	28	+28	50	50	28	+28	50	49	28	+28	49
8003	24	24	24	0	24	44	36	+12	44	44	36	+12	44	44	36	+12	44
8004	35	35	33	-2	35	44	29	-6	44	44	35	0	44	38	23	-12	38
8005	63	63	63	0	63	309	52	-11	204	309	52	-11	204	83	51	-12	83
8006	129	129	129	0	129	265	265	+136	265	265	265	+136	265	255	255	+126	255
8007	15	15	15	0	15	157	120	+105	157	157	120	+105	157	76	76	+61	76
8008	6	6	6	0	6	31	6	0	31	31	6	0	31	31	6	0	31
8009	180	180	0	-180	158	900	0	-180	0	900	221	+41	461	300	162	-18	162
8010	96	96	43	-53	96	829	0	-96	14	829	137	+41	202	128	96	0	107
8011	35	35	35	0	35	65	47	+12	65	65	47	+12	65	60	47	+12	60
8012	275	275	37	-238	275	415	0	-275	415	415	119	-156	415	396	119	-156	396
8013	275	275	142	-133	275	1,200	133	-142	529	1,200	142	-133	538	1,138	142	-133	538
8014	24	24	24	0	24	26	26	+2	26	26	26	+2	26	26	26	+2	26
8015	88	88	23	-65	88	176	23	-65	97	176	23	-65	97	176	23	-65	97
8016	53	53	53	0	53	400	93	+40	396	400	93	+40	396	371	93	+40	371
8017	86	86	58	-28	86	229	58	-28	134	229	58	-28	134	121	58	-28	121
8018	365	365	22	-343	365	1,360	0	-365	204	1,360	368	+3	803	1,095	368	+3	457
8019	59	59	17	-42	49	125	17	-42	53	125	17	-42	53	74	17	-42	49
8020	0	0	0	0	14	14	2	+2	14	14	2	+2	14	14	1	+1	1
8021	183	183	20	-163	183	375	20	-163	185	375	20	-163	185	183	128	-55	183
8022	105	105	43	-62	105	380	43	-62	134	380	43	-62	134	105	43	-62	105
8023	8	8	1	-7	5	10	1	-7	1	10	1	-7	1	8	4	-3	4
8024	88	88	14	-74	88	234	0	-88	54	234	45	-43	135	88	45	-43	88
8025	29	29	0	-29	29	36	0	-29	36	36	36	+7	36	36	31	+2	36
8026	265	265	89	-176	205	443	66	-199	182	443	89	-176	205	303	120	-145	236
8027	18	18	0	-18	0	22	0	-18	0	22	6	-12	6	22	7	-11	7
8028	29	29	29	0	29	60	48	+19	48	60	59	+30	60	44	44	+15	44
8029	124	124	11	-115	25	414	7	-117	7	414	13	-111	27	394	60	-64	74
8030	40	40	40	0	40	150	16	-24	16	150	52	+12	66	60	51	+11	60
8031	34	34	17	-17	17	43	2	-32	2	43	18	-16	18	43	18	-16	18
8032	29	29	28	-1	29	292	8	-21	125	292	103	+74	242	271	103	+74	242
8033	30	30	18	-12	18	118	8	-22	8	118	42	+12	53	75	42	+12	51
8034	8	8	8	0	8	54	4	-4	18	54	18	+10	30	54	19	+11	37
8035	16	16	16	0	16	180	16	0	16	180	67	+51	167	180	90	+74	90
8036	32	32	23	-9	24	48	6	-26	7	48	25	-7	26	32	27	-5	27
8037	16	16	14	-2	16	36	8	-8	16	36	18	+2	36	16	15	-1	15
8038	4	4	0	-4	0	7	0	-4	0	7	4	0	4	6	2	-2	2

RANGELAND

8039	296	240	-56	296	991	55	-241	421	991	240	-56	606	991	356	+60	722
8040		0	0	90	150	95	+5	150	150	124	+34	150	124	124	+34	150
8041		1	-5	23	29	18	-5	29	29	29	-5	29	29	18	-5	18
8042		16	-22	266	417	244	-22	417	417	244	-22	417	244	18	+14	417
8043		62	+94	178	272	272	+94	272	272	272	+94	272	272	62	+94	272
8044		181	0	2-	18	7	+5	18	18	7	+5	18	9	181	+5	7
8045		37	0	130	146	146	+16	146	146	146	+16	146	146	37	+16	146
8046	30	18	-245	507	665	262	-245	665	665	262	-245	665	665	37	-245	665
8201	23	23	-31	84	114	15	-89	79	114	30	-89	79	114	150	-89	114
8202	266	244	0	85	70	70	+15	45	45	45	+15	45	45	266	+15	70
8203	178	178	0	10	45	45	+11	27	45	45	+11	27	45	178	+11	45
8204	2	0	-14	51	37	37	-14	51	51	37	-14	51	51	2	-14	37
8205	130	130	8	8	56	0	-8	56	56	56	45	37	56	130	45	56
8206	507	262	-13	63	182	33	-30	63	182	50	-30	63	182	507	-30	182
8207	84	84	0	19	40	26	+7	34	40	40	+21	40	40	84	+7	40
8208	85	85	-138	596	1,348	458	-138	1,348	1,348	458	-138	1,348	458	85	-138	458
8209	85	85	0	947	3,368	2,271	+1,324	3,368	3,368	2,271	+1,324	3,368	2,271	85	+1,324	2,362
8210	30	30	0	44	185	85	+41	103	165	85	+41	103	120	30	+41	120
8211	16	16	-23	76	126	53	-23	78	126	53	-23	78	126	16	-23	126
8212	51	51	0	10	18	18	+8	18	18	18	+8	18	18	51	+8	18
8213	8	8	0	10	18	3	0	18	18	5	0	18	18	8	0	18
8214	63	50	4	4	13	4	0	5	13	4	0	5	13	63	0	4
8215	19	19	4	4	14	8	-6	8	14	4	0	8	14	19	-6	4
8216	19	19	4	4	14	8	-6	8	14	4	0	8	14	19	-6	4
8217	49	49	4	4	22	83	0	49	0	83	0	49	0	49	0	49
8218	41	41	4	4	41	41	+54	37	37	37	+29	37	37	41	+54	41
8219	8	8	0	0	0	0	0	0	0	0	0	0	0	8	0	0
8220	8	8	0	0	0	0	0	0	0	0	0	0	0	8	0	0
8221	8	8	0	0	0	0	0	0	0	0	0	0	0	8	0	0
8222	140	140	-6	1	8	2	-6	4	4	4	-3	5	4	140	-6	4
8223	140	140	0	140	309	153	+13	309	309	153	+13	309	140	140	+13	146
8224	17	17	0	17	18	18	+1	18	18	18	+1	18	18	17	+1	18
8225	207	207	0	219	495	194	-25	495	495	194	-25	495	288	207	-25	194
8226	79	79	-25	174	174	174	+77	174	174	174	+77	174	174	79	+77	174
8227	0	0	0	0	28	18	+18	18	28	18	+18	18	28	0	+18	174
8228	97	97	0	97	174	174	-79	174	174	174	-79	174	174	97	-79	174
8229	98	98	0	97	150	19	-79	150	150	19	-79	150	150	98	-79	174
8230	17	17	0	17	30	15	-2	30	30	22	+5	30	30	17	+5	17
8231	152	152	0	152	356	356	+204	356	356	356	+204	356	303	152	+204	303
8232	207	207	0	207	430	430	+133	430	430	430	+133	430	372	207	+133	340
8233	79	79	-5	79	122	117	+38	122	117	117	+38	122	79	79	+38	117
8234	401	401	0	401	923	401	0	923	923	401	0	923	401	401	0	923
8235	158	158	0	158	546	276	+118	546	546	276	+118	546	276	158	+118	163
8236	158	158	0	158	160	160	+89	160	160	160	+89	160	160	158	+89	163
8237	91	91	0	91	160	160	+99	160	160	160	+99	160	160	91	+99	163
8238	133	133	0	133	348	5	-108	348	348	5	-108	348	348	133	-108	163
8239	113	113	0	113	161	98	-20	161	161	98	-20	161	161	113	-20	163
8240	112	112	0	112	168	132	+20	168	168	132	+20	168	168	112	+20	168
8241	6	6	0	6	8	8	+2	8	8	8	+2	8	8	6	+2	8
8242	40	40	0	40	60	60	+20	60	60	60	+20	60	60	40	+20	60

TABLE F-1. LIVESTOCK FORAGE ALLOCATION AND IMPACTS—Continued

(in animal-unit months)

Allotment Number	Existing Livestock Use ¹	Continuation of Current Management				Resource Protection				Economic Development				Preferred Alternative			
		Objective ²	Initial Allocation ³	Change in Existing Use versus Initial Allocation	Projected Allocation ⁴	Objective ²	Initial Allocation ³	Change in Existing Use versus Initial Allocation	Projected Allocation ⁴	Objective ²	Initial Allocation ³	Change in Existing Use versus Initial Allocation	Projected Allocation ⁴	Objective ²	Initial Allocation ³	Change in Existing Use versus Initial Allocation	Projected Allocation ⁴
8218	0	0	0	0	0	84	60	+60	84	84	84	+84	84	84	84	+84	84
8219	21	21	21	0	21	61	5	-16	44	61	36	+15	61	61	39	+18	61
8220	41	41	41	0	41	63	49	+8	63	63	63	+42	63	63	75	+34	63
8221	9	9	9	0	9	12	12	+3	12	12	12	+3	12	12	12	+3	12
8222	1,031	1,031	624	-407	1,031	2,375	624	-407	1,852	2,375	624	-407	1,852	1,496	624	-407	1,496
8223																	
8224	182	182	150	-32	166	180	131	-51	145	180	160	-2	180	180	158	-24	172
8225	76	76	59	-17	59	95	48	-28	48	95	53	-23	53	95	53	-23	53
8226	6	6	6	0	6	7	7	+1	7	7	7	+1	7	7	7	+1	7
8227	15	15	5	-10	5	25	5	-10	5	25	5	-10	5	25	5	-10	5
8901	46	46	46	0	46	76	76	0	76	76	76	0	76	56	56	0	56
8902	309	309	309	0	309	700	281	-28	700	392	+83	700	700	566	+257	700	
8903	382	382	138	-244	237	830	138	-244	138	830	258	-124	407	760	248	-134	360
8904	0	0	0	0	0	232	0	0	13	232	33	+33	70	0	33	+33	70
8905	27	27	27	0	27	45	45	+18	45	45	45	+18	45	45	37	+10	37
8907	275	275	121	-154	275	687	121	-154	500	687	121	-154	500	475	121	+354	475
8908	2,624	2,624	1,684	-940	2,624	5,493	1,684	-940	5,493	5,493	1,684	-940	5,493	3,963	1,684	-1,140	3,963
8909	724	724	724	0	724	1,926	1,049	+325	1,926	1,926	1,049	+325	1,926	1,090	1,090	+366	1,090
8910	1,707	1,707	1,227	-480	1,707	3,393	1,227	-480	3,393	3,393	1,227	-480	3,393	2,064	1,227	-480	2,064
8912	0	0	0	0	0	40	25	+25	25	40	40	+40	40	23	23	+23	23
8913	456	456	411	-45	456	1,110	411	-45	1,110	1,110	411	-45	1,110	684	505	+49	684
8914	245	245	198	-47	245	654	198	-47	654	654	198	-47	654	399	198	-47	399
8916	8	8	0	-8	8	10	0	-8	10	10	0	-8	10	0	-8	0	
8917	61	61	1	-60	1	77	1	-60	1	77	1	-60	1	77	1	-60	1
8918	45	45	8	-37	16	124	8	-37	16	124	8	-37	16	124	8	-37	8
8919	30	30	30	0	30	188	9	-21	9	188	67	+37	68	96	80	+50	80
8920	87	87	51	-36	87	123	51	-36	123	123	51	-36	123	123	51	-36	123
8922	121	121	97	-24	121	200	31	-90	103	200	113	-8	185	200	142	+58	200
8923*																	
8924*	617	617	367	-250	472	1,577	367	-250	1,097	1,577	367	-250	1,097	678	367	-250	678

Roaring Fork Capability Unit

8205	130	130	130	0	130	154	154	+24	154	154	154	0	154	154	154	0	154
8206	58	58	58	0	58	100	100	+42	100	100	100	+42	100	100	100	+42	100
8212	200	200	200	0	200	200	200	0	200	200	200	0	200	200	200	0	200
8217	135	135	135	0	135	300	231	+96	300	300	231	+96	300	300	231	+96	300
8301	264	264	119	-145	264	552	119	-145	346	552	119	-145	346	552	119	-145	346
8302	175	175	173	-2	175	333	166	-9	333	333	187	+12	333	180	98	-77	180
8303	6	6	6	0	6	6	6	0	6	6	6	0	6	6	6	0	6

8304	3	3	3	0	3	24	20	+17	20	24	20	+17	20	24	20	+17	20
8305	3	3	2	-1	2	3	2	-1	2	3	3	0	3	3	3	0	3
8306	43	43	43	0	43	101	80	+37	101	101	84	+41	101	101	82	+39	101
8307	8	8	8	0	8	13	9	+1	9	13	12	+4	12	13	13	+5	13
8308	123	123	123	0	123	300	194	+71	300	300	194	+71	300	300	194	+71	300
8309	12	12	12	0	12	60	15	+3	60	60	18	+6	60	60	26	+14	60
8310	64	64	19	-45	64	64	19	-45	64	64	19	-45	64	64	19	-45	64
8311	12	12	12	0	12	60	16	+4	46	60	16	+4	46	60	16	+4	34
8312	20	20	20	0	20	20	20	0	20	20	20	0	20	20	20	0	20
8313	0	0	0	0	0	338	338	+338	338	338	338	+338	338	301	301	+301	301
8314	22	22	22	0	22	28	28	+6	28	28	28	+6	28	28	10	+6	10
8315	10	10	10	0	10	10	8	-2	10	10	10	0	10	10	10	0	10
8316	186	186	53	-133	186	295	53	-133	295	295	185	-1	295	286	169	-17	286
8317	12	12	8	-4	12	24	8	-4	24	24	17	+5	24	24	9	-3	24
8318	12	12	0	-12	12	75	22	+10	22	75	64	+52	70	75	33	+21	70
8319			33				33			55	55				33		
8320	44	44	24	-20	44	55	24	-20	24	55	55	+11	55	55	22	-22	55
8321	1	1	0	-1	1	73	0	-1	0	73	37	+36	73	54	13	+12	40
8322	4	4	0	-4	4	19	0	-4	19	19	6	+2	19	19	8	+4	19
8323	242	242	232	-10	242	589	232	-10	431	589	232	-10	431	589	232	-10	431
8324	170	170	114	-56	170	386	114	-56	293	386	114	-56	293	386	114	-56	293
8325			21				0			26	26				21		
8326			26				22			26	26				26		
8327	14	14	7	-7	14	72	7	-7	72	72	41	+27	72	72	38	+24	72
8328	29	29	0	-29	29	121	0	-29	0	121	89	+60	121	84	42	+13	51
8329	60	60	60	0	60	67	67	+7	67	67	67	+7	67	67	67	+7	67
8330			88				14			173	173				88		
8331	167	167	167	0	167	472	443	+276	472	472	472	+305	472	262	262	+95	262
8332			21				19			49	49				21		
8333	0		0				0			52	52				0		
8334	329	329	329	0	329	388	349	+20	388	388	388	+59	388	344	344	+15	344
8335	90	90	90	0	90	590	22	-68	590	590	255	+165	590	267	236	+146	236
8336	241	241	107	-134	241	249	72	-169	249	249	107	-134	249	243	107	-134	243
8337	75	75	75	0	75	256	64	-11	256	256	122	+47	256	151	122	+47	151
8338	88	88	32	-56	88	93	32	-56	93	93	32	-56	93	93	32	-56	93
8339	65	65	58	-7	65	65	36	-29	65	65	59	-6	65	65	59	-6	65
8340	43	43	43	0	43	180	119	+76	119	180	119	+76	119	108	108	+65	108
8341	160	160	160	0	160	570	70	-90	570	570	238	+78	570	337	238	+78	337
8342	89	89	89	0	89	750	42	-47	201	750	297	+208	750	445	264	+175	445
8343	0	0	0	0	0	254	43	+43	254	254	158	+158	254	243	158	+158	243
8344	31	31	14	-17	31	32	2	-29	32	32	32	+1	32	32	29	-2	32
8345			3				0			4	4				3		
8346	79	79	79	0	79	83	83	+4	83	83	83	+4	83	83	83	+4	83
8347	13	13	13	0	13	16	16	+3	16	16	16	+3	16	16	16	+3	16
8348	457	457	288	-169	457	757	113	-344	757	757	288	-169	757	593	88	-169	457
8349	68	68	12	-56	56	90	12	-56	32	90	12	-56	54	80	12	-56	56
8350	77	77	13	-64	55	99	2	-75	2	99	23	-54	65	99	23	-54	65
8351	0		0				0			40	40				0		
8352	54	54	24	-30	54	90	0	-54	12	90	90	+36	90	90	63	+9	90
8353			45				45			45	45				45		
8401			1				1			2	2				1		
8402	17	17	17	0	17	17	17	0	17	17	17	0	17	17	17	0	17
8411	20	20	12	-8	12	20	17	0	17	20	13	-7	13	20	17	0	17

TABLE F-1. LIVESTOCK FORAGE ALLOCATION AND IMPACTS—Continued

(in animal-unit months)

Allotment Number	Existing Livestock Use ¹	Continuation of Current Management				Resource Protection				Economic Development				Preferred Alternative			
		Objective ²	Initial Allocation ³	Change in Existing Use versus Initial Allocation	Projected Allocation ⁴	Objective ²	Initial Allocation ³	Change in Existing Use versus Initial Allocation	Projected Allocation ⁴	Objective ²	Initial Allocation ³	Change in Existing Use versus Initial Allocation	Projected Allocation ⁴	Objective ²	Initial Allocation ³	Change in Existing Use versus Initial Allocation	Projected Allocation ⁴
Eagle-Vall Capability Unit																	
8501.....	25	25	22	-3	25	25	18	-7	25	25	25	0	25	25	25	0	25
8502.....	685	685	685	0	685	879	879	+194	879	879	879	+194	879	870	870	+185	870
8503.....	3	3	3	0	3	9	7	+4	9	9	8	+5	9	9	9	+6	9
8504.....	822	822	670	-152	822	1,171	696	-126	696	1,171	1,069	+247	1,171	1,157	800	-22	845
8505.....	12	12	6	-6	12	16	5	-7	16	16	13	+1	16	16	10	-2	16
8506.....	747	747	606	-141	747	787	606	-141	787	787	606	-141	787	787	787	+40	787
8507.....	583	583	583	0	583	778	598	+15	778	778	598	+15	778	628	598	+15	628
8508.....	80	80	32	-48	80	80	32	-48	80	80	32	-48	80	80	32	-48	80
8707.....	106	106	106	0	106	430	288	+182	430	430	329	+223	430	266	250	+144	266
8710.....	16	16	16	0	16	174	30	+14	143	174	30	+14	174	40	30	+14	30
8712.....	180	180	105	-75	180	180	108	-72	180	180	180	0	180	180	130	-50	180
8716.....	6	6	6	0	6	30	26	+20	30	30	26	+20	30	30	30	+24	30
8718.....	11	11	3	-8	11	18	3	-8	18	18	3	-8	18	18	9	-2	18
8719.....	44	44	20	-24	36	44	15	-29	31	44	20	-24	39	44	28	-16	28
8720.....	23	23	0	-23	0	25	0	-23	0	25	11	-12	11	25	5	-18	5
8721.....	241	241	29	-212	183	368	45	-196	45	368	235	-6	368	249	132	-109	184
8722.....	56	56	29	-27	50	153	29	-27	121	153	29	-27	153	64	29	-27	64
8723.....	9	9	9	0	9	9	9	0	9	9	9	0	9	9	9	0	9
8727.....			10				10				10				10		
8728.....			22				22				46				22		
8734.....	2	2	2	0	2	18	17	+15	17	18	18	+16	18	18	7	+5	7
Castle Peak Capability Unit																	
8601.....	2,799	2,799	2,799	-483	2,799	2,316	2,316	-483	2,316	2,316	2,316	-483	2,316	2,316	2,316	-483	2,316
8604.....	36	36	36	0	36	36	36	0	36	36	36	0	36	36	36	0	36
8605.....	75	75	75	0	75	75	75	0	75	75	75	0	75	75	75	0	75
8606.....	155	155	155	0	155	545	545	+390	545	545	545	+390	545	430	430	+275	430
8607.....	18	18	18	0	18	43	43	+25	43	43	43	+25	43	43	43	+25	43
8608.....	5	5	5	0	5	9	9	+4	9	9	9	+4	9	9	9	+4	9
8609.....	170	170	170	0	170	170	6	-164	170	170	170	0	170	170	170	0	170
8616.....	406	406	406	0	406	900	703	+287	757	900	703	+297	757	900	703	+297	757
8617.....	4	4	4	0	4	4	4	0	4	4	4	0	4	4	4	0	4
8619.....	886	886	886	0	886	886	886	0	886	886	886	0	886	886	886	0	886
8620.....	522	522	522	0	522	522	522	0	522	522	522	0	522	522	522	0	522
8621.....	15	15	15	0	15	15	15	0	15	15	15	0	15	15	15	0	15
8622.....	4	4	4	0	4	7	7	+3	7	7	7	+3	7	7	7	+3	7
8623.....	21	21	21	0	21	48	21	0	21	48	48	+27	48	48	48	+27	48

8625	360	360	360	0	360	360	261	-99	360	360	360	0	360	360	360	0	360
8638	38	38	38	0	38	112	112	+74	112	112	112	+74	112	112	112	0	112
8639	171	171	149	-22	171	265	149	-22	265	265	149	-22	265	214	149	-22	214
8641	517	517	473	-44	517	860	365	-152	860	860	473	-44	860	860	473	-44	860
8642	128	128	128	0	128	655	373	+245	655	655	373	+245	655	321	321	+193	321
8643	379	379	379	0	379	535	535	+156	535	535	535	+156	535	535	535	+156	535
8701	10	10	10	0	10	45	13	+3	27	45	13	+3	27	45	13	+3	27
8702	263	263	263	0	263	974	613	+350	974	613	613	+350	974	974	788	+525	974
8729			0				0			94				0			
8730	250	250	250	0	250	290	254	+4	290	290	290	+40	290	290	254	+4	254
8731	396	396	156	-180	396	340	156	-180	340	340	156	-180	340	340	240	-96	263
8732	3	3	3	0	3	26	19	+16	26	26	24	+21	26	26	19	+16	26
8733	52	52	36	-16	52	65	36	-16	65	65	36	-16	65	65	36	-16	65
8735	8	8	8	0	8	34	21	+13	34	34	34	+26	34	34	29	+21	34

King Mountain Capability Unit

8506	168	168	136	-32	168	168	92	-76	168	168	168	0	168	168	152	-16	168
8602	30	30	0	-30	0	76	0	-30	0	76	76	+44	76	76	29	-1	29
8603	27	27	0	-27	0	27	0	-27	0	27	27	0	27	27	8	-19	8
8610	19	19	0	-19	0	20	0	-19	0	20	20	-10	9	20	4	-15	4
8611	100	100	2	-98	2	100	2	-98	2	100	100	0	100	100	62	-38	62
8612	23	23	10	-13	12	24	3	-20	5	24	18	-5	20	24	19	-4	19
8613	25	25	0	-25	0	25	0	-25	0	25	25	0	25	25	15	-10	15
8614	125	125	16	-109	16	125	16	-109	20	125	85	-40	125	125	60	-65	60
8615	38	38	38	0	38	125	102	+64	102	125	125	+87	125	38	38	0	38
8618	27	27	21	-6	27	100	19	-8	43	100	25	-2	49	40	28	+1	40
8625	50	50	15	-35	50	50	0	-50	0	50	50	0	50	50	43	-7	50
8627	24	24	24	0	24	50	46	+22	46	50	46	+22	46	50	50	+26	50
8628			125				5			335				125			
8629	57	57	0	-57	0	126	0	-57	0	126	126	+69	126	126	62	+5	62
8630	79	79	79	0	79	132	132	+53	132	132	132	+53	132	132	132	+53	132
8631	16	16	0	-16	0	76	0	-16	0	76	62	+46	62	76	30	+14	30
8632	71	71	33	-38	71	338	33	-38	95	338	33	-38	116	153	77	+6	153
8633	120	120	120	0	120	384	384	+264	384	384	384	+264	384	300	180	300	
8634	48	48	24	-24	48	60	0	-48	60	60	60	+12	60	60	50	+2	60
8635	24	24	15	-9	24	30	12	-12	21	30	24	0	30	30	22	-2	30
8636	84	84	84	0	84	105	84	0	84	105	84	0	84	105	92	+8	92
8637	4	4	4	0	4	8	8	+4	8	8	8	+4	8	8	8	+4	8
8644	26	26	26	0	26	34	34	+8	34	34	34	+8	34	34	34	+8	34
8645	47	47	22	-25	27	50	22	-25	27	50	22	-25	27	50	22	-25	22
8646	27	27	0	-27	0	27	27	0	27	27	27	0	27	27	27	0	27
8647	372	372	0	-372	372	930	0	-372	745	930	383	+11	930	477	203	-169	477
8648	44	44	40	-4	44	72	40	-4	72	72	40	-4	72	40	40	-4	40
8649	224	224	109	-115	224	394	8	-216	394	394	278	+54	394	324	207	-17	324
8652			0				0			11				0			
8653	186	186	35	-151	35	186	35	-151	35	186	35	-151	35	186	35	-151	35
8654	162	162	162	0	162	162	153	-9	162	162	162	0	162	162	162	0	162
8655	4	4	0	-4	0	4	0	-4	0	4	4	0	4	4	1	-3	1
8656	13	13	8	-5	13	13	7	-6	13	13	11	-2	13	13	10	-3	10
8657	7	7	0	-7	0	7	0	-7	0	7	7	0	7	7	3	-4	3
8658	105	105	52	-53	73	105	33	-72	54	105	81	-24	102	105	81	-24	81
8659	249	249	59	-190	95	249	59	-190	76	249	59	-190	126	249	96	-153	96
8661	343	343	48	-295	343	343	0	-343	343	343	343	-161	343	343	161	-182	343

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TABLE F-1. LIVESTOCK FORAGE ALLOCATION AND IMPACTS—Continued

(in animal-unit months)

Allotment Number	Exist- ing Live- stock Use ¹	Continuation of Current Management				Resource Protection				Economic Development				Preferred Alternative			
		Objec- tive ²	Initial Alloca- tion ³	Change in Exist- ing Use versus Initial Alloca- tion	Pro- jected Alloca- tion ⁴	Objec- tive ²	Initial Alloca- tion ³	Change in Exist- ing Use versus Initial Alloca- tion	Pro- jected Alloca- tion ⁴	Objec- tive ²	Initial Alloca- tion ³	Change in Exist- ing Use versus Initial Alloca- tion	Pro- jected Alloca- tion ⁴	Objec- tive ²	Initial Alloca- tion ³	Change in Exist- ing Use versus Initial Alloca- tion	Pro- jected Alloca- tion ⁴
8662	109	109	32	-77	109	109	32	-77	109	109	32	-77	109	109	32	-77	109
8663	53	53	53	0	53	53	53	0	53	53	53	0	53	53	53	0	53
8665	30	30	30	0	30	30	30	0	30	30	30	0	30	30	30	0	30
8666	488	488	100	-388	299	488	100	-388	236	488	100	-388	488	488	100	-388	400
8667	42	42	42	0	42	42	42	0	42	42	42	0	42	42	42	0	42
8668	211	211	138	-73	142	211	138	-73	142	211	138	-73	142	211	138	-73	142
8695			45				45				50				45		
8672	127	127	0	-127	0	127	0	-127	0	127	127	0	127	127	59	-68	59

¹Existing Use—average licensed livestock use 1975-79.²Livestock objectives by alternative are CCMA, existing use; RPA, total preference; EDA, total preference; PA, active preference.³Initial Allocation—allocation of existing forage to livestock.⁴Projected allocation—allocation of existing forage plus estimated additional forage developed in each alternative.⁵Combined in Soil Vegetation Inventory Method runs.

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TABLE F-2. WILDLIFE FORAGE ALLOCATION

(in AUMs)

Allotment Number	Existing Wildlife Use ¹	Continuation of Current Management Alternative			Resource Protection Alternative			Economic Development Alternative			Preferred Alternative		
		Objective ²	Initial Allocation ²	Projected allocation ²	Objective ²	Initial Allocation ²	Projected allocation ²	Objective ²	Initial Allocation ²	Projected allocation ²	Objective ²	Initial Allocation ²	Projected allocation ²
Garfield Capability Unit													
8001	21	21	17	21	30	18	30	30	17	30	21	21	21
8002	27	27	27	27	37	37	37	37	37	37	27	27	27
8003	102	102	102	102	122	122	122	122	122	122	102	102	102
8004	10	10	10	10	14	14	14	14	8	14	10	10	10
8005	21	21	21	21	27	27	27	27	27	27	21	21	21
8006	337	337	337	337	430	430	430	430	430	430	337	337	337
8007	157	157	157	157	220	220	220	220	220	220	157	157	157
8008	17	17	17	17	23	23	23	23	23	23	17	17	17
8009	558	558	476	558	731	476	716	731	255	255	558	314	554
8010	217	217	217	217	311	260	311	311	123	123	217	164	217
8011	69	69	69	69	85	85	85	85	85	85	69	69	69
8012	932	932	928	932	1,182	965	1,182	1,182	846	1,182	932	846	932
8013	247	247	247	247	323	323	323	323	314	314	247	247	247
8014	22	22	22	22	24	24	24	24	24	24	22	22	22
8015	29	29	29	29	35	35	35	35	35	35	29	29	29
8016	192	192	192	192	230	230	230	230	230	230	192	192	192
8017	109	109	109	109	155	155	155	155	155	155	109	109	109
8018	790	790	790	790	1,043	812	1,043	1,043	444	444	790	444	790
8019	31	31	31	31	37	37	37	37	37	37	31	31	31
8020	3	3	3	3	4	4	4	4	4	4	3	3	3
8021	89	89	89	89	116	116	116	116	116	116	89	63	89
8022	56	56	56	56	67	67	67	67	67	67	56	56	56
8023	5	5	5	5	7	7	7	7	5	5	5	2	2
8024	174	174	172	174	222	186	222	222	141	141	174	141	174
8025	258	258	258	258	333	258	333	333	222	222	258	227	258
8026	141	141	141	141	202	202	202	202	179	179	141	141	141
8027	19	19	13	13	23	13	23	23	7	7	19	6	6
8028	73	73	73	73	106	89	89	106	78	78	73	73	73
8029	138	138	138	138	199	142	156	199	126	126	138	89	89
8030	76	76	76	76	115	100	114	115	64	64	76	65	65
8031	28	28	28	28	43	43	43	43	27	27	28	27	27
8032	155	155	155	155	222	200	222	222	105	105	155	105	105
8033	94	94	94	94	136	96	136	136	59	59	94	59	59
8034	25	25	25	25	36	36	36	36	22	22	25	21	21
8035	159	159	153	153	229	154	229	229	103	103	159	80	80
8036	28	28	28	28	45	45	45	45	26	26	28	24	24
8037	23	23	23	23	37	29	37	37	19	19	23	22	22
8038	5	5	4	4	8	4	8	8	0	0	5	2	2
8039	501	501	501	501	735	735	735	735	550	551	501	434	434
8040	98	98	98	98	137	98	137	98	108	108	98	98	98
8041	55	55	55	55	79	52	79	79	52	54	55	55	55
8042	24	24	24	24	32	32	32	32	32	32	24	24	24
8043	60	60	60	60	82	82	82	82	82	82	60	60	60
8044	152	152	152	152	212	212	212	212	212	212	152	152	152
8045	59	59	59	59	94	94	94	94	94	94	59	59	59
8046	130	130	130	130	156	156	156	156	127	156	130	127	130
8201	54	54	54	54	63	63	63	63	63	63	54	54	54
8202	107	107	107	107	132	132	132	132	132	132	107	107	107
8203	328	328	328	328	403	403	403	403	403	403	328	328	328
8204	17	17	17	17	21	21	21	21	21	21	17	17	17
8207	91	91	91	91	111	111	111	111	111	111	91	91	91
8208	293	293	293	293	337	337	337	337	337	337	293	293	293
8209	119	119	119	119	157	113	122	157	122	122	119	113	119
8210	242	242	242	242	314	314	314	314	314	314	242	242	242
8211	158	158	158	158	203	203	203	203	203	203	158	158	158
8259	47	47	47	47	59	59	59	59	59	59	47	47	47
8228	53	53	53	53	64	64	64	64	64	64	53	53	53
8101	78	76	76	76	98	98	98	98	98	98	76	55	76

APPENDIX F

TABLE F-2. WILDLIFE FORAGE ALLOCATION—Continued

(in AUMs)

Allotment Number	Existing Wildlife Use ¹	Continuation of Current Management Alternative			Resource Protection Alternative			Economic Development Alternative			Preferred Alternative		
		Objective ²	Initial Allocation ³	Projected allocation ⁴	Objective ²	Initial Allocation ³	Projected allocation ⁴	Objective ²	Initial Allocation ³	Projected allocation ⁴	Objective ²	Initial Allocation ³	Projected allocation ⁴
8102	54	54	54	54	71	71	71	71	54	54	54	54	54
8103	69	69	69	69	96	96	96	96	62	63	69	64	69
8104	171	171	171	171	217	217	217	217	217	217	171	171	171
8105	763	763	763	763	974	974	974	974	974	974	763	763	763
8106	43	43	43	43	55	55	55	55	55	55	43	43	43
8107	50	50	50	50	66	66	66	66	66	66	50	50	50
8108	13	13	13	13	17	17	17	17	17	17	13	13	13
8109	18	18	18	18	24	24	24	24	19	19	18	18	18
8110	4	4	4	4	5	5	5	5	5	5	4	4	4
8111	14	14	14	14	17	17	17	17	14	14	14	14	14
8112	51	51	51	51	69	69	69	69	24	24	51	28	28
8113	27	27	27	27	30	30	30	30	30	30	27	27	27
8114	15	15	15	15	19	19	19	19	19	19	15	15	15
8115	14	14	13	13	15	14	15	15	10	10	14	11	11
8116	10	10	8	8	10	8	10	5	5	10	6	6	6
8117	49	49	49	49	60	60	60	60	60	60	49	49	49
8118	3	3	3	3	4	4	4	4	4	4	3	3	3
8119	68	68	68	68	89	89	89	89	89	89	68	68	68
8120	7	7	7	7	10	10	10	10	10	10	7	7	7
8121	52	52	52	52	69	69	69	69	69	69	52	52	52
8122	11	11	11	11	13	13	13	13	13	13	11	11	11
8123	20	20	20	20	26	26	26	26	19	26	20	20	20
8124	115	115	115	115	146	146	146	146	146	146	115	115	115
8125	312	312	312	312	403	403	403	403	403	403	312	312	312
8126	108	108	108	108	139	139	139	139	65	95	108	86	108
8127	387	387	387	387	486	486	486	486	486	486	387	387	387
8128	71	71	71	71	89	89	89	89	89	89	71	71	71
8129	158	158	156	156	194	194	194	194	94	194	156	156	156
8130	140	140	140	140	178	178	178	178	86	96	140	96	96
8131	95	95	95	95	137	99	118	137	64	94	95	77	77
8213	93	93	93	93	120	120	120	120	120	120	93	93	93
8214	23	23	23	23	29	28	28	28	28	28	23	23	23
8215	6	6	6	6	7	7	7	7	7	7	6	6	6
8216	19	19	19	19	23	23	23	23	23	23	19	19	19
8218	85	85	85	85	110	110	110	110	86	110	85	85	85
8219	50	50	50	50	66	66	66	66	35	49	50	32	49
8220	71	71	71	71	91	91	91	91	57	91	71	65	71
8221	27	27	27	27	37	37	37	37	37	37	27	27	27
8222	172	172	172	172	197	197	197	197	197	197	172	172	172
8223	6	6	6	6	7	7	7	7	7	7	6	6	6
8224	67	67	67	67	86	86	86	86	37	51	67	59	59
8225	39	39	39	39	50	50	50	50	45	45	39	39	39
8226	3	3	3	3	3	3	3	3	3	3	3	3	3
8227	15	15	5	5	15	5	15	5	5	15	10	10	10
8901	121	121	121	121	169	169	169	169	169	169	121	121	121
8902	482	482	482	482	678	678	678	678	567	678	487	393	482
8903	427	427	402	427	594	402	551	594	282	282	427	292	329
8904	63	63	63	63	89	85	89	89	32	32	63	22	22
8905	28	28	28	28	37	37	37	37	37	37	28	28	28
8907	268	268	268	268	367	367	367	367	367	367	268	268	268
8908	380	380	380	380	506	506	506	506	506	506	380	380	380
8909	193	193	193	193	258	258	258	258	258	258	193	193	193
8910	302	302	302	302	404	404	404	404	404	404	302	302	302
8912	160	160	160	160	225	193	196	225	178	186	160	160	160
8913	92	92	92	92	122	125	122	122	122	122	92	92	92
8914	45	45	45	45	60	60	60	60	60	60	45	45	45
8916	26	26	26	26	35	35	35	35	35	35	26	26	26
8917	9	9	9	9	9	9	9	9	9	9	9	9	9
8918	37	37	37	37	48	48	48	48	50	48	37	37	37
8919	124	124	124	124	172	172	172	172	114	114	124	101	101

RANGELAND

TABLE F-2. WILDLIFE FORAGE ALLOCATION—Continued

(in AUMs)

Allotment Number	Existing Wildlife Use ¹	Continuation of Current Management Alternative			Resource Protection Alternative			Economic Development Alternative			Preferred Alternative		
		Objective ²	Initial Allocation ³	Projected allocation ⁴	Objective ²	Initial Allocation ³	Projected allocation ⁴	Objective ²	Initial Allocation ³	Projected allocation ⁴	Objective ²	Initial Allocation ³	Projected allocation ⁴
8920	34	34	34	34	44	44	44	44	44	44	34	34	34
8022	156	156	156	156	222	222	222	222	140	140	156	111	125
8923													
8924	234	234	234	234	324	324	324	324	324	324	234	234	234
Roaring Fork Capability Unit													
8205	140	140	140	140	175	175	175	175	175	175	140	140	140
8206	86	86	86	86	105	105	105	105	105	105	86	86	86
8212	151	151	151	151	240	240	240	240	240	240	151	151	151
8217	94	94	94	94	129	129	129	129	129	129	94	94	94
8301	64	64	64	64	80	80	80	80	80	80	64	64	64
8302	26	26	26	26	33	33	33	33	12	33	26	26	26
8303	4	4	4	4	5	5	5	5	5	5	4	4	4
8304	3	3	3	3	3	3	3	3	3	3	3	3	3
8305	8	8	8	8	8	8	8	8	7	8	8	8	8
8306	30	30	30	30	37	17	37	37	33	37	30	30	30
8307	8	8	8	8	10	10	10	10	7	5	8	8	8
8308	133	133	133	133	160	160	160	160	160	160	133	133	133
8309	15	15	15	15	18	18	18	18	15	18	15	6	15
8310	16	16	16	16	21	21	21	21	21	21	16	16	16
8311	9	9	9	9	11	11	11	11	11	11	9	9	9
8312	26	26	26	26	27	27	27	27	27	27	26	26	26
8313	100	100	100	100	123	123	123	123	123	123	100	100	100
8314	21	21	21	21	30	30	30	30	30	30	21	21	21
8315	7	7	7	7	10	10	10	10	10	10	7	7	7
8316	394	394	349	394	524	349	524	524	217	524	394	233	394
8317	64	64	24	64	89	24	89	89	15	89	64	23	64
8318	179	179	89	179	253	89	248	253	47	195	179	77	179
8319	146	146	47	95	207	47	95	207	47	95	146	80	128
8320	246	246	100	246	344	100	310	344	69	303	246	102	246
8321	97	97	37	97	137	37	137	137	0	59	97	24	97
8322	25	25	18	25	33	18	33	33	12	33	25	10	25
8323	59	59	59	59	89	89	89	89	89	89	59	59	59
8324	25	25	25	25	38	61	38	38	38	38	25	25	25
8325	38	38	38	38	61	59	61	61	59	61	38	38	38
8326	23	23	23	23	37	37	37	37	37	37	23	23	23
8327	150	150	113	150	199	113	199	199	79	199	150	82	150
8328	469	469	283	469	600	283	384	600	194	249	469	241	469
8329	64	64	64	64	99	99	99	99	99	99	64	64	64
8330	161	161	161	161	283	235	283	283	235	283	161	161	161
8331	182	182	182	182	277	277	277	277	248	277	182	182	182
8332	94	94	71	94	138	73	73	138	66	66	94	63	63
8333	141	141	85	141	204	75	204	204	75	204	141	85	141
8334	368	368	368	368	563	563	563	563	524	563	368	368	368
8335	360	360	360	360	548	526	548	548	293	548	360	312	312
8336	115	115	115	115	178	178	178	178	143	178	115	115	115
8337	166	166	166	166	254	193	254	254	135	254	166	134	165
8338	13	13	13	13	18	18	18	18	18	18	13	13	13
8339	73	73	73	73	109	95	109	109	72	109	73	73	73
8340	46	46	46	46	70	70	70	70	70	70	46	46	46
8341	322	322	322	322	495	495	495	495	327	495	322	322	322
8342	566	566	498	566	883	557	883	883	302	302	566	335	566
8343	353	353	353	353	553	475	553	553	360	553	353	353	353
8344	74	74	74	74	115	96	115	115	66	115	74	69	74
8345	10	10	10	10	13	13	13	13	13	13	10	10	10
8346	101	101	101	101	156	156	156	156	156	156	101	101	101
8347	9	9	9	9	14	14	14	14	14	14	9	9	9
8348	412	412	412	412	648	648	648	648	473	648	412	412	412
8349	124	124	124	124	158	134	158	158	134	134	124	124	124
8350	200	200	200	200	258	211	258	258	190	190	200	190	190

APPENDIX F

TABLE F-2. WILDLIFE FORAGE ALLOCATION—Continued

(in AUMs)

Allotment Number	Existing Wildlife Use ¹	Continuation of Current Management Alternative			Resource Protection Alternative			Economic Development Alternative			Preferred Alternative		
		Objective ²	Initial Allocation ³	Projected allocation ⁴	Objective ²	Initial Allocation ³	Projected allocation ⁴	Objective ²	Initial Allocation ³	Projected allocation ⁴	Objective ²	Initial Allocation ³	Projected allocation ⁴
8351	169	169	79	169	246	79	148	246	79	148	169	79	169
8352	330	330	278	330	520	302	520	520	212	340	330	239	330
8353	36	36	36	36	57	57	57	57	57	57	36	36	36
8401	4	4	4	4	4	4	4	4	4	4	4	4	4
8402	11	11	11	11	17	17	17	17	17	17	11	11	11
8411	2	2	2	2	2	2	2	2	0	0	2	1	1

Eagle-Vail Capability Unit

8501	45	45	45	45	61	49	61	61	42	61	45	45	45
8502	868	868	868	868	1,041	1,041	1,041	1,041	1,041	1,041	868	868	868
8503	4	4	4	4	6	6	6	6	5	6	4	4	4
8504	1,660	1,660	1,280	1,660	2,141	1,254	1,809	2,141	881	1,107	1,660	1,150	1,660
8505	10	10	10	10	11	11	11	11	3	11	10	6	10
8506	616	616	616	616	825	825	825	825	825	825	616	616	616
8507	1,114	1,114	1,084	1,114	1,430	1,062	1,430	1,062	1,430	1,114	1,114	1,084	1,114
8508	21	21	21	21	28	28	28	28	28	28	21	21	21
8707	430	430	369	430	546	369	546	546	328	546	430	369	430
8710	7	7	7	7	10	10	10	10	10	10	7	7	7
8712	295	295	237	295	387	234	387	387	162	387	295	212	295
8716	28	28	28	28	27	26	26	27	26	26	28	28	28
8718	14	14	8	14	17	8	17	17	8	17	14	7	17
8719	21	21	21	21	26	26	26	26	21	21	21	13	13
8720	27	27	12	27	12	12	12	12	1	1	27	7	7
8721	670	670	460	670	849	445	809	849	255	255	670	358	670
8722	43	43	43	43	55	55	55	55	55	55	43	43	43
8723	13	13	8	13	16	8	16	16	8	16	13	13	13
8727	11	11	8	11	15	8	15	15	8	15	11	11	11
8728	33	33	33	33	40	29	40	40	29	40	33	29	29
8734	30	30	30	30	40	30	34	40	29	33	30	30	30

Castle Peak Capability Unit

8601	273	273	273	273	318	318	318	318	318	318	273	273	273
8604	3	3	3	3	3	3	3	3	3	3	3	3	3
8605	141	141	114	141	141	117	141	141	117	141	141	114	114
8606	419	419	419	419	524	524	524	524	524	419	419	419	419
8607	4	4	4	4	4	4	4	4	4	4	4	4	4
8608	1	1	1	1	1	1	1	1	1	1	1	1	1
8609	15	15	15	15	18	18	18	18	18	18	15	15	15
8616	303	303	303	303	351	351	351	351	351	351	303	303	303
8617	9	9	8	9	10	8	10	10	8	10	9	8	8
8619	481	481	481	481	500	500	500	500	500	500	481	481	481
8620	499	499	499	499	591	591	591	591	591	591	499	499	499
8621	17	17	17	17	20	18	20	20	18	20	17	10	10
8622	8	8	7	7	9	7	9	9	7	7	8	7	7
8623	13	13	13	13	16	16	16	16	16	16	13	13	13
8625	576	576	576	576	623	623	623	623	623	623	576	576	576
8638	80	80	80	80	100	100	100	100	100	100	80	80	80
8639	31	31	31	31	39	39	39	39	39	39	31	31	31
8641	520	520	520	520	642	642	642	642	534	642	520	520	520
8642	573	573	573	573	651	651	651	651	651	651	573	573	573
8643	558	558	558	558	683	683	683	683	683	683	558	558	558
8701	25	25	25	25	25	25	25	25	25	25	25	25	25
8702	429	429	429	429	523	523	523	523	523	523	429	354	429
8729	234	234	168	168	292	168	189	292	168	189	234	168	189
8730	342	342	223	342	505	223	223	505	187	187	342	223	254
8731	94	94	94	94	117	117	117	117	117	117	94	68	94
8732	68	68	20	68	86	20	86	86	15	86	68	20	60
8733	7	7	7	7	8	8	8	8	0	4	7	7	7

RANGELAND

TABLE F-2. WILDLIFE FORAGE ALLOCATION—Continued

(in AUMs)

Allotment Number	Existing Wildlife Use ¹	Continuation of Current Management Alternative			Resource Protection Alternative			Economic Development Alternative			Preferred Alternative		
		Objective ²	Initial Allocation ³	Projected allocation ⁴	Objective ²	Initial Allocation ³	Projected allocation ⁴	Objective ²	Initial Allocation ³	Projected allocation ⁴	Objective ²	Initial Allocation ³	Projected allocation ⁴
8735	49	49	49	49	62	49	62	62	36	62	49	41	49
King Mountain Capability Unit													
8506	356	356	139	356	383	383	383	383	307	383	356	323	356
8602	264	264	134	221	307	221	221	307	60	145	264	105	192
8603	489	489	154	191	569	191	191	569	127	164	489	146	183
8610	33	33	9	9	38	0	0	38	0	9	33	5	5
8611	960	960	501	548	1,087	548	548	1,087	403	548	960	441	488
8612	38	38	38	38	45	45	45	45	30	30	38	29	29
8613	395	395	229	369	467	317	317	467	204	292	395	214	302
8614	225	225	155	198	275	208	208	275	86	103	225	111	164
8615	446	446	373	429	595	424	424	595	345	401	446	373	429
8618	23	23	23	23	25	25	25	25	19	19	23	16	23
8626	456	456	415	456	528	510	510	528	380	461	456	387	456
8627	27	27	25	25	30	29	29	30	29	29	27	25	25
8628	861	861	665	861	956	956	956	956	784	956	861	665	861
8629	648	648	389	529	770	529	529	770	263	403	648	327	467
8630													
8631	504	504	229	229	603	229	229	603	167	167	504	199	199
8632	46	46	31	46	52	52	52	52	31	31	46	20	27
8633	313	313	313	313	350	350	350	350	350	350	313	313	313
8634	147	147	147	147	196	196	196	196	111	196	147	121	147
8635	26	26	26	26	35	35	35	35	17	26	26	19	26
8636	20	20	20	20	24	24	24	24	24	24	20	20	20
8637	4	4	4	4	5	5	5	5	5	5	4	4	4
8644	86	86	61	86	116	116	116	116	61	116	86	63	86
8645	7	7	7	7	7	7	7	7	7	7	7	7	7
8646	27	27	27	27	34	34	34	34	34	34	27	27	27
8647	1,282	1,282	754	1,282	1,602	1,602	1,602	1,602	371	1,417	1,282	551	1,282
8648	50	50	50	50	56	56	56	56	56	56	50	48	48
8649	689	689	689	689	774	689	774	774	369	774	689	440	689
8652	75	75	18	18	87	18	18	87	18	18	75	18	18
8653	58	58	58	58	62	62	62	62	62	62	58	58	58
8654	245	245	245	245	279	279	279	279	270	279	245	245	245
8655	44	44	13	13	52	13	13	52	9	9	44	12	12
8656	8	8	8	8	9	9	9	9	6	9	8	6	6
8657	47	47	23	23	54	23	23	54	16	23	47	20	20
8658	190	190	190	190	209	209	209	209	161	161	190	155	176
8659	109	109	78	109	126	76	126	126	76	76	109	42	109
8661	727	727	429	727	820	477	820	820	295	820	727	316	727
8662	21	21	21	21	25	25	25	25	25	25	21	21	21
8663	84	84	84	84	93	93	93	93	93	93	84	84	84
8665	13	13	13	13	15	15	15	15	15	15	13	13	13
8666	359	359	163	359	422	163	170	422	163	422	359	163	163
8667	85	85	85	85	105	105	105	105	105	105	85	85	85
8669	115	115	115	115	133	133	133	133	133	133	115	115	115
8695													
8672	578	578	520	520	723	328	520	723	201	393	578	269	461

¹Existing use—average estimated wildlife populations 1976-80.

²Wildlife objectives by alternative are CCMA, existing use; RPA, Colorado Division of Wildlife 1988 goals; EDA, Colorado Division of Wildlife 1988 goals; PA, existing use.

³Initial allocation—allocation of existing forage to wildlife.

⁴Projected allocation—allocation of existing forage plus estimated additional forage developed in each alternative.

APPENDIX F

TABLE F-3. EXISTING LIVESTOCK GRAZING USE

Allotment Number	Allotment Name	Kind of Allotment	Public Land Acreage	Kind of Livestock	Season of Use
Garfield Capability Unit					
8001	Sample	I	260	Cattle	5/16 to 6/15
8002	Reed	I	710	Cattle	6/01 to 6/15
8003	Kissel	I	640	Cattle	6/11 to 7/18
8004	Bowen Isolated Tracts	I	160	Cattle	6/16 to 9/30
8005	Doak	I	370	Cattle	6/01 to 10/18
8006	Cedar Mountain	I	6,060	Cattle	5/15 to 6/15
				Cattle	10/25 to 12/25
8007	Rifle	I	1,880	Cattle	6/16 to 9/28
8008	Jackson	I	320	Cattle	6/16 to 7/31
8009	Weaver	I	4,260	Sheep	5/10 to 6/10
				Sheep	10/05 to 10/30
				Sheep	1/15 to 2/15
8010	East Cedar Mountain	I	2,180	Cattle	5/01 to 6/30
8011	Middle Rifle	I	927	Cattle	5/16 to 10/31
8012	Brush Creek Common	C	4,120	Cattle	5/16 to 10/31
8013	Harris Gulch	I	2,277	Cattle	6/16 to 10/15
8014	Graham	I	190	Cattle	6/16 to 9/30
8015	Hayden	I	168	Cattle	6/16 to 9/30
8016	Southwest Rifle Creek	I	1,370	Cattle	5/01 to 10/14
8017	Lundgren-Hogback	I	1,080	Cattle	10/25 to 12/26
8018	Horse Mountain-Brush Creek	I	8,490	Cattle	5/25 to 6/21
				Cattle	11/01 to 12/20
8019	Morrow	I	729	Cattle	5/25 to 10/24
8020	Coal Mine	I	80	Cattle	5/15 to 9/30
8021	Watts	I	800	Sheep	6/01 to 6/30
				Sheep	10/01 to 11/15
8022	Simpson and Nichols	I	430	Cattle	5/15 to 10/15
8023	Government Creek Isolated	I	80	Sheep	1/07 to 2/28
8024	Ryden	I	1,240	Cattle	5/01 to 6/15
8025	Dodo	I	2,340	Cattle	5/15 to 6/15
8026	Hogback Common	C	1,960	Cattle	5/06 to 6/15
				Sheep	5/15 to 7/15
8027	Roberts	I	130	Sheep	12/01 to 1/01
8028	Red Mountain	I	1,000	Cattle	5/26 to 6/10
8029	Pretti-Roberts	C	1,696	Cattle	5/16 to 6/15
8030	Castle	I	1,410	Cattle	4/25 to 5/24
8031	Hill	I	440	Cattle	5/01 to 6/15
8032	Elk Park Common	C	2,200	Cattle	5/01 to 6/15
8033	Brosius Gulch	C	1,390	Cattle	5/01 to 5/31
8034	Harvey Gap 1	I	947	Sheep	5/05 to 5/15
8035	Harvey Gap 2	I	2,120	Sheep	5/05 to 6/15
8036	Jewell	I	480	Sheep	2/01 to 5/31
8037	Scuttler Gulch	I	440	Sheep	5/01 to 5/16
8038	Wittwer	I	80	Cattle	5/01 to 5/31
8039	Government Creek Common	C	7,580	Cattle	5/16 to 6/15
				Sheep	1/01 to 2/28
8040	Middle Elk	U	1,270		
8041	Andgee	U	723		
8042	Chirp	U	211		
8043	Butler Creek	U	638		
8044	Rifle Gap	U	2,199		
8045	North Hogback	U	520		
8046	Jackson Gulch	I	2,160	Cattle	6/01 to 6/30
8201	Kaiser Hells Hole	I	1,160	Cattle	6/01 to 9/30
8202	Possum Creek	I	1,970	Sheep	6/01 to 6/30
				Sheep	6/01 to 9/30
8203	Storm King	I	4,650	Sheep	6/01 to 7/05
				Sheep	9/06 to 5/28
8204	Storm King-Dolan Gulch	I	280	Horses	5/16 to 6/30
8207	Canyon Creek	I	1,400	Cattle	7/16 to 9/15
				Sheep	6/16 to 7/10
				Sheep	9/06 to 9/30
8208	Bearwallow and Jolley	I	3,370	Cattle	5/15 to 10/10

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TABLE F-3. EXISTING LIVESTOCK GRAZING USE—Continued

Allotment Number	Allotment Name	Kind of Allotment ¹	Public Land Acreage	Kind of Livestock	Season of Use
8209.....	Bearwallow-Jolley-Harris	I	1,000	Cattle	5/15 to 6/15
8210.....	Bolier Creek	C	2,520	Cattle	5/16 to 6/30
8211.....	Dietz	I		Cattle	5/15 to 6/15
8259.....	Possum Creek Driveway	I	510	Cattle	6/22 to 6/28
					10/15 to 10/19
8228.....	Canyon Creek	I	730	Cattle	6/16 to 7/31
8101.....	Kamm Mesa	I	920	Cattle	5/10 to 6/09
8102.....	Whitman	I	790	Cattle	5/01 to 6/30
8103.....	Oates	I	1,150	Cattle	4/01 to 5/01
					10/01 to 11/30
8104.....	Beaver-Mamm Common	C	3,946	Cattle	5/01 to 10/16
8105.....	East Divide Common	C*	13,628	Cattle	6/01 to 6/30
					10/01 to 10/15
8106.....	Scott	I	938	Cattle	6/01 to 6/30
8107.....	Dean Gulch	I	865	Cattle	6/16 to 10/31
8108.....	Smith (lease)	I	148	Cattle	6/20 to 8/03
8109.....	Barr	U	86		
8110.....	Kinney Brothers Individual	I	80	Cattle	5/15 to 6/08
8111.....	Shideler	I	160	Cattle	10/01 to 4/30
8112.....	Grass Mesa	I	640	Cattle	10/16 to 11/15
8113.....	Beaver Creek	I	600	Cattle	5/12 to 10/14
8114.....	Franks	I	320	Cattle	4/16 to 6/15
8115.....	Couasy 1	I	160	Cattle	5/01 to 5/31
					10/01 to 10/31
8116.....	Shideler Individual	I	95	Cattle	5/16 to 6/15
8117.....	Pitman	I	1,125	Cattle	5/01 to 11/30
8118.....	Couasy 2	I	40	Cattle	6/20 to 10/19
8119.....	Porcupine Common	C	1,197	Cattle	5/01 to 9/30
8120.....	Porcupine Individual	I	155	Sheep	5/01 to 6/15
					10/16 to 10/31
8121.....	Spruce Gulch Common	C	1,089	Cattle	5/15 to 10/30
8122.....	Smith	I	360	Cattle	5/15 to 10/10
8123.....	Hoaglund	I	320	Cattle	6/01 to 7/31
8124.....	Battlement Creek Common	C	2,643	Cattle	5/01 to 6/15
					6/16 to 10/15
8125.....	Dry Creek Pete and Bill	C	7,948	Cattle	5/01 to 9/15
					6/16 to 9/30
					10/01 to 10/31
8126.....	Pole Creek and Cottonwood	I	960	Cattle	5/16 to 6/15
					6/16 to 7/31
8127.....	Dry Hollow-Reservoir Gulch	C	6,956	Cattle	6/01 to 6/15
					6/16 to 10/15
8128.....	Middle Mamm Creek	C	2,215	Cattle	6/01 to 6/30
8129.....	Upper Wallace Common	C	2,591	Cattle	6/16 to 10/15
8130.....	Alkali Creek Common	C	1,645	Cattle	5/01 to 6/15
8131.....	Alkali Gulch	I	1,145	Sheep	3/16 to 5/15
					11/01 to 12/31
8213.....	Vulcan	I*	1,977	Cattle	5/16 to 6/23
					10/16 to 10/30
8214.....	Alkali Creek	I	960	Cattle	6/20 to 8/31
8215.....	Larsen	I	145	Cattle	5/01 to 7/31
8216.....	Delaney	I	445	Cattle	7/01 to 10/15
8218.....	Horse Creek	I	1,237	Sheep	10/16 to 10/30
8219.....	Bair	I	440	Sheep	5/06 to 6/05
					11/01 to 11/15
8220.....	Lower Garfield Common	C	920	Cattle	5/16 to 5/30
8221.....	Hilton Individual	I	360	Cattle	6/01 to 6/15
8222.....	Upper Garfield Common	C*	4,957	Cattle	6/01 to 9/30
8223.....	Larsen (exchange of use)	I			
8224.....	Hilton-Porter Common	C	900	Cattle	7/01 to 9/30
8225.....	Hilton 1	I	1,800	Cattle	7/01 to 10/15
8226.....	Hilton 2	I	40	Cattle	7/16 to 10/31
8227.....	Skaen	I	160	Cattle	8/16 to 10/31
8901.....	Maggie Creek	I	160	Cattle	5/01 to 10/31
8902.....	Webster Park	I	7,133	Sheep	11/01 to 5/31

APPENDIX F

TABLE F-3. EXISTING LIVESTOCK GRAZING USE—Continued

Allotment Number	Allotment Name	Kind of Allotment ¹	Public Land Acreage	Kind of Livestock	Season of Use
8903	Hubbard Mesa	C	5,980	Cattle	5/16 to 6/15
				Sheep	3/25 to 5/15
				Sheep	11/20 to 12/31
8904	Home Ranch	I	862	Sheep	12/01 to 5/31
8905	Doodlebug	I	920	Cattle	5/16 to 6/15
8907	Rees	I	3,647	Sheep	5/01 to 6/30
				Sheep	9/16 to 11/30
8908	JOS Common	C*	10,176	Cattle	6/16 to 9/30
				Sheep	6/16 to 9/30
8909	Clough-Alber	C	5,267	Cattle	6/16 to 10/15
				Sheep	6/16 to 6/30
				Sheep	9/12 to 10/28
8910	East Fork Common	C*	8,432	Cattle	6/16 to 10/15
8912	Sharrade Park	I	2,236	Cattle	5/1 to 6/15
8913	Mahaffey Summer	I	3,400	Cattle	6/15 to 0/15
				Sheep	6/01 to 11/15
8914	Old Mountain	C	1,325	Cattle	6/15 to 10/15
8916	Crawford and Kerlee	I	695	Cattle	5/01 to 6/15
8917	Starkey Gulch	I	247	Cattle	6/01 to 10/15
8918	Wheeler Gulch	I	600	Cattle	4/16 to 5/31
8919	Callahan Mountain Common	C	1,777	Cattle	5/16 to 6/15
				Sheep	12/01 to 12/31
8920	Riley Gulch	C	1,473	Cattle	4/17 to 6/15
				Cattle	11/01 to 11/30
8922	Smith Gulch	I	2,320	Sheep	4/16 to 5/15
				Sheep	1/01 to 2/15
8923	Mahaffey Winter 1 and 2	I	6,319	Sheep	3/01 to 5/31
8924	Mahaffey Winter 3	I	9,591	Sheep	11/16 to 2/28
				Sheep	3/01 to 5/31
Roaring Fork Capability Unit					
8205	Mitchell-Oasis	I	2,080	Cattle	5/16 to 6/30
8206	Oasis Creek	I	1,440	Sheep	6/23 to 7/04
8212	Paradise Creek	I	2,290	Sheep	5/16 to 6/15
				Sheep	10/01 to 10/31
8217	South Canyon	I	2,399	Cattle	7/16 to 10/15
8301	Cottonwood	I	880	Cattle	6/16 to 9/30
8302	Cattle Creek Driveway	I	643	Sheep	7/10 to 7/27
				Sheep	7/28 to 8/13
8303	Blanco	I	80	Cattle	6/01 to 7/05
				Cattle	9/01 to 10/05
8304	Upper Place	I	40	Cattle	6/01 to 10/15
8305	Squires	I	40	Cattle	5/20 to 10/01
8306	Gould	I	240	Cattle	6/01 to 7/15
8307	Coryell	I	80	Cattle	5/16 to 6/15
				Cattle	10/16 to 10/25
8308	Driveway Common	C	1,000	Cattle	6/15 to 7/16
				Cattle	10/01 to 10/15
8309	Homestead	I	120	Cattle	6/01 to 6/30
				Cattle	10/01 to 10/31
8310	Lower Place	I	160	Cattle	6/17 to 10/30
8311	Pretzel	I	90	Cattle	5/01 to 5/31
				Cattle	10/01 to 10/31
8312	Hopkins	I	240	Cattle	9/29 to 10/13
				Sheep	5/10 to 7/05
8313	Lookout Mountain	I	3,270	Sheep	9/25 to 11/20
8314	Hauschel	I	280	Cattle	6/01 to 6/25
8315	Doyal	I	80	Cattle	5/16 to 6/15
8316	West Basalt Mountain	C	2,090	Cattle	5/25 to 6/20
				Cattle	10/16 to 10/25
8317	Haff Ranch	I	280	Cattle	5/16 to 6/05
				Cattle	10/01 to 10/15
8318	Badlands	I	640	Cattle	6/01 to 6/30
8319	Petre	U	529		

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TABLE F-3. EXISTING LIVESTOCK GRAZING USE—Continued

Allotment Number	Allotment Name	Kind of Allotment ¹	Public Land Acreage	Kind of Livestock	Season of Use
8320.....	Sutey.....	I	730	Cattle	6/01 to 6/30
				Horses	6/01 to 9/30
8321.....	Strook Individual.....	I	280	Cattle	5/01 to 6/05
				Cattle	10/16 to 12/19
8322.....	Rodgers.....	I	100	Cattle	10/16 to 11/15
8323.....	Diamond Flats Common.....	C	1,920	Cattle	5/15 to 8/15
8324.....	Driveway.....	C	840	Cattle	7/01 to 8/31
8325.....	Motz.....	U	228		
8326.....	Motz.....	U	214		
8327.....	Frying Pan.....	I	950	Cattle	5/25 to 6/20
8328.....	Wheatley.....	I	2,150	Cattle	6/16 to 9/30
8329.....	Fender.....	I	920	Cattle	5/01 to 5/20
8330.....	Light Hill.....	U	1,507		
8331.....	Light.....	I	1,665	Horses	5/07 to 10/30
				Cattle	5/20 to 9/30
8332.....	Kent.....	U	700		
8333.....	Christensen.....	U	487		
8334.....	Crown Common.....	C	2,700	Cattle	5/16 to 6/25
8335.....	Crown.....	I	1,370	Cattle	5/16 to 6/28
8336.....	Vasten Homestead Common.....	C	770	Cattle	6/16 to 10/10
8337.....	Crown Individual.....	I	871	Cattle	5/15 to 6/14
8338.....	Driveway Common.....	C	240	Cattle	5/16 to 6/25
				Cattle	10/01 to 10/01
8339.....	Fender Individual.....	I	540	Cattle	5/21 to 6/26
8340.....	Cerise.....	I	720	Cattle	5/21 to 10/10
8341.....	Prince Creek.....	I	2,040	Cattle	5/16 to 6/28
8342.....	Crystal River.....	I	3,985	Cattle	6/01 to 6/15
				Cattle	11/01 to 11/30
8343.....	Thompson Creek.....	I	3,230	Cattle	5/20 to 6/15
				Cattle	10/01 to 11/30
8344.....	Mount Sopris.....	I	440	Cattle	5/16 to 9/30
8345.....	Prince.....	U	38		
8346.....	Thomas.....	I	1,020	Cattle	5/16 to 10/15
8347.....	Potato Bill.....	I	220	Cattle	8/16 to 10/15
8348.....	North Thompson Creek Common.....	C	3,415	Cattle	6/01 to 6/15
				Cattle	10/10 to 10/16
8349.....	Red Canyon.....	C	520	Cattle	6/17 to 6/30
				Cattle	10/10 to 10/25
8350.....	Little Woody Creek.....	I	480	Cattle	5/16 to 6/20
				Cattle	10/01 to 10/10
8351.....	Williams Hill.....	U	547		
8352.....	Stevenson.....	I	1,715	Cattle	5/01 to 6/10
				Cattle	10/15 to 11/14
8353.....	Smith.....	U	564		
8401.....	Besancon Creek.....	U	38		
8402.....	Cantly Homestead.....	I	500	Cattle	6/21 to 6/30
8411.....	Snowmass Creek.....	I	23	Cattle	6/01 to 9/30

Eagle-Vall Capability Unit

8501.....	Third Gulch.....	I	538	Cattle	5/01 to 9/30
8502.....	East Hardscrabble Common.....	C	7,614	Cattle	5/06 to 9/30
8503.....	Brush Creek.....	I	100	Cattle	6/01 to 6/15
8504.....	West Hardscrabble.....	C	14,642	Cattle	5/05 to 6/15
				Cattle	10/16 to 10/31
8505.....	Eagle River.....	I	80	Horses	12/01 to 3/31
8506.....	Cottonwood Creek Etc.....	I	9,107	Sheep	4/16 to 11/20
8507.....	Red Hill Common.....	C	11,936	Cattle	5/06 to 6/24
8508.....	Cottonwood Creek.....	I	1,030	Cattle	5/01 to 10/10
8707.....	Ute Creek.....	I	3,090	Sheep	5/11 to 6/25
				Sheep	10/01 to 11/20
8710.....	Walcott Isolated Tract.....	I	214	Cattle	6/01 to 9/30
8712.....	North Bellyache.....	I	2,460	Cattle	5/16 to 6/15
				Cattle	10/01 to 10/31
8716.....	Williams Individual.....	I	290	Cattle	5/16 to 6/15

APPENDIX F

TABLE F-3. EXISTING LIVESTOCK GRAZING USE—Continued

Allotment Number	Allotment Name	Kind of Allotment ¹	Public Land Acreage	Kind of Livestock	Season of Use
8718	Lake Creek	I	160	Sheep	6/01 to 6/30
8719	Horse Creek	I	320	Sheep	5/25 to 6/24
				Sheep	10/01 to 11/12
8720	Fanno	I	200	Cattle	8/23 to 8/31
8721	Salt Creek-Bellyache	I	4,260	Cattle	6/01 to 6/15
				Cattle	10/15 to 11/14
8722	Salt Creek-Forest	I	780	Cattle	6/16 to 10/15
8723	Falk	I	80	Cattle	5/15 to 5/31
8727	Squaw Creek	U	259		
8728	Red Canyon	U	265		
8734	Bellyache	I*	685	Cattle	5/10 to 7/09

Castle Peak Capability Unit

8601	East Castle	I*	9,307	Cattle	6/01 to 11/15
8604	Detweiler	I	20	Cattle	1/01 to 1/31
8605	River-Catamount	I	1,569	Cattle	5/01 to 6/15
8606	Fiskey	I		Cattle	5/16 to 6/30
8607	Wheelock Individual Large	I	11	Cattle	11/01 to 2/28
8608	Wheelock Individual Small	I	7	Cattle	9/18 to 4/03
8609	Castle Creek Individual	I	840	Cattle	5/01 to 10/15
8616	Deer Pen	I	7,670	Cattle	5/11 to 7/01
				Cattle	9/16 to 9/30
8617	Newcomer	I	100	Horses	5/15 to 6/14
8619	Catamount Common	C	6,601	Cattle	6/16 to 9/30
8620	West Castle Common	C	5,340	Cattle	6/16 to 9/30
8621	Castle	I	60	Cattle	7/01 to 6/30
8622	West Castle Peak	I	100	Cattle	9/16 to 10/15
8623	East Castle Peak	I	160	Cattle	6/01 to 10/31
8225	Bull Bulch Common	C	9,728	Cattle	5/01 to 8/31
8638	Elby Creek	I	1,680	Cattle	5/15 to 5/31
8639	Upper Cottonwood	I	1,120	Cattle	5/16 to 6/30
8641	Greenhorn	I	10,839	Cattle	5/16 to 6/30
8642	Trail Gulch	I*	13,577	Cattle	5/09 to 6/20
				Cattle	10/15 to 10/30
8643	Blowout	I*	18,791	Cattle	5/12 to 6/23
				Cattle	10/02 to 10/16
8701	Pinay Creek	I	240	Cattle	5/10 to 6/09
				Cattle	11/01 to 11/30
8702	Wolcott	I	6,050	Horses	3/18 to 6/21
				Sheep	11/10 to 4/30
				Sheep	5/01 to 7/24
				Sheep	9/15 to 12/19
8729	Pocket	U	1,655		
8730	Bocco Mountain	I*	4,040	Cattle	5/16 to 5/31
8731	Cabin Gulch	I*	3,331	Cattle	5/08 to 6/27
8732	Diamond J	I*	880	Cattle	11/15 to 5/15
8733	Dormantle	I*	120	Cattle	6/28 to 10/15
8735	Hells Hole	I*	645	Cattle	5/16 to 12/15

King Mountain Capability Unit

8506	Cottonwood Creek (Burnt Ridge)	I	1,950	Sheep	4/16 to 11/20
8602	L and H Individual	I	3,720	Cattle	5/01 to 11/30
8603	Tepee Creek	I	3,408	Cattle	5/19 to 10/15
8610	East Sunnyside	I	407	Cattle	6/01 to 6/13
8611	Sunnyside Individual	I	1,400	Cattle	5/10 to 5/31
8612	West Sunnyside	I	823	Cattle	5/25 to 6/14
				Cattle	10/16 to 10/17
8613	Sunnyside	I	702	Cattle	5/01 to 5/31
8614	Spring Creek	I	2,340	Horses	5/01 to 5/20
				Cattle	5/06 to 7/03
8615	River Common	C	3,260	Cattle	5/01 to 5/31
8618	Derby Ridge	I	340	Cattle	6/01 to 9/30
8626	Red Dirt	I	3,080	Cattle	5/10 to 5/31

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TABLE F-3. EXISTING LIVESTOCK GRAZING USE—Continued

Allotment Number	Allotment Name	Kind of Allotment	Public Land Acreage	Kind of Livestock	Season of Use
8627	Sugarloaf	I	200	Cattle	7/15 to 9/30
8628	Sheep Creek (Colorado Division of Wildlife)	U	6,870		
8629	Willow Creek	I	3,190	Cattle	5/16 to 7/16
8630	Irrigated Land-Trail Gulch	I	20	Cattle	7/01 to 7/31
8506	Cottonwood Creek (Burnt Ridge)	I	1,950	Sheep	4/16 to 11/20
8631	Horse Creek	I	2,600	Horses	4/21 to 5/31
8632	Upper Little Shee Creek	I	960	Cattle	6/01 to 9/30
8633	Upper Hack Creek	I	3,000	Cattle	6/01 to 9/30
8634	Three Springs	I	1,100	Cattle	6/01 to 6/15
8635	Mooney	I	120	Cattle	5/16 to 9/15
8636	McKeen Creek	I	360	Cattle	6/27 to 6/30
				Cattle	9/25 to 10/02
8637	South McKeen Creek	I	40	Cattle	7/01 to 7/30
8644	Monier Ridge	I	298	Cattle	6/01 to 9/30
8645	Upper and Lower Jack Spring	I	65	Cattle	5/16 to 10/15
8646	Monier Ridge Skiff	I	298	Cattle	5/16 to 9/30
8647	Onion Ridge	I	7,800	Cattle	5/16 to 6/10
				Cattle	10/16 to 10/31
8648	Upper Coffeepot	I	837	Sheep	7/01 to 7/07
				Sheep	9/19 to 11/14
				Cattle	7/01 to 10/30
8649	Lower Coffeepot	I		Cattle	5/16 to 6/30
					11/01 to 11/30
8652	McCoy	U	316		
8653	Albertson	I	1,646	Cattle	1/01 to 12/31
8654	Benton	I	1,462	Cattle	1/01 to 12/31
8655	Dude	I	131	Cattle	7/25 to 1/31
8656	Gates	I	160	Cattle	1/01 to 12/31
8657	Hastings	I	280	Cattle	5/10 to 2/28
8658	Holt	I	2,233	Cattle	6/29 to 2/28
8659	Horn	I	2,272	Cattle	
8661	L and H	I	4,349	Cattle	5/01 to 11/30
8662	Black Mountain	I	987	Cattle	6/01 to 2/28
8663	McSweeney	I	1,081	Cattle	4/01 to 2/28
8665	Strubi	I	203	Cattle	5/16 to 2/28
8666	Visintainer	I	4,105	Cattle	6/01 to 2/28
8667	Bambi	I	2,373	Cattle	4/01 to 2/28
8668	Copper Spur	I	1,375	Cattle	5/01 to 10/31
8695	Old 8660 and 8670	U	800		
8672	Luarik	I	2,467	Cattle	1/01 to 12/31

I—Individual, one permittee in allotment; C—common, two or more permittees in allotment; U—unalotted, no livestock preference in allotment.

*Existing allotment management plan.

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APPENDIX G

CONSIDERATIONS USED IN DETERMINING LAND TENURE ADJUSTMENTS

RETENTION OR MULTIPLE USE ZONE

DEFINITION

Tracts or combinations of tracts of public land or interests in land that are retained in public ownership and are managed under the principles of multiple-use and sustained yield.

CONSIDERATIONS

- a. Well-blocked tracts of public land.
- b. Tracts controlling access to other public lands (except for easements or patent reservations).
- c. Areas where community expansion is not expected.
- d. Manageable tracts (defined by such factors as access, resource values, compatibility with BLM mission).
- e. Areas where public demand for disposal is minimal.
- f. Areas valuable for resource programs and protection/management.
- g. State and local governments' land-use plans.
- h. Areas not in conflict with existing planned intensive development.

EXCEPTIONS

- a. Recreation and public purpose (R&PP) applications for patents.
- b. Resolution of unintentional trespass both occupancy and agricultural.
- c. Selection by the state of in-lieu lands.
- d. Critical needs for energy development, i.e., disposal of spent oil shale.
- e. Lands critical for community expansion.

- f. Mining claims to patent.

COOPERATIVE MANAGEMENT (WITHIN RETENTION ZONE)

DEFINITION

Tracts or combinations of tracts of public land or interests in lands which may or may not be interspersed with private, state, or other agency lands or interests in lands, where several agencies have varying responsibilities for management.

CONSIDERATIONS

- a. Special withdrawals and reserves, i.e., Naval Oil Shale Reserve.
- b. Broken land pattern with similar management goals among federal, state, or private owners.
- c. Public land needed to support or add to other agency or state needs, i.e., Colorado River corridor.

EXCEPTIONS

- a. Retention for full management responsibility by BLM or disposal could occur when cooperative management is no longer required.
- b. Disposal would occur where all parties involved would benefit.

METHODS FOR COOPERATIVE MANAGEMENT

- a. Cooperative agreements.
- b. Memoranda of understanding.
- c. Partial withdrawals.

APPENDIX G

- d. Scenic easements.

DISPOSAL ZONE

DEFINITION

Tracts or combinations of tracts of public land or interests in land that are suitable for conveyance out of federal ownership under existing laws and regulations.

CONSIDERATIONS

- a. Isolated and small land parcels.
- b. Difficult and expensive to manage (no access, cost benefit low) lands.
- c. Tracts not suitable for management by another federal department or agency.
- d. Tracts that would serve important public objectives that could not be achieved prudently and feasibly on land other than public land and which outweighed other public objectives that would be served by retaining in public ownership.

Community needs: urban, suburban, and residential,

Industrial and commercial,

Agricultural,

Recreation and other public purposes

- e. Long-term public benefits weighed against more immediate or local benefits.

- f. Tracts identified in state and local land-use plans.

- g. Lands identified by public proposals.

EXCEPTIONS

- a. Where fragile or unique resource values are known and the tract cannot be efficiently managed by another agency.
- b. Where disposal would adversely affect management of adjacent lands by other agencies, i.e., Forest Service, State.
- c. Where needs exist for R&PP leases, i.e., landfills, detention centers.
- d. Where access to other public lands would be cut off (easements or patent reservations might be used).

METHODS FOR DISPOSAL

- a. Sales.
- b. State selection.
- c. State and private exchange.
- d. Recreation and public purpose.
- e. Desert land entry.
- f. Indian allotments.
- g. Conveyance of federal minerals under private surface.
- h. Color-of-title.
- i. Carey Act.
- j. Forest Service exchange or boundary adjustment.

APPENDIX H

WATER RESOURCES

METHODOLOGY FOR DETERMINING SHEET EROSION AND SEDIMENT YIELD

Sheet erosion by water was estimated by use of the Musgrave equation. The equation was developed from measured erosion rates on plots with 10 percent slope, 72.6 foot length, and a rainfall of 1.375 inches. The equation is as follows:

$$E = FR(S/10)^{1.35}(L/72.6)^{0.35}(P/1.375)^{1.75}$$

Where:

E equals sheet erosion in tons per acre per year

F equals basic erosion rate of bare soil in tons/year. This was assumed to equal 50 for all manipulation areas and corresponds with a deep, medium textured, moderately permeable soil. This soil type corresponds well with the soil types which were originally selected as suitable for manipulation or burning.

R equals cover factor. This element of the equation is the factor which would vary the most with BLM Management proposals in the Resource Management Plan. Existing cover conditions were determined by selecting the Soil Conservation Service range site which is most commonly associated with a specific vegetation type in the resource area. The Soil Conservation Service range sites selected and the corresponding vegetation types are as follows:

Rolling loam—sagebrush

Brushy loam—mountain brush

Pinyon juniper—pinyon juniper

SVIM data were then used to derive an average percent cover for each range site. Changes in cover from mechanical manipulation and burning were based on the following assumptions.

1. Mechanical Manipulation. Includes churning, plowing, furrowing, brushbeating, and spraying. In the short-term would slightly increase bare ground and rock and would convert most of the disturbed vegetation into persistent and nonpersistent litter.
2. Burning. In the short-term, vegetation would be converted to $\frac{1}{2}$ bare ground and $\frac{1}{2}$ vegetation.

Persistent litter would be converted to $\frac{1}{2}$ bare ground and $\frac{1}{2}$ persistent litter and nonpersistent litter would be converted to bare ground.

3. Percent cover is the sum of the following: vegetation plus persistent litter plus $\frac{1}{2}$ nonpersistent litter plus $\frac{1}{2}$ rock.
4. S equals average slope of contribution area in percent. The assumptions used in the analysis were:
Mechanical manipulation areas—15% slope
Burning areas—20% slope
Water yield areas—25% slope
Productive forest <40% slope—25% slope
Productive forest >40% slope—50% slope
Woodlands <40% slope—25% slope
Woodlands >40% slope—50% slope
5. L equals length of largest contributing meander waterway in feet. This was assumed to be 150 feet.
6. P equals maximum 2-year frequency, 30 minute rainfall in inches. This figure was determined by interpolating from a 2-year 30-minute rainfall frequency map in BLM Manual 7317.

Sediment yields resulting from the erosion estimates derived from use of the Musgrave equation were then estimated by use of a sediment delivery ratio developed by the Soil Conservation Service in Oregon. The equation for the delivery ratio is:

$$SDR \text{ equals } 1 - (L / [50 + (4)(\%s)])$$

Where

L equals slope length of buffer strip to channel, this figure was assumed to be 75 feet as an average for the resource area.

S equals percent slope of the buffer strip. Percent slope was considered to be the same as the slopes used in the Musgrave equation.

The initial sediment yield ratios used in the analysis were taken from the sediment yield map for Colorado published by the Colorado Land Use Commission (1974).

Changes in sediment yield for major watersheds in the resource area are indicated in Tables H-1 through H-6.

TABLE H-1. CHANGE IN SEDIMENT YIELD FROM MECHANICAL TREATMENTS AND BURNING—CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE

Capability Unit—Watersheds	Existing Situation		Minimum Disturbance				Maximum Disturbance					
	Watershed Area (acres) ¹	Current Average Sediment Yield (tons/acre/year) ²	Vegetative Manipulation (tons/year) ³	Clear-cut Productive Forest (tons/year) ⁴	Clear-cut Woodlands (tons/year) ⁵	Total Sediment Yield (tons/acre/year) ⁶	Total Sediment Yield (tons/acre/year) ⁷	Burning (tons/year) ⁸	Selective Productive Forest (tons/year) ⁹	Woodlands (tons/year) ¹⁰	Total Sediment Yield (tons/year) ¹¹	Total Sediment Yield (tons/acre/year) ^{12,13}
Garfield												
Battlement Creek	4,672	0.59										
Cache Creek	1,344	0.87										
Divido Creek	62,528	0.83			43	43	<.01			76	76	<.01
Garfield Creek	25,024	0.56	569			57	<.01	7,653			765	.03
Parachute Creek	80,640	0.89	251			25	<.01	18,710			1,871	.023
Rifle Creek	47,488	0.96	324		86	32	<.01	4,837		152	636	.01
Elk Creek	27,072	0.90	375		43	38	<.01	6,091		76	685	.03
Canyon Creek	14,144	0.65						2,106			211	.01
Lower Colorado River	27,8131	1.85	1,345		43	178	<.01	21,514		76	2,227	<.01
Total	541,056	1.33	2,864		215	373	<.01	60,911		380	6,471	.01
Roaring Fork												
Fourmile Creek	5,440	0.97	4			4	<.01	252			194	.04
Thompson Creek	6,400	0.49	131			15	<.01	1,766			200	.03
Prince Creek	5,056	0.71										
Sopris Creek	12,032	0.89	35			16	<.01	955			203	.02
Cattle Creek	37,184	0.94	36		43	58	<.01	931		76	250	.01
Threemile Creek	8,320	0.66						265			190	.02
Roaring Fork	162,048	0.88	332			33	<.01	5,946			595	<.01
Total	236,480	0.86	538		43	126	<.01	10,115		76	1,632	<.01
Eagle-Vail												
Cottonwood Creek	13,774	0.99	30			14	<.01	1,033			199	.01
Gypsum Creek	16,064	1.40	202	107	43	170	.01	2,630	169	76	508	.03
Brush Creek	31,424	0.89	225	590		613	0.02	2,995	932		1,231	.04
Eagle River	40,576	1.38	117	69		84	<.01	1,881	109		297	<.01
Colorado River	12,480	0.85	30		43	57	<.01	415		76	269	.02
Total	114,304	1.15	604	766	86	938	<.01	8,954	1,210	152	2,504	.02
Castle Peak												
Alkali Creek	23,616	0.96	25	54		68	<.01	314	85		259	<.01
Big Alkali Creek	28,352	0.66	40	399		408	0.01	597	629		788	.03
Milk Creek	11,232	0.86		192		192	0.02		302		302	0.03
Eagle River	62,080	1.20	79	38		52	<.01	1,194	60		226	<.01
Colorado River	75,264	1.25	75	77	346	432	<.01	889	121	606	836	0.01
Total	200,544	1.09	219	760	346	1,152	<.01	2,994	1,197	606	2,391	0.01
King Mountain												
Deep Creek	8,896	0.65	97			14	<.01	1,353			171	.02
Sweetwater Creek	24,704	0.79	13			13	<.01	791			190	<.01

Red Dirt Creek.....	3,136	1.30							278			198	.06
Cabin Creek.....	33,216	0.84			43	43	<.01	440			76	272	<.01
Rock Creek.....	46,144	0.44	32	767		799	0.02	1,507	1,210			1,361	.03
Colorado River.....	62,272	1.27	159	368	130	514	<.01	6,362	581	227		1,444	.02
Total.....	178,368	0.88	301	767	173	1,015	<.01	10,731	1,210		303	3,055	.02
Resource Area Total.....	1,270,752	1.12	4,526	767	863	2,078	<.01	93,705	1,210	1,517	13,646		0.01

¹Watershed area within the resource area.

²Weighted average of sediment yield condition classes within each watershed. The average of the range within each condition class was used to derive the overall average.

³Total sediment yield resulting from all the mechanical manipulation proposed by range and wildlife within each watershed.

⁴Indicates sediment which would result from the maximum amount of timber which could be clearcut in a particular watershed in any one year on slopes less than 40 percent.

⁵Indicates sediment resulting from the percent of woodlands that would be clearcut harvested from a watershed each year on less than 40 percent slopes.

⁶Total sediment equals one-tenth of 40 acres of the sediment resulting from mechanical manipulation (whichever is greater) plus the productive forest and woodlands harvest.

⁷Derived by dividing column six by column 1.

⁸Total sediment yield which would result from the burning needed to meet range and wildlife objectives.

⁹Indicates sediment yield which would result from selective cutting the maximum amount of productive forest which could be harvested in a particular watershed in any one year on all slopes. The maximum is limited by the annual allowable cut.

¹⁰Indicates sediment yield which would result from selective cutting the percentage of woodlands which on the average would be harvested from each watershed each year.

¹¹Total sediment equals one-tenth the total sediment from burning or from burning 40 acres (whichever is greater) plus total sediment from productive forest and woodlands.

¹²Derived by dividing column 11 by column 1.

TABLE H-2. CHANGE IN SEDIMENT YIELD FROM MECHANICAL TREATMENT AND BURNING—RESOURCE PROTECTION ALTERNATIVE

Capability Unit— Watershed	Existing Situation			Minimum Disturbance								Change in Sediment Yield (tons/ acre/ year) ¹²		
	Watershed Area (Acres) ¹	Average Annual Sediment Yield (ton/ acre/ year) ²	Mechani- cal Manipulation (tons/ year) ³	Clearcut <40 Percent		Total Sediment Yield (tons/ year) ⁴	Change in Sediment Yield (tons/ acre/ year) ⁵	Burning (tons/ year) ⁶	Water Yield (tons/ year) ⁷	Selective Cut			Total Sediment Yield (tons/ year) ⁸	
				Productive Forest Land ⁹	Wood- lands ¹⁰					Produc- tive Forest Land ¹¹	Wood- lands ¹¹			
Garfield														
Battlement Creek.....	4,672	0.59		964	148	243	0.05		2,073	1,025		1,292	0.26	
Cache Creek.....	1,344	0.87	64			16	0.01	787				203	0.15	
Divide Creek.....	65,528	0.83		10,174	296	1,313	0.02		23,843	5,124	177	7,886	0.12	
Garfield Creek.....	25,024	0.56	1,052	4,004	296	801	0.03	25,936	3,843			6,722	0.27	
Parachute Creek.....	80,640	0.89	2,846	14,270	296	92	0.02	38,870	14,757			5,363	0.07	
Rifle Creek.....	47,488	0.96	562	8,800	296	92	0.03	41,399	4,082	5,124	532	10,203	0.21	
Elk Creek.....	27,072	0.90	324	5,116	296	31	0.02	7,392	60	3,572	177	4,548	0.17	
Canyon Creek.....	14,144	0.85		6,228	296	919	0.06	4,082	10,833	5,124		6,615	0.47	
Lower Colorado River	278,131	1.85	3,386	9,506	296	61	1,647	<0.01	61,387	7,602	5,124	354	12,377	0.04
Total.....	541,056	1.33	8,234	54,453	296	184	6,759	0.01	156,510	66,101	5,124	1,239	31,337	0.06
Roaring Fork														
Fournille Creek.....	5,440	0.97	2		148	150	0.03	1,592		1,065		1,259	0.23	
Thompson Creek.....	6,400						<0.01							
Prince Creek.....	5,056					75	0.01	7,469		240		987	0.20	
Sopris Creek.....	12,032	0.89	192		89	108	<0.01	5,830		498		1,081	0.09	
Cattle Creek.....	37,184	0.94	367		61	98	<0.01	9,672			354	1,321	0.04	
Threemile Creek.....	8,320	0.66			296	296	0.04	1,783		2,370		2,566	0.31	

TABLE H-2. CHANGE IN SEDIMENT YIELD FROM MECHANICAL TREATMENT AND BURNING—RESOURCE PROTECTION ALTERNATIVE—
Continued

Capability Unit— Watershed	Existing Situation			Minimum Disturbance										
	Watershed Area (Acres) ¹	Average Annual Sediment Yield (ton/ acre/ year) ²	Mechani- cal Manipula- tion (tons/ year) ³	Water Yield (tons/ year) ⁴	Clearcut <40 Percent		Total Sedi- ment Yield (tons/ year) ⁷	Change in Sedi- ment Yield (tons/ acre/ year) ⁸	Burning (tons/ year) ⁹	Water Yield (tons/ year) ¹⁰	Selective Cut		Total Sedi- ment Yield (tons/ year) ¹³	Change in Sedi- ment Yield (tons/ acre/ year) ¹⁴
					Pro- ductive Forest Land ⁵	Wood- lands ⁶					Produc- tive Forest Land ¹¹	Wood- lands ¹²		
Roaring Fork.....	162,048	0.88	2,025		89	31	322	<0.01	82,996		996	177	9,473	0.06
Total.....	236,480	0.86	2,658		296	92	664	<0.01	109,342		5,124	531	16,642	0.07
Eagle-Vail					89									
Cottonwood Creek.....	13,774	0.99	30		298		310	0.02	1,033		3,843		4,042	0.03
Gypsum Creek.....	16,064	1.40	790		296		324	0.01	6,907		5,124		2,770	0.17
Brush Creek.....	31,424	0.89	281		296		389	<0.01	7,035		5,124	177	5,815	0.18
Eagle River.....	40,576	1.38	624		296		31	<0.01	415				6,005	0.15
Colorado River.....	12,480	0.85	30			31	14						109	<0.01
Total.....	11,304	1.15	1,755		296	31	524	<0.01	27,721		5,124	177	8,237	0.07
Castle Peak					296		313	0.01	1,196		4,612		4,732	0.20
Alkali Creek.....	23,616	0.96	168		296		131	0.01	799		5,124		5,267	0.19
Big Alkali Creek.....	28,352	0.86	41		296		118	0.01	298		1,281		1,456	0.13
Milk Creek.....	11,232	0.86	22		296		359	<0.01	9,377		5,124	1,240	938	0.02
Eagle River.....	62,080	1.20	630		296	215	774	0.01	10,252				7,390	0.10
Colorado River.....	75,264	1.25	2,620		296	215	774	0.01	10,252		5,124	1,240	8,766	0.04
Total.....	200,544	1.09	3,487		296	215	876	<0.01	21,922		5,124	1,240	8,766	0.04
King Mountain					89		104	0.01	5,309		512		1,043	0.12
Deep Creek.....	8,896	0.65	152		296		310	0.01	2,797		3,074		3,353	0.14
Sweetwater Creek.....	24,704	0.79	71		59		14	<0.01	619				200	0.06
Red Dirt Creek.....	3,136	1.30	14		296		73	<0.01	5,064		512		1,018	0.03
Cabin Creek.....	33,216	0.84	131		296		310	0.01	2,267		5,124	354	5,350	0.12
Rock Creek.....	46,144	0.44	32		296	61	423	0.01	27,829		5,124		8,261	0.13
Colorado River.....	62,272	1.27	663		296	61	423	0.01	27,829		5,124	354	8,261	0.13
Total.....	178,368	0.88	1,063		296	61	494	<0.01	44,085		5,124	354	10,003	0.06
Resource Area					296	583	8,133	<0.01	359,580	66,101	5,124	3,541	54,489	0.04
Total.....	1,270,752	1.12	17,197	54,453	296	583	8,133	<0.01	359,580	66,101	5,124	3,541	54,489	0.04

¹Watershed area within the resource area.

²Weighted average of sediment yield condition classes within each watershed. The average of the range within each condition class was used to derive the overall average.

³Total sediment yield resulting from all the mechanical manipulation proposed by range and wildlife within each watershed.

⁴Total sediment yield resulting from mechanical manipulation of aspen, conifer, mountain brush and sagebrush proposed for water yield in each watershed.

⁵Indicates sediment which would result from the maximum amount of timber which could be clearcut in a particular watershed in any one year on slopes less than 40 percent.

⁶Indicates sediment resulting from the percent of woodlands that would be clearcut harvested from a watershed each year on less than 40 percent slopes.

⁷Total sediment equals one-tenth or 40 acres of the sediment resulting from mechanical manipulation (whichever is greater) plus one-tenth of the water yield manipulation plus the productive forest and woodlands harvest.

⁸Derived by dividing column six by column 1.

⁹Total sediment yield which would result from the burning needed to meet range and wildlife objectives.

*Total sediment yield which would result from cutting aspen and conifer and burning oakbrush and sagebrush.

**Indicates sediment yield which would result from selective cutting the maximum amount of productive forest which could be harvested in a particular watershed in any one year on all slopes. The maximum is limited by the annual allowable cut.

***Indicates sediment yield which would result from selective cutting the percentage of woodlands which on the average would be harvested from each watershed each year.

†††Total sediment equals one-tenth the total sediment from burning or from burning 40 acres (whichever is greater) plus one-tenth the sediment from water yield plus total sediment from productive forest and woodlands.

††††Derived by dividing column 11 by column 1.

TABLE H-3. CHANGE IN SEDIMENT YIELD FROM MECHANICAL TREATMENTS AND BURNING—ECONOMIC DEVELOPMENT ALTERNATIVE

Capability Unit— Watershed	Existing Situation		Minimum Disturbance											
	Watershed Area (Acres) ¹	Average Annual Sediment Yield (ton/ acre/ year) ²	Mechanical Manipulation (tons/ year) ³	Water Yield (tons/ year) ⁴	Clearcut <40 Percent		Total Sediment Yield (tons/ year) ⁵	Change in Sediment Yield (tons/ acre/ year) ⁶	Burning (tons/ year) ⁷	Water Yield (tons/ year) ⁸	Selective Cut		Total Sediment Yield (tons/ year) ⁹	Change in Sediment Yield (tons/ acre/ year) ¹⁰
					Pro- ductive Forest Land ¹¹	Wood- lands ¹²					Pro- ductive Forest Land ¹¹	Wood- lands ¹²		
Garfield														
Battlement Creek.....	4,672	0.59		869			87	0.02		1,996			200	0.04
Cache Creek.....	1,344	0.87	64	14			84	0.06	787	14			217	0.16
Divide Creek.....	62,528	0.83		10,780	744	43	1,865	0.03		24,850		72	10,431	0.17
Garfield Creek.....	25,024	0.56	1,052	4,004	744		1,292	0.05	25,936	3,067	7,087		9,988	0.40
Parachute Creek.....	80,640	0.89	2,846	14,270	744		2,456	0.03	38,870	14,757	7,874		13,237	0.16
Rifle Creek.....	47,488	0.96	562	9,144	744	86	1,800	0.04	44,059	4,417	7,874	144	12,866	0.27
Elk Creek.....	27,072	0.90	324	516		43	126	<0.01	7,886	60	5,392	72	6,259	0.23
Canyon Creek.....	14,144	0.65		7,037	744		1,448	0.10	2,082	13,109	7,874		9,393	0.66
Lower Colorado River.....	278,131	1.85	3,630	9,786	744	43	2,129	<0.01	64,241	6,970	7,874	72	15,067	0.05
Total.....	540,993	1.33	8,478	56,420	744	215	7,567	0.01	183,861	69,240	7,874	360	33,683	0.06
Roaring Fork Fourmile Creek.....	5,440	0.97	24	3,321	744		1,078	0.20	1,592	5,178	3,349		4,061	0.75
Thompson Creek.....	6,400	0.49												
Prince Creek.....	5,056	0.71	72	915	112		252	0.05	7,469	120	5,512		6,271	1.24
Sopris Creek.....	12,032	0.89	192	883	149		256	0.02	5,830	516	519		1,154	0.10
Cattle Creek.....	37,184	0.94	189	2,099		43	271	<0.01	3,861	1,958		72	654	0.02
Threemile Creek.....	8,320	0.66		5,126	744		1,257	0.15	1,757	5,375	6,397		7,110	0.85
Roaring Fork.....	162,048	0.88	1,799	5,287	744	43	1,496	<0.01	39,469	3,415	7,874	72	12,235	0.07
Total.....	236,480	0.86	2,276	17,631	744	86	2,861	0.01	59,778	16,562	7,874	144	15,708	0.07
Eagle-Yaill Cottonwood Creek.....	13,774	0.99	30	5,336	744		1,322	0.10	1,033	10,295	5,593		6,821	0.50
Gypsum Creek.....	16,064	1.40	597	1,287	372	43	604	0.04	12,331	1,230	1,575	72	3,003	0.19
Brush Creek.....	31,424	0.89	281	9,517	744		1,724	0.05	6,932	9,517	7,874		9,519	0.30
Eagle River.....	40,576	1.38	684	4,894	744	133	1,439	0.04	11,636	4,949	7,874	216	9,749	0.24
Colorado River.....	12,480	0.85	30				15	<0.01	415				193	0.02
Total.....	114,304	1.15	1,622	21,034	744	176	3,244	0.03	32,347	25,991	7,874	288	14,243	0.12
Castle Peak Alkali Creek.....	23,616	0.96	168	5,406	744		1,302	0.06	1,196	7,503	5,392		6,262	0.26
Big Alkali Creek.....	28,352	0.66	41	19,983	744		2,771	0.10	799	20,627	7,874		10,811	0.36

TABLE H-3. CHANGE IN SEDIMENT YIELD FROM MECHANICAL TREATMENTS AND BURNING—ECONOMIC DEVELOPMENT ALTERNATIVE—
Continued

Capability Unit— Watershed	Existing Situation		Minimum Disturbance											
	Watershed Area (Acres) ¹	Average Annual Sediment Yield (tons/ acre/ year) ²	Mechanical Manipulation (tons/ year) ³	Water Yield (tons/ year) ⁴	Clearcut < 40 Percent		Total Sediment Yield (tons/ year) ⁷	Change in Sediment Yield (tons/ acre/ year) ⁸	Burning (tons/ year) ⁹	Water Yield (tons/ year) ¹⁰	Selective Cut		Total Sediment Yield (tons/ year) ¹³	Change in Sediment Yield (tons/ acre/ year) ¹⁴
					Pro- ductive Forest Land ⁵	Wood- lands ⁶					Pro- ductive Forest Land ¹¹	Wood- lands ¹²		
Milk Creek.....	11,232	0.86	22	13,961	744	265	2,181	0.19	298	17,181	7,874	432	9,767	0.87
Eagle River.....	62,080	1.20	630	9,499	744	265	63	<0.01	9,258	394	7,874	432	1,320	0.02
Colorado River.....	75,264	1.25	627	9,499	744	265	2,022	0.03	9,731	9,499	7,874	432	10,229	0.14
Total.....	196,928	1.09	1,488	48,849	744	265	6,107	0.03	21,282	54,81	7,874	432	16,855	0.08
King Mountain														
Deep Creek.....	8,896	0.65	152	465	149	43	210	0.02	5,309	428	502	72	1,076	0.12
Sweetwater Creek....	24,704	0.79	71	5,413	744	43	1,372	0.06	2,797	6,886	7,536	72	8,577	0.35
Red Dirt Creek.....	3,136	1.30	14				14	<0.01	819				200	0.06
Cabin Creek.....	33,216	0.84	131	1,083	223	43	418	0.01	3,653	1,083	1,260	72	1,806	0.05
Rock Creek.....	46,144	0.44	32	11,251	744	43	2,645	0.06	1,485	11,251	7,874	72	9,148	0.20
Colorado River.....	62,272	1.27	537	14,567	744	43	2,297	0.04	18,554	14,252	7,874	72	11,626	0.19
Total.....	178,368	0.88	937	32,779	744	129	5,096	0.03	32,617	33,900	7,874	216	15,261	0.08
Resource Area														
Total.....	1,270,752	1.12	14,801	176,713	744	871	21,899	0.02	329,885	200,503	7,874	1,440	64,254	0.05

¹Watershed area within the resource area

²Weighted average of sediment yield condition classes within each watershed. The average of the range within each condition class was used to derive the overall average.

³Total sediment yield resulting from all the mechanical manipulation proposed by range and wildlife within each watershed.

⁴Total sediment yield resulting from mechanical manipulation of aspen, conifer, mountain brush and sagebrush proposed for water yield in each watershed.

⁵Indicates sediment which would result from the maximum amount of timber which could be clearcut in a particular watershed in any one year on slopes less than 40 percent.

⁶Indicates sediment resulting from the percent of woodlands that would be clearcut harvested from a watershed each year on less than 40 percent slopes

⁷Total sediment equals one-tenth or 40 acres of the sediment resulting from mechanical manipulation (whichever is greater) plus one-tenth of the water yield manipulation plus the productive forest and woodlands harvest.

⁸Derived by dividing column six by column 1.

⁹Total sediment yield which would result from the burning needed to meet range and wildlife objectives.

¹⁰Total sediment yield which would result from cutting aspen and conifer and burning oakbrush and sagebrush.

¹¹Indicates sediment yield which would result from selective cutting the maximum amount of productive forest which could be harvested in a particular watershed in any one year on all slopes. The maximum is limited by the annual allowable cut.

¹²Indicates sediment yield which would result from selective cutting the percentage of woodlands which on the average would be harvested from each watershed each year.

¹³Total sediment equals one-tenth the total sediment from burning or from burning 40 acres (whichever is greater) plus one-tenth the sediment from water yield plus total sediment from productive forest and woodlands.

¹⁴Derived by dividing column 11 by column 1.

TABLE H-4. CHANGE IN SEDIMENT YIELD FROM MECHANICAL TREATMENT AND BURNING—PREFERRED ALTERNATIVE

Capability Unit— Watershed	Existing Situation		Minimum Disturbance										Change in Sedi- ment Yield (tons/ acre/ year) ¹⁴	
	Watershed Area (Acres) ¹	Aver- age Annual Sedi- ment Yield (ton/ acre/ year) ²	Me- chanical Manipu- lation (tons/ year) ³	Water Yield (tons/ year) ⁴	Clearcut <40 Percent		Total Sedi- ment Yield (tons/ year) ⁷	Change in Sedi- ment Yield (tons/ acre/ year) ⁸	Burning (tons/ year) ⁹	Water Yield (tons/ year) ¹⁰	Selective Cut			Total Sedi- ment Yield (tons/ year) ¹³
					Pro- ductive Forest Land ⁵	Wood- lands ⁶					Produc- tive Forest Land ¹¹	Wood- lands ¹²		
Garfield														
Battlement Creek	4,672	0.59												
Cache Creek	1,344	0.87	64				16	0.01	787				203	0.15
Divide Creek	62,528	0.83		2,284		41	269	<0.01		2,284		72	300	<0.01
Garfield Creek	25,024	0.56	437	556			99	<0.01	12,980	556			1,354	0.05
Parachute Creek	80,640	0.89	1,354	13,490	767		2,251	0.03	18,537	13,490	1,210		4,413	0.05
Rifle Creek	47,488	0.96	562	815		82	220	<0.01	36,851	815			3,911	0.08
Elk Creek	27,072	0.90	334	60		41	80	<0.01	6,259	60		72	704	0.03
Canyon Creek	14,144	0.65		2,102			210	0.01	3,023	2,102			512	0.04
Lower Colorado River	278,131	1.85	1,862	3,958	767	41	603	<0.01	32,023	3,958		72	3,670	0.01
Total	541,056	1.33	4,413	23,265	296	205	3,748	<0.01	110,460	23,265	1,210	360	15,067	0.03
Roaring Fork														
Fourmile Creek	5,440 D0.97	17	238			41	<0.01	1,385	238			218	0.04	
Thompson Creek	6,400	0.49												
Prince Creek	5,056	0.71	72				16	<0.01	1,480				172	0.03
Sopris Creek	12,032	0.89	101	74			23	<0.01	1,862	74			210	0.02
Cattle Creek	37,184	0.94	332	160		41	90	<0.01	7,577	160		72	846	0.02
Threemile Creek	8,320	0.66		764			76	<0.01	848	764			266	0.03
Roaring Fork	162,048	0.88	1,370	46			142	<0.01	25,953	46			2,600	0.02
Total	236,480	0.86	1,892	1,282		41	388	<0.01	39,105	1,282		72	4,312	0.02
Eagle-Vail														
Cottonwood Creek	13,774	0.99		682			68	<0.01	618	682			271	0.02
Gypsum Creek	16,064	1.40	601	181		41	226	0.01	9,906	181		72	1,250	0.08
Brush Creek	31,424	0.89	196	2,030	590		813	0.03	5,258	2,030	932		1,661	0.05
Eagle River	40,576	1.38	360	397	69		145	<0.01	6,869	383	109		834	0.02
Colorado River	12,480	0.85				41	41	<0.01				72	72	<0.01
Total	114,304	1.15	1,194	3,290	766	82	1,334	0.01	22,651	3,276	1,210	144	4,088	0.04
Castle Peak														
Alkali Creek	23,616	0.96	157	702	54		140	<0.01	944	702	85		325	0.01
Big Alkali Creek	28,352	0.66	28	1,896	399		598	0.02	416	1,896	629		958	0.03
Milk Creek	11,232	0.86	22	920	192		297	0.03	298	920	302		569	0.05
Eagle River	62,080	1.20	584		38		96	<0.01	6,991	60		60	759	0.01
Colorado River	75,264	1.25	405		77	328	445	<0.01	6,983		121		1,395	0.02
Total	200,544	1.09	1,196	3,518	760	328	1,576		15,632	3,518	1,197	576	4,006	0.02
King Mountain														
Deep Creek	8,896 D0.65	152				15	<0.01	3,128				313	0.04	
Sweetwater Creek	24,704	0.79					14	<0.01	2,216				222	<0.01
Red Dirt Creek	3,136	1.30	77				14	<0.01	788				199	0.06

WATER RESOURCES

TABLE H-4. CHANGE IN SEDIMENT YIELD FROM MECHANICAL TREATMENT AND BURNING—PREFERRED ALTERNATIVE—Continued

Capability Unit— Watershed	Existing Situation			Minimum Disturbance										
	Watershed Area (Acres) ¹	Average Annual Sediment Yield (tons/acre/year) ²	Mechanical Manipulation (tons/year) ³	Water Yield (tons/year) ⁴	Clearcut <40 Percent		Total Sediment Yield (tons/year) ⁷	Change in Sediment Yield (tons/acre/year) ⁸	Burning (tons/year) ⁹	Water Yield (tons/year) ¹⁰	Selective Cut		Total Sediment Yield (tons/year) ¹³	Change in Sediment Yield (tons/acre/year) ¹⁴
					Pro-ductive Forest Land ⁵	Wood-lands ⁶					Pro-ductive Forest Land ¹¹	Wood-lands ¹²		
Cabin Creek	33,216	0.84	139			41	55	<0.01	3,653			72	437	0.01
Rock Creek	46,144	0.44	32	19	767		800	0.02	2,039	19	1,210		1,416	0.03
Colorado River	62,272	1.27	647	334	368	123	589	<0.01	24,839	334	581	216	3,314	0.05
Total	178,368	0.88	1,061	353	767	164	1,119	<0.01	36,663	353	1,210	288	5,320	0.03
Resource Area Total	1,270,752 ¹	1.12	9,756	31,708	767	820	5,872	<0.01	4,511	31,694	1,210	1,440	29,176	0.02

¹Watershed area within the resource area

²Weighted average of sediment yield condition classes within each watershed. The average of the range within each condition class was used to derive the overall average.

³Total sediment yield resulting from all the mechanical manipulation proposed by range and wildlife within each watershed.

⁴Total sediment yield resulting from mechanical manipulation of aspen, conifer, mountain brush and sagebrush proposed for water yield in each watershed.

⁵Indicates sediment which would result from the maximum amount of timber which could be clearcut in a particular watershed in any one year on slopes less than 40 percent.

⁶Indicates sediment resulting from the percent of woodlands that would be clearcut harvested from a watershed each year on less than 40 percent slopes

⁷Total sediment equals one-tenth or 40 acres of the sediment resulting from mechanical manipulation (whichever is greater) plus one-tenth of the water yield manipulation plus the productive forest and woodlands harvest.

⁸Derived by dividing column six by column 1.

⁹Total sediment yield which would result from the burning needed to meet range and wildlife objectives.

¹⁰Total sediment yield which would result from cutting aspen and conifer and burning oakbrush and sagebrush.

¹¹Indicates sediment yield which would result from selective cutting the maximum amount of productive forest which could be harvested in a particular watershed in any one year on all slopes. The maximum is limited by the annual allowable cut.

¹²Indicates sediment yield which would result from selective cutting the percentage of woodlands which on the average would be harvested from each watershed each year.

¹³Total sediment equals one-tenth the total sediment from burning or from burning 40 acres (whichever is greater) plus one-tenth the sediment from water yield plus total sediment from productive forest and woodlands.

¹⁴Derived by dividing column 11 by column 1.

TABLE H-5. LONG TERM DECREASE IN SEDIMENT YIELD FROM RANGE AND WILDLIFE MANIPULATIONS

Capability Unit— Watershed	Resource Protection Decrease in Sediment Yield				Economic Development Decrease in Sediment Yield				Continue Current Management Decrease in Sediment Yield				Preferred Alternative Decrease in Sediment Yield			
	Vegetation Manipulation		Burning		Vegetation Manipulation		Burning		Vegetation Manipulation		Burning		Vegetation Manipulation		Burning	
	Tons/Year	Tons/Acres/Year	Tons/Year	Tons/Acres/Year	Tons/Year	Tons/Acres/Year	Tons/Year	Tons/Acres/Year	Tons/Year	Tons/Acres/Year	Tons/Year	Tons/Acres/Year	Tons/Year	Tons/Acres/Year	Tons/Year	Tons/Acres/Year
Garfield Capability Unit																
Battlement Creek																
Cache Creek	46	0.03	39	0.03	46	0.03	39	0.03					46	0.03	39	0.03

Divide Creek.....																	
Garfield Creek.....	596	0.02	1,081	0.04	598	0.02	1,081	0.04	191	<0.01	243	0.01	229	<0.01	519	0.02	
Parachute Creek.....	1,625	0.02	813	0.01	1,625	0.02	3	0.01	323	<0.01	162	<0.01	773	<0.01	396	<0.01	
Rifle Creek.....	500	0.01	1,795	0.04	500	0.01	1,781	0.04	295	<0.01	9	0.02	500	0.01	1,491	0.03	
Elk Creek.....	186	<0.1	317	0.01	186	<0.01	342	0.01	186	<0.01	204	<0.01	192	<0.01	262	<0.01	
Canyon Creek.....			166	0.01			85	<0.01			86	<0.01			123	<0.04	
Lower Colorado																	
River.....	1,899	<0.01	2,565	<0.01	2,022	<0.01	2,565	<0.01	765	<0.01	901	<0.01	961	<0.01	1,368	<0.01	
Roaring Fork Capability Unit																	
Fourmile Creek.....	2	<0.1	66	0.01	19	<0.01	66	0.01	4	<0.01	10	<0.01	14	<0.01	57	0.01	
Thompson Creek.....	120	0.02	415	0.06	120	0.02	255	0.04	71	0.01	71	0.01	70	0.01	70	0.01	
Prince Creek.....	46	0.01	348	0.07	46	0.01	348	0.07					46	0.01	69	0.01	
Sopris Creek.....	146	0.01	288	0.02	146	0.01	288	0.02	26	<0.01	47	<0.01	76	<0.01	92	<0.01	
Cattle Creek.....	247	<0.01	476	0.01	122	<0.01	158	<0.01	24	<0.01	43	<0.01	233	<0.01	374	0.01	
Threemile Creek.....			73	<0.01			72	<0.01			11	<0.01			36	<0.01	
Roaring Fork.....	938	<0.01	1,601	0.01	857	<0.01	1,425	<0.01	175	<0.01	247	<0.01	686	<0.01	1,059	<0.01	
Eagle-Vail Capability Unit																	
Cottonwood Creek.....	17	<0.01	42	<0.01	17	<0.01	42	<0.01	17	<0.01	42	<0.01			24	<0.01	
Gypsum Creek.....	541	0.03	522	0.03	407	0.02	522	0.03	140	<0.01	112	<0.01	416	0.03	423	0.03	
Brush Creek.....	157	<0.01	314	0.01	157	<0.01	315	0.01	127	<0.01	136	<0.01	112	<0.01	248	<0.01	
Eagle River.....	466	0.01	550	0.01	461	0.01	492	0.01	80	<0.01	80	<0.01	272	<0.01	293	<0.01	
Colorado River.....	17	<0.01	17	<0.01	17	<0.01	17	<0.01	17	<0.01	17	<0.01					
Castle Peak Capability Unit																	
Alkali Creek.....	93	<0.01	47	<0.01	93	<0.01	28	<0.01	14	<0.01	14	<0.01	91	<0.01	22	>0.01	
Big Alkali Creek.....	35	<0.01	22														
			D<0.01	35	<0.01	22	<0.01	34	<0.01	17	<0.01	24	<0.01	12	<0.01	7	>0.01
Milk Creek.....	14	<0.01	7	<0.01	14	<0.01	7	<0.01					14	<0.01			
Eagle River.....	360	<0.01	8	<0.01	360	<0.01	225	<0.01	43	<0.01	43	<0.01	334	<0.01	171	<0.01	
Colorado River.....	201	<0.01	256	<0.01	201	<0.01	564	<0.01	69	<0.01	69	<0.01	125	<0.01	157	<0.01	
King Mountain Capability Unit																	
Deep Creek.....	86	0.01	126	0.01	86	0.01	126	0.01	55	<0.01	32	<0.01	86	0.01	75	<0.01	
Sweetwater Creek.....	41	<0.01	59	<0.01	41	<0.01	59	<0.01	8	<0.01	17	<0.01	44	<0.01	46	<0.01	
Red Dirt Creek.....	8	<0.01	33	0.01	8	<0.01	33	0.01			11	<0.01	8	<0.01	32	0.01	
Cabin Creek.....	75	<0.01	104	<0.01	75	<0.01	75	<0.01			9	<0.01	79	<0.01	74	<0.01	
Rock Creek.....	18	<0.01	48	<0.01	18	<0.01	31	<0.01	18	<0.01	32	<0.01	18	<0.01	43	<0.01	
Colorado River.....	580	0.01	465	<0.01	502	<0.01	401	<0.01	137	<0.01	137	<0.01	578	<0.01	527	<0.01	
Resource Area Totals	9,060		12,883		6,017		8,089		8,779		12,277		2,819		3,552		

WATER RESOURCES

APPENDIX H

Table H-6. CHANGE IN SEDIMENT YIELD FROM FOREST LAND MANAGEMENT

Alternative	Selection Cutting				Clearcut					Long Term Decrease in Sediment Yield	
	Annual Harvest	Change in Erosion Rate (tons/acre/year)	Change in Sediment Yield (tons/acre/year)	Acres ²	Total Sediment Yield (tons/year)	Change in Erosion Rate (tons/acre/year)	Change in Sediment Yield	Acres ¹	Total Sediment Yield (tons/year)	Selective Cut Sediment Yield (tons/year)	Clear-cut Sediment Yield (tons/year)
Continue Current Management											
Productive Forest.....	1.8 MMBF..	3.4	1.80	672	1,210	5.7	2.85	269	767		
Woodlands.....	3,720 cords.	4.5	2.25	674	1,516	6.4	3.20	270	864	370	148
Total				1,346	2,726				1,631		
Resource Protection Alternative											
Option I											
Productive Forest.....	0.7 MMBF..	3.4	1.80	261	470	5.7	2.85	104	296		
Woodlands.....	2,650 cords.	4.5	2.25	480	1,080	6.4	3.20	192	614	264	106
Total				741	1,550				296	910	
Option II											
Productive Forest*											
<40 Percent Slope.....	2.48 MMBF.	3.4	1.80	925	1,665	5.7	2.85	370	1,054		
>40 Percent Slope.....	1.52 MMBF.	8.7	6.1	567	3,459	14.4	10.1	227	2,293		
Total					5,124						
Woodlands											
<40 Percent Slope.....	2,650 cords.	4.5	2.25	480	1,080	6.4	3.20	192	614	264	106
>40 Percent Slope.....	1,640 cords.	11.6	8.1	304	2,462	11.4	11.5	122	1,403	617	248
Total				2,276	8,666			911	5,364	881	354
Economic Development Alternative											
Option I											
Productive Forest.....	1.75 MMBF.	3.4	1.80	653	1,175	5.7	2.85	261	744		
Woodlands.....	3,695 cords.	4.5	2.25	669	1,505	6.4	3.2	268	858	368	148
Total				1,322	2,680			529	1,602		
Option II											
Productive Forest*											
<40 Percent Slope.....	4.03 MMBF.	3.4	1.80	1,504	2,707	5.7	2.85	601	1,713		
>40 Percent Slope.....	2.27 MMBF.	8.70	6.10	847	5,167	14.4	10.10	339	3,424		
Total				2,351							
Woodlands											
<40 percent Slope.....	3,695 cords.	4.5	2.25	669	1,505	6.4	3.2	268	858	368	148
>40 Percent Slope.....	4,255 cords.	11.6	8.10	771	6,245	16.4	11.5	308	3,542	1,565	625
Totals				3,791	15,624			1,516	9,537	1,933	773
Preferred Alternative											
Productive Forest.....	1.8 MMBF..	3.4	1.80	672	1,210	5.7	2.85	269	767		
Woodlands.....	3,535 cords.	4.5	2.25	640	1,440	6.4	3.2	256	819	352	141
Totals				1,312	2,650			525	1,586		

¹Average volume of timber per acre is 6,700 board feet. Average number of cords per acre is 13.8.

²Selection cutting results in a removal of 40 percent of the trees in a stand of productive forest and of fuelwood in woodlands.

³38 percent of the manageable forest base falls on slopes greater than 40 percent.

⁴36 percent of the manageable forest base falls on slopes greater than 40 percent.

APPENDIX I

CHARACTERISTICS OF GROUND WATER SYSTEMS IN THE GLENWOOD SPRINGS RESOURCE AREA

Geologic Unit	Thickness (feet)	Physical Character	Hydrologic Character	Areas of Outcrop
Valley Fill Deposits.....	20-40	Clay, sand, gravel, boulder and glacial debris	Well yields up to 1,000 gpm; hydrologically connected to surface water	Along primary stream and river bottoms
Colluvial Deposits.....	10-100	Unconsolidated debris of sand, gravel and boulders	Well yields generally less than 20 gpm	Along primary stream and river bottoms
Green River Formation (Parachute Creek Member).	500-1,800	Beds of dolomitic marlstone and shale containing their pyroclastic beds	Commonly yields 200-400 gpm; water quality from middle or lower portions is saline	Naval Oil Shale Reserve, north side of South Mamm Peak
Uinta Formation.....	0-1,250	Interlocking beds of sandstone marlstone, containing lenses of pyroclastics and conglomerate	Yields 100-300 gpm; salinity averages about 950 mg/l	Piceance Basin
Wasatch Formation.....		Similar to Green River and Uinta Formations	Similar to Green River and Uinta Formations	Western portion of resource area
Basalt Formation.....	up to 100	Alevine basalts that are commonly jointed or fractured	Well yields up to 100 gpm in fractured areas; good water quality but prone to contamination from leach falls	Upper Cattle Creek drainage, Yarmony Cottonwood Peak area, portions of Piney River Basin
Dakota Formation.....	up to 300	Fine to medium-well sorted and well cemented sandstones with interbedded shales and siltstones	Well yields less than 50 gpm; salinity ranges from 500-3,000 mg/l; most wells are located close to recharge areas	Eastern slopes of the Grand Hogback Burns region
Leadville Formation.....	50-200	Massive dense and relatively impermeable limestone or dolomite which is coarsely oolitic	Water occurs in fractures and solution openings; yield reported up several thousand gpm but not widely tapped; may be saline	Glenwood Canyon, Deep Creek, Sweetwater Creek and Red Dirt Creek
Maroon Formation.....	up to 12,000	Red Calcareous sandstone and shale with interbedded siltstone, sandstone and arkosic conglomerates	Well yields 5-25 gpm; dissolved solids range from 194 to 1,600 mg/l	Red Table Mountain, east of Grand Hogback, Aspen area, west of State Bridge
Weber Formation.....	up to 400	Fine-to medium-grained, poorly sorted sandstone with interbedded siltstone and shale	Well yields 5-25 gpm; dissolved solids range from 194 to 1,600 mg/l	Red Table Mountain, east of Grand Hogback, Aspen area, west of State Bridge
Mesa Verde Formation.....	1,500-5,300	Interbedded sandstone, sandy shale and coal beds	Well yields up to 1,000 gpm often under artesian pressure; dissolved solids range from 181-2,500 mg/l; fluoride concentration may exceed supply standards	Grand Hogback
Morrison Formation.....	325-600	Shale with interbedded sandstone, siltstone and limestone	Unknown for the Glenwood Springs Resource Area	Burns region, eastern face of Grand Hogback, scattered throughout the resource area
Eagle Valley Evaporite.....		Gypsum anhydrite and halite imbedded with shale, siltstone, mudstone and limestone	Poor water quality	Grand Hogback, extensive deposits in western Eagle County

APPENDIX I

Geologic Unit	Thickness (feet)	Physical Character	Hydrologic Character	Areas of Outcrop
Mancos Shale.....		Clayey marine shale; sometimes includes lenses of limy sandstone, sandy shale and chalky limestone	Well yields up to about 25 gpm; water is highly mineralized; sulfate concentrations often exceed water supply standards	Grand Hogback, northwestern Eagle County, southwestern Roaring Fork Basin

Source: Boettcher 1972

APPENDIX J

RANCH ECONOMICS AND INCOME EFFECTS

The analysis of the income effects of changed forage allocation is based on a study of ranch economics by the Range Science Department at Colorado State University. The study is entitled *Impacts of Federal Grazing on the Economy of Colorado* (by E. T. Bartlett, R. G. Taylor, and J. R. McKean, 1979, Fort Collins: Colorado State University). It was funded by the State of Colorado, the U. S. Forest Service, and the Bureau of Land Management.

The study involved an intensive survey of 134 ranching operations that graze livestock on public land in Colorado. The operations were randomly selected from all Colorado ranches that use public grazing land. Survey was done by personal interview.

The study divided Colorado into five regions, each exhibiting certain ranching characteristics. For each region, several ranch models were developed, varying according to ranch size and the mix of cattle and sheep. The Glenwood Springs Resource Area is in the northwest region. Eight ranch models were developed for this region based on survey data from 51 ranches, some of which may be among those grazing livestock on public land in the resource area.

The survey data were used to develop ranch model budgets, each with six sections: operating expenses, livestock inventory, gross revenue, building-improvement-land inventory, equipment and machinery inventory, and a forage balance. Using linear programming techniques, the ranch model budgets were then evaluated for changes in costs, revenue, and employment at different levels of forage availability. That evaluation yielded rates of change for revenue, costs, and employment given a change in forage. These rates enable the calculation of the income and employment effects of different ranch management alternatives.

Several types of net revenue were estimated in the study. The net revenue used in this environ-

mental impact statement (called second net in the study) is equal to gross revenue less operating costs and depreciation. It represents the return to labor and investment and could be considered the personal income of a ranching family. To the extent that this revenue figure is insufficient to support a family (as it certainly is with the two smallest models), the family is subsidizing the ranch with its labor or nonranch income.

The 168 ranching operations that use public grazing land in the resource area were grouped according to size and livestock mix into the eight ranch models. Data used for the grouping were from the BLM Range Management Automated System, adjusted by information taken directly from more than half of the operators. Current BLM forage use and proposed alternative levels of use for each operator and for each model were calculated by aggregating upward from the allotment level for which current and proposed forage availability had been estimated. In the case of common use allotments, a proration was made based on each operator's proportional authorized use.

Forage use and changes in use were calculated for each ranch, but income effects were estimated by model grouping only. After the individual forage reductions and increases had been aggregated by ranch model, the total gross and net revenue changes for all affected ranches in the model were calculated for each specified change in forage availability. Average revenue changes were then calculated to give a sense of the impact on individual ranching operations.

Table 4-15, *Affected Environment Chapter*, shows estimates of current BLM forage use, gross revenue, and net revenue for each ranch model, as well as the size characteristics of each. Tables J-1 through J-4 show the forage and income effects in detail for each ranch model, both those receiving reductions and those receiving increases, under each alternative.

TABLE J-1. INCOME EFFECTS OF CHANGES IN FORAGE ALLOCATION UNDER CONTINUATION OF THE CURRENT MANAGEMENT ALTERNATIVE

Model	Cattle	Sheep	Initial Forage Allocation								Potential Forage Allocation							
			Number of Ranches	Change in Forage Allocation (AUMs)		Change in Gross Revenue (dollars)		Change in Net Revenue (dollars)		Number of Ranches	Change in Forage Allocation (AUMs)		Change in Gross Revenue (dollars)		Change in Net Revenue (dollars)			
				Total	Average	Total	Average	Total	Average		Total	Average	Total	Average	Total	Average		
Forage Reductions																		
I.....	< 149		38	-2,007	-53	-58,685	-1,544	-26,111	-687	27	-668	-25	-19,532	-723	-8,691	-322		
II.....	150-449		34	-3,158	-93	-92,340	-2,716	-53,054	-1,560	24	-1,591	-66	-46,521	-1,938	-26,729	-1,114		
III.....	450-749		10	-1,750	-175	-57,225	-5,723	-44,800	-4,480	5	-596	-119	-19,489	-3,898	-15,258	-3,052		
IV.....	750-1,999		10	-1,965	-197	-60,801	-6,060	-36,726	-3,673	5	-901	-180	-27,787	-5,557	-16,840	-3,368		
V.....	> 2,000		2	-767	-384	-46,641	-23,320	-35,259	-17,630									
VI.....	< 1,399	< 1,749	5	-818	-164	-13,890	-6,945	-11,419	-2,284	2	-474	-237	-8,048	-4,024	-6,617	-3,308		
VII.....	> 1,400	> 1,750	3	-587	-196	-20,686	-6,895	-12,427	-4,142	2	-234	-117	-8,246	-4,123	-4,954	-2,477		
VIII.....		0-6,000	8	-1,048	-131	-39,572	-4,947	-22,951	-2,869	6	-761	-127	-28,735	-4,789	-16,666	-2,778		
Subtotal.....			110	-12,100	-110	-389,640	-3,542	-242,747	-2,207	71	-5,225	-74	-158,358	-2,230	-95,755	-1,349		
Forage Increases																		
I.....	< 149		10	+238	+24	+6,959	+696	+3,096	+310	16	+377	+24	+11,023	+689	+4,905	+307		
II.....	150-449		7	+126	+18	+3,684	+526	+2,117	+302	10	+265	+27	+7,749	+775	+4,452	+445		
III.....	450-749		3	+55	+18	+1,799	+600	+1,408	+469	3	+74	+25	+2,420	+807	+1,894	+631		
IV.....	750-1,999		2	+83	+42	+2,560	+1,280	+1,551	+776	2	+183	+91	+5,644	+2,822	+3,420	+1,710		
V.....	> 2,000		2	+15	+7	+912	+456	+690	+345	2	+15	+7	+912	+456	+690	+345		
VI.....	< 1,399	< 1,750	1	+105	+105	+1,783	+1,783	+1,468	+1,468	3	+322	+107	+5,468	+1,823	+4,495	+1,498		
VII.....	> 1,400	> 1,750	3	+227	+76	+8,572	+2,857	+4,971	+1,657	3	+457	+152	+17,256	+5,752	+10,008	+3,336		
VIII.....		0-6,000	26	+834	+32	+25,357	+975	+14,611	+562	39	+1,693	+43	50,472	+1,294	+29,864	+766		
Subtotal.....			136	+11,266	+83	+364,283	+2,679	+228,136	+1,677	110	+3,532	+32	+107,886	+980	+65,891	+599		
Net Impact of All Changes.....																		
			136	-11,266	-83	-364,283	-2,679	-228,136	-1,677	110	-3,532	-32	-107,886	-980	-65,891	-599		

TABLE J-2. INCOME EFFECTS OF CHANGES IN FORAGE ALLOCATION UNDER THE RESOURCE PROTECTION ALTERNATIVE

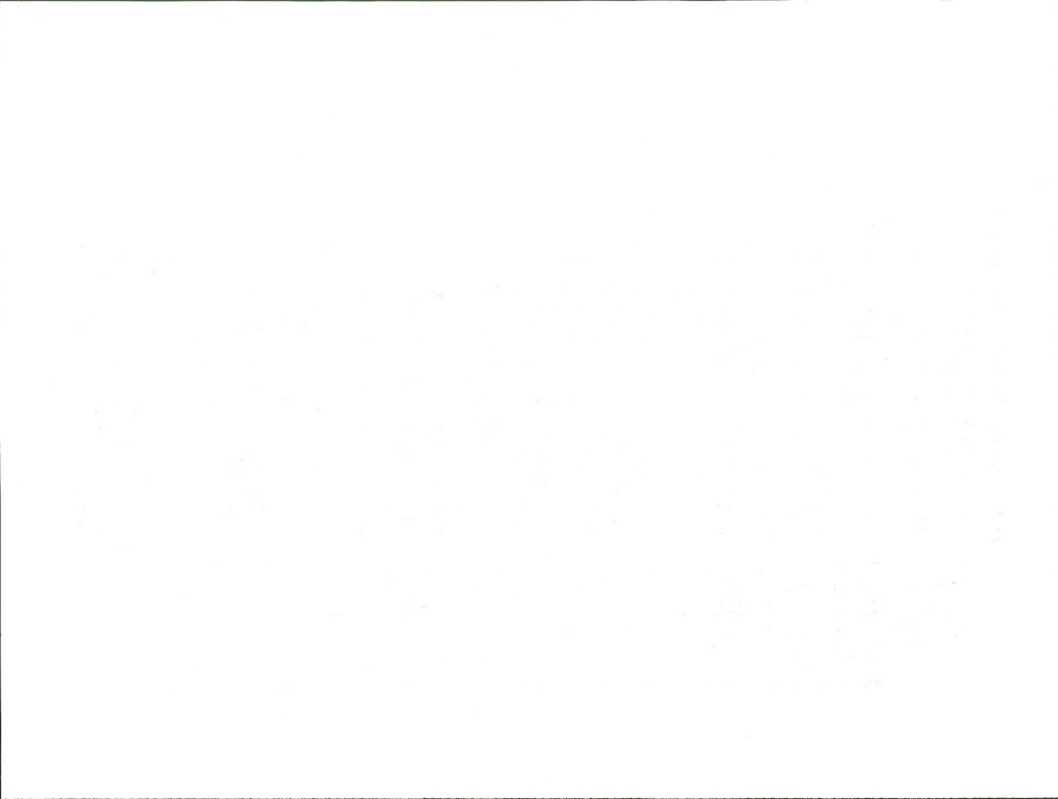
Model	Cattle	Sheep	Initial Forage Allocation						Potential Forage Allocation							
			Number of Ranches	Change in Forage Allocation (AUMs)		Change in Gross Revenue (dollars)		Change in Net Revenue (dollars)		Number of Ranches	Change in Forage Allocation (AUMs)		Change in Gross Revenue (dollars)		Change in Net Revenue (dollars)	
				Total	Average	Total	Average	Total	Average		Total	Average	Total	Average		
Forage Reductions																
I.....	< 14		39	-2,299	-59	-67,223	-1,724	-29,910	-767	14	-259	-19	-7,573	-541	-3,370	-241
II.....	150-449		28	-2,719	-97	-79,504	-2,839	-45,879	-1,631	10	-572	-57	-16,725	-1,673	-9,610	-961
III.....	450-749		11	-1,776	-161	-58,075	-5,280	-45,466	-4,133	2	-72	-36	-2,354	-1,177	-1,843	-922
IV.....	750-1,999		9	-1,555	-173	-47,956	-5,328	-29,063	-3,229	3	-636	-212	-19,614	-6,538	-11,887	-3,962
V.....	> 2,000		2	-704	-352	-42,810	-21,405	-32,363	-3,596							
VI.....	< 1,349	< 1,749	6	-851	-142	-14,450	-2,408	-11,880	-1,980	2	-300	-150	-5,094	-2,547	-4,188	-2,094
VII.....	> 1,350	> 1,750	2	-552	-276	-19,452	-9,726	-11,686	-5,843	1	-280	-280	-9,867	-9,867	-5,928	-5,928
VIII.....		0-6,000	6	-768	-126	-29,000	-4,833	-16,819	-2,803	4	-267	-67	-10,082	-2,521	-5,847	-1,462
Subtotal.....			103	-11,224	-109	-358,470	-3,480	-222,866	-2,164	36	-2,386	-66	71,309	-1,389	-42,673	-1,185
Forage Increases																
I.....	< 149		24	+1,309	+55	+38,275	+1,595	+17,030	+710	45	+4,009	+89	+117,223	+2,605	+52,157	+1,159
II.....	150-449		18	+1,004	+56	+29,357	+1,631	+16,867	+937	34	+5,436	+160	+158,949	+4,675	+91,325	+2,686
III.....	450-749		3	+332	+111	+10,856	+3,619	+8,499	+2,833	12	+4,051	+338	+132,468	+11,039	+103,706	+8,642
IV.....	750-1,999		3	+964	+321	+29,730	+9,910	+18,017	+6,006	7	+1,897	+271	+58,503	+8,358	+35,455	+5,065
V.....	> 2,000		2	+1,256	+628	+76,377	+38,189	+57,738	+28,869	2	+1,256	+628	+76,377	+38,189	+57,738	+28,869
VI.....	< 1,349	< 1,749	3	+317	+106	+5,383	+1,794	+4,425	+1,475	7	+1,531	+219	+25,996	+3,714	+21,373	+3,053
VII.....	> 1,350	> 1,750	2	+514	+257	+18,113	+9,057	+10,881	+5,441	3	+1,217	+406	+42,887	+14,296	+25,764	+8,588
VIII.....		0-6,000	6	+474	+79	+17,898	+2,983	+10,381	+1,730	7	+2,183	+312	+82,430	+11,776	+47,806	+6,830
Subtotal.....			59	+4,914	+83	+149,612	+2,536	+86,100	+1,459	117	+21,580	+184	+684,833	+5,839	+435,326	+3,721
Net Impact of All Changes																
			162	-6,310	-39	-208,858	-1,289	-136,766	-844	153	+19,194	+125	+623,524	+4,075	+392,653	+2,566

TABLE J-3. INCOME EFFECTS OF CHANGES IN FORAGE ALLOCATION UNDER THE ECONOMIC DEVELOPMENT ALTERNATIVE

Model	Cattle	Sheep	Initial Forage Allocation						Potential Forage Allocation							
			Number of Ranches	Change in Forage Allocation (AUMs)		Change in Gross Revenue (dollars)		Change in Net Revenue (dollars)		Number of Ranches	Change in Forage Allocation (AUMs)		Change in Gross Revenue (dollars)		Change in Net Revenue (dollars)	
				Total	Average	Total	Average	Total	Average		Total	Average	Total	Average	Total	Average
Forage Reductions																
I.....	< 149		27	-1,500	-56	-43,860	-1,624	-19,515	-723	5	-62	-12	-1,813	-361	-807	-161
II.....	150-449		23	-1,822	-79	-53,275	-2,316	-30,610	-1,331	6	-273	-46	-7,983	-1,331	-4,586	-764
III.....	450-749		4	-701	-175	-22,923	-5,731	-17,946	-4,487							
IV.....	750-1,999		5	-659	-132	-20,324	-4,065	-12,317	-2,463	1	-378	-378	-11,658	-11,658	-7,065	-7,065
V.....	> 2,000		1	-180	-180	-10,946	-10,946	-8,275	-8,275							
VI.....	<1,349	<1,749	3	-604	-201	-10,256	-3,419	-8,432	-2,811							
VII.....	>1,350	>1,750	2	-544	-272	-19,171	-9,586	-11,516	-5,758							
VIII.....		0-6,000	4	-391	-98	-14,764	-3,691	-8,563	-2,141	2	-11	-6	-415	-208	-241	-121
Subtotal.....			69	-6,401	-93	-195,519	-2,834	-117,174	-1,698	14	-724	-52	-21,869	-1,562	-12,699	-907
Forage Increases																
I.....	< 149		33	+1,787	+54	+52,252	+1,583	+23,249	+705	52	+4,634	+89	+135,498	+2,606	+60,288	+1,159
II.....	150-449		23	+1,375	+60	+40,205	+1,748	+23,100	+1,004	38	+6,222	+164	+181,931	+4,788	+104,530	+2,751
III.....	450-749		10	+712	+71	+23,282	+2,328	+18,227	+1,823	14	+4,614	+330	+158,878	+10,777	+118,118	+8,437
IV.....	750-1,999		6	+1,194	+199	+36,823	+6,137	+22,316	+3,719	9	+2,552	+284	+78,704	+8,745	+47,697	+5,300
V.....	> 2,000		1	+14	+14	+851	+851	+644	+644	2	+2,007	+1,004	+122,046	+61,023	+92,262	+46,131
VI.....	<1,349	<1,749	6	+721	+120	+12,243	+2,041	+10,065	+1,678	9	+2,529	+281	+42,942	+4,771	+35,305	+3,923
VII.....	>1,350	>1,750	2	+561	+281	+19,770	+9,885	+11,876	+5,938	3	+1,228	+409	+43,275	+14,425	+25,997	+8,666
VIII.....		0-6,000	8	+716	+90	+27,036	+3,380	+15,680	+1,960	10	+2,687	+269	+101,461	+10,146	+58,845	+5,885
Subtotal.....			89	+7,080	+80	+212,462	+2,387	+125,157	+1,406	137	+26,473	+193	+856,735	+6,254	+543,042	+3,964
Net Impact of All Changes																
			158	+679	+4	+16,943	+107	+7,983	+51	151	+25,749	+171	+834,866	+5,529	+530,343	+3,512

TABLE J-4. INCOME EFFECTS OF CHANGES IN FORAGE ALLOCATION UNDER THE PREFERRED ALTERNATIVE

Model	Cattle	Sheep	Initial Forage Allocation						Potential Forage Allocation									
			Number of Ranches		Change in Forage Allocation (AUMs)		Change in Gross Revenue (dollars)		Change in Net Revenue (dollars)		Number of Ranches		Change in Forage Allocation (AUMs)		Change in Gross Revenue (dollars)		Change in Net Revenue (dollars)	
					Total	Average	Total	Average	Total	Average			Total	Average	Total	Average	Total	Average
			Total	Average							Total	Average						
Forage Reductions																		
I.....	<149		31	-1,606	-52	-46,959	-1,515	-20,894	-674	14	-231	-17	-6,754	-482	-3,005	-215		
II.....	150-449		26	-1,789	-69	-52,310	-2,012	-30,055	-1,156	15	-351	-23	-10,263	-684	-5,897	-393		
III.....	450-749		5	-1,001	-200	-32,733	-6,547	-25,626	-5,125	2	-91	-46	-2,976	-1,488	-2,330	-1,165		
IV.....	750-1,999		6	-725	-121	-22,355	-3,726	-13,550	-2,258	4	-445	-111	-13,724	-3,431	-8,317	-2,079		
V.....	>2,000		1	-203	-203	-12,344	-12,344	-9,332	-9,332									
VI.....	<1,349	<1,749	2	-155	-78	-2,632	-1,316	-2,164	-1,082	2	-37	-19	-628	-314	-517	-259		
VII.....	>1,350	>1,750	1	-372	-372	-13,109	-13,109	-7,875	-7,875	1	-88	-88	-3,101	-3,101	-1,863	-1,863		
VIII.....		0-6,000	5	-186	-37	-7,023	-1,405	-4,073	-815	3	-22	-7	-831	-277	-482	-161		
Subtotal.....			77	-6,037	-78	-189,465	-2,461	-113,569	-1,475	41	-1,265	-91	-38,277	-934	-22,411	-547		
Forage Increases																		
I.....	<149		30	+1,342	+45	+39,240	+1,308	+17,459	+582	43	+2,802	+65	+81,930	+1,905	+36,454	+848		
II.....	150-449		19	+1,283	+68	+37,515	+1,974	+21,554	+1,134	30	+3,075	+103	+89,913	+2,997	+51,660	+1,722		
III.....	450-749		8	+678	+85	+22,171	+2,771	+17,357	+2,170	12	+2,043	+170	+66,806	+5,567	+52,301	+4,358		
IV.....	750-1,999		6	+1,100	+183	+33,924	+5,654	+20,559	+3,427	7	+1,898	+271	+58,534	+8,362	+35,474	+5,068		
V.....	>2,000		1	+14	+14	+851	+851	+644	+644	2	+1,201	+601	+73,033	+36,517	+55,210	+27,805		
VI.....	<1,349	<1,750	6	+665	+111	+11,292	+1,882	+9,283	+1,547	6	+1,126	+188	+19,119	+3,187	+15,719	+2,620		
VII.....	>1,350	>1,750	3	+886	+295	+31,223	+10,408	+18,757	+6,252	3	+1,095	+365	+38,588	+12,863	+23,181	+7,727		
VIII.....		0-6,000	7	+1,086	+155	+41,007	+5,858	+23,783	+3,398	9	+2,040	+227	+77,030	+8,559	+44,676	+4,964		
Subtotal.....			80	+7,054	+88	+217,223	+2,715	+129,396	+1,617	112	+15,280	+136	+504,953	+4,509	+314,875	+2,810		
Net Impact of All Changes.....																		
			157	+1,017	+6	+27,758	+177	+15,827	-101	153	+14,015	+92	+466,676	+3,050	+292,264	+1,910		



APPENDIX K

STREAMS AND LAKES PROPOSED FOR MANAGEMENT

TABLE K-1. SUMMARY OF PROPOSED FISHERIES ACTIONS—CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE

Number ^a	Name	Habitat Improvements (miles)	Monitor	
			Miles	Surface Acres
King Mountain Capability Unit				
1	Cedar Creek		0.6	
2	Rock Creek		3.1	
3	Egeria Creek		7.6	
4	Deep Creek		5.7	
5	*Cabin Creek		1.4	
6	Sunnyside Creek		2.0	
7	Willow Creek		0.5	
8	Hack Lake			2.0
9	Sheep Creek West Fork		2.7	
10	Sheep Creek		0.5	
11	Sweetwater Creek		0.5	
12	Darby Creek		0.8	
13	Horse Lake			2.1
14	Red Dirt Creek		1.0	
15	Upper Colorado River		25.1	
Castle Peak Capability Unit				
16	Piney River		1.9	
17	Castle Creek		2.9	
18	Edges Lake			3.0
19	*Catamount Creek		2.0	
20	*Norman Creek		1.2	
Eagle-Vail Capability Unit				
21	Eagle River		5.0	
22	*Frost Creek		0.7	
23	Salt Creek		0.2	
24	Cottonwood Creek		0.8	
25	Abrams Creek		1.9	
Roaring Fork Capability Unit				
26	Prince Creek		1.3	
27	Thompson Creek		2.5	
28	Thomas Creek		0.8	
29	Crystal River		0.1	
30	Sopris Creek West		1.3	
31	Sopris Creek East		0.6	
32	Snowmass Creek		0.2	
33	*Snead Canyon Creek		0.5	
34	Fryingpan River		2.9	
35	*Coulter Creek West		1.9	
36	Cattle Creek		1.4	
37	Fournille Creek		0.2	
38	Thompson Creek North		2.3	
39	Threemile Creek		0.3	
40	Roaring Fork River		1.2	
41	*Meas Creek		0.6	
42	Mitchell Creek		0.8	
43	Colorado River		1.0	

APPENDIX K

TABLE K-1. SUMMARY OF PROPOSED FISHERIES ACTIONS—CONTINUATION OF CURRENT MANAGEMENT ALTERNATIVE—Continued

Number ^a	Name	Habitat Improvements (miles)	Monitor	
			Miles	Surface Acres
Garfield Capability Unit				
44	Rifle Creek		0.6	
45	Elk Creek Main		0.2	
46	Harris Gulch		1.9	
47	Butler Creek		1.8	
48	Rifle Creek Middle		1.8	
49	George Creek		0.8	
50	Rifle Creek East		0.3	
51	Piceance Creek		0.5	
52	Harris Reservoir			12.0
53	Elk Creek East		0.9	
54	Keyser Creek		0.4	
55	*Dry Possum Creek		0.9	
56	Canyon Creek East		2.0	
57	Possum Creek		4.7	
58	Canyon Creek		1.4	
59	Colorado River		1.8	
60	Wallace Creek North		0.9	
61	Wallace Creek		1.2	
62	Battlement Creek		1.9	
63	Cache Creek		0.4	
64	*Baldy Creek		1.0	
65	Garfield Creek		0.3	
66	Second Anvil Creek	1.0	1.5	
67	Parachute Creek, East Middle Fork ^b	1.2	1.2	
68	Northwater Creek ^b	3.2	4.2	
69	Parachute Creek, East Fork ^b	6.3	6.4	
70	Trapper Creek ^b	2.3	5.7	
71	Frevert Reservoir			12.0
72	JSQ Gulch ^b		0.5	1.4
73	First Water Gulch ^b			0.6
74	First Anvil Creek ^b		1.0	2.5
75	Lower Colorado River			1.0
Total	15.5		120.1	31.1

^aThis number corresponds to the number shown on Map 3-10.

^bManagement of these streams is outlined in the BLM *Naval Oil Shale Reserve Aquatic Habitat Management Plan*.

*These streams have potential as a fishery, but do not presently support a fish population.

TABLE K-2. SUMMARY OF PROPOSED FISHERIES ACTIONS—RESOURCE PROTECTION ALTERNATIVE

Number ^a	Name	Habitat Improvements		Monitor		Area of Critical Environmental Concern		Minimum Filings	
		Miles	Surface Acres	Miles	Surface Acres	Miles	Surface Acres	Stream-flow	Pool Level
King Mountain Capability Unit									
1	Cedar Creek	0.6							X
2	Rock Creek			3.1					
3	Egeria Creek		7.6				X		
4	Deep Creek	0.2		3.7					
5	*Cabin Creek	1.4							
6	Sunnyside Creek	1.4		0.6					X
7	Willow Creek	0.5							X

STREAMS AND LAKES PROPOSED FOR MANAGEMENT

TABLE K-2. SUMMARY OF PROPOSED FISHERIES ACTIONS—RESOURCE PROTECTION
ALTERNATIVE—Continued

Number ¹	Name	Habitat Improvements		Monitor		Area of Critical Environmental Concern		Minimum Filings	
		Miles	Sur-face Acres	Miles	Sur-face Acres	Miles	Sur-face Acres	Stream-flow	Pool Level
8	Hack Lake		2.0				2.0		X
9	Sheep Creek West Fork	2.7						X	
10	Sheep Creek	0.5						X	
11	Sweetwater Creek			0.5					
12	Derby Creek	0.7		0.1					
13	Horse Lake				2.1				X
14	Red Dirt Creek	1.0				1.0		X	
15	Upper Colorado River	25.1						X	
Castle Peak Capability Unit									
16	Piney River			1.9					X
17	Castle Creek	2.9							X
18	Edges Lake		3.0						X
19	*Catamount Creek	2.0							X
20	*Norman Creek	1.2							X
Eagle-Vail Capability Unit									
21	Eagle River	5.0							X
22	*Frost Creek	0.7							X
23	Salt Creek			0.2					X
24	Coltonwood Creek	0.8				1.9			X
25	Abrams Creek	1.9							X
Roaring Fork Capability Unit									
26	Prince Creek			1.3					X
27	Thompson Creek			2.5					X
28	Thomas Creek	0.8							X
29	Crystal River			0.1					X
30	Sopris Creek West			1.3					X
31	Sopris Creek East	0.6							X
32	Snowmass Creek			0.2					X
33	*Red Canyon Creek	0.5							X
34	Fryingpan River			2.9					X
35	*Coulter Creek West	1.9							X
36	Cattle Creek	0.5		0.9					X
37	Fourmile Creek			0.2					X
38	Thompson Creek North	2.3							X
39	Threemile Creek	0.3							X
40	Roaring Fork River			1.2					X
41	*Mesa Creek	0.6							X
42	Mitchell Creek			0.8		0.8			X
43	Colorado River	1.0							X
Garfield Capability Unit									
44	Rifle Creek			0.6					X
45	Elk Creek Main			0.2					X
46	Harris Gulch	1.9					X		X
47	Butler Creek	1.3					X		X
48	Rifle Creek Middle			1.8					X
49	George Creek			0.8			X		X
50	Rifle Creek East			0.3					X
51	Piceance Creek	0.5					X		X
52	Harris Reservoir				12.0				X
53	Elk Creek East			0.1					X
54	Keyser Creek			0.9		0.9	X		X
55	*Dry Possum Creek			0.4					X

APPENDIX K

**TABLE K-2. SUMMARY OF PROPOSED FISHERIES ACTIONS—RESOURCE PROTECTION
ALTERNATIVE—Continued**

Number ¹	Name	Habitat Improvements		Monitor		Area of Critical Environmental Concern		Minimum Filings	
		Miles	Sur-face Acres	Miles	Sur-face Acres	Miles	Sur-face Acres	Stream-flow	Pool Level
56	Canyon Creek East	0.3		1.7		1.7	X		
57	Possum Creek	0.1		4.6		4.7	X		
58	Canyon Creek	1.4					X		
59	Colorado River	1.8					X		
80	Wallace Creek North			0.9			X		
61	Wallace Creek			1.2			X		
62	Battlement Creek			1.9					
63	Cache Creek			0.4			X		
64	*Baldy Creek	1.0					X		
65	Garfield Creek	0.1		0.2			X		
66	Second Anvil Creek ²	1.5				1.5			
67	Parachute Creek, East Middle Fork ³	1.2				1.2			
68	Northwater Creek ⁴	4.2				4.2			
69	Parachute Creek East Fork ⁴	6.4				6.4			
70	Trapper Creek ⁴	5.7				5.7			
71	Fravert Reservoir		12.0						X
72	JOS Gulch ⁵	1.4				1.4			
73	First Water Gulch	0.6				0.6			
74	First Anvil Creek ⁶	2.5				2.5			
75	Lower Colorado River	1.0				1.0		X	
Total		90	17.0	45.6	14.1	*35.5	2.0		

¹This number corresponds to the number shown on Map 3-10.

²Below the diversion at SE 1/4 SW 1/4, T. 5 S., R. 84 W., 6th PM.

³Management of these streams is outlined in the BLM *Naval Oil Shale Reserve Aquatic Habitat Management Plan*.

⁴This number includes streams designated for improvement as well as those listed for monitoring.

⁵These streams have potential as a fishery, but presently do not support a fish population.

**TABLE K-3. SUMMARY OF PROPOSED FISHERIES ACTIONS—ECONOMIC DEVELOPMENT
ALTERNATIVE**

Number ¹	Name	Habitat Improvements		Monitor		Area of Critical Environmental Concern		Minimum Filings		Access Re-quired ²
		Miles	Sur-face Acres	Miles	Sur-face Acres	Miles	Sur-face Acres	Stream-flow	Pool Level	
King Mountain Capability Unit										
1	Cedar Creek	0.6						X		
2	Rock Creek			3.1						1.1
3	Egeria Creek			7.6				X		7.6
4	Deep Creek			3.9						1.4
5	*Cabin Creek	1.4								
6	Sunnyside Creek	1.4		0.6				X		
7	Willow Creek	0.5						X		0.5
8	Hack Lake		2.0			2.0			X	
9	Sheep Creek West Fork	2.7						X		
10	Sheep Creek	0.5						X		
11	Sweetwater Creek			0.5						
12	Derby Creek	0.6		0.2						0.6
13	Horse Lake					2.1			X	
14	Red Dirt Creek	1.0				1.0		X		
15	Upper Colorado River	25.1						X		

STREAMS AND LAKES PROPOSED FOR MANAGEMENT

TABLE K-3. SUMMARY OF PROPOSED FISHERIES ACTIONS—ECONOMIC DEVELOPMENT
ALTERNATIVE—Continued

Number ^a	Name	Habitat Improvements		Monitor		Area of Critical Environmental Concern		Minimum Filings		Access Required ^b
		Miles	Sur-face Acres	Miles	Sur-face Acres	Miles	Sur-face Acres	Stream-flow	Pool Level	
Castle Peak Capability Unit										
16	Piney River.....			1.9					X	
17	Castle Creek.....	2.9							X	2.9
18	Edges Lake.....		3.0							X
19	*Catamount Creek.....	2.0							X	2.0
20	*Norman Creek.....	1.2							X	1.2
Eagle-Vail Capability Unit										
21	Eagle River.....	5.0								
22	*Frost Creek.....	0.7							X	
23	Salt Creek.....		0.2						X	
24	Cottonwood Creek.....	0.8							X	
25	Abrams Creek.....	1.9				1.9			*X	1.9
Roaring Fork Capability Unit										
26	Prince Creek.....			1.3					X	
27	Thompson Creek.....			2.5					X	
28	Thomas Creek.....	0.8							X	0.8
29	Crystal River.....		0.1							
30	Sopris Creek West.....		1.3							
31	Sopris Creek East.....	0.6								
32	Snowmass Creek.....		0.2							
33	*Red Canyon Creek.....	0.5							X	0.5
34	Fryingpan River.....		2.9							
35	*Coulter Creek West.....	1.9							X	1.9
36	Cattle Creek.....	0.5	0.9						X	
37	Fourmile Creek.....		0.2						X	
38	Thompson Creek North.....	2.3								
39	Threemile Creek.....	0.3							X	
40	Roaring Fork River.....		1.2						X	
41	*Mesa Creek.....	0.6							X	
42	Mitchell Creek.....		0.8			0.8			X	
43	Colorado River.....	1.0							X	
Garfield Capability Unit										
44	Rifle Creek.....			0.6						
45	Elk Creek Main.....		0.2							
46	Harris Gulch.....	1.9							X	1.9
47	Butler Creek.....	1.3							X	1.8
48	Rifle Creek Middle.....		1.8							
49	George Creek.....		0.8						X	
50	Rifle Creek East.....		0.3							
51	Piceance Creek.....	0.5							X	
52	Harris Reservoir.....				12.0					X
53	Elk Creek East.....		0.1							
54	Keyser Creek.....		0.9			0.9			X	
55	*Dry Possum Creek.....		0.4							
56	Canyon Creek East.....	0.3	1.7			1.7			X	2.0
57	Possum Creek.....	0.1	4.6			4.7			X	4.7
58	Canyon Creek.....	1.4							X	1.4
59	Colorado River.....	1.8							X	
60	Wallace Creek North.....		0.9						X	0.9
61	Wallace Creek.....		1.2						X	
62	Battlement Creek.....		1.9						X	1.9
63	Cache Creek.....		0.4							
64	*Baldy Creek.....	1.0							X	

APPENDIX K

**TABLE K-3. SUMMARY OF PROPOSED FISHERIES ACTIONS—ECONOMIC DEVELOPMENT
ALTERNATIVE—Continued**

Number ¹	Name	Habitat Improvements		Monitor		Area of Critical Environmental Concern		Minimum Filings		Access Required ²
		Miles	Surface Acres	Miles	Surface Acres	Miles	Surface Acres	Stream-flow	Pool Level	
65	Garfield Creek.....			0.3				X		
66	Second Anvil Creek ⁴	1.5				1.5				
67	Parachute Creek, East Middle Fork ⁴	1.2				1.2				
68	Northwater Creek ⁴	4.2				4.2				
69	Parachute Creek, East Fork ⁴	6.4				6.4				
70	Trapper Creek ⁴	5.7				5.7				5.7
71	Fravert Reservoir.....		12.0						X	
72	JCS Gulch ⁴	1.4				1.4				
73	First Water Gulch.....	0.6				0.6				
74	First Anvil Creek ⁴	2.5				2.5				
75	Lower Colorado River.....	1.0				1.0		X		
Total	89.6.....	17.0	46.0	14.1	*35.5	14.1				42.7

¹This number corresponds to the number shown on Map 3-10.

²This number corresponds to the miles of stream that would require additional legal access for public use.

³Below the diversion at SE ½ SW ¼ T. 5 S., R. 84 W., 6th PM.

⁴Management of these streams is outlined in the BLM *Naval Oil Shale Reserve Aquatic Habitat Management Plan*.

⁵This number includes streams designated for improvement as well as those listed for monitoring.

⁶These streams have potential as a fishery, but presently do not support a fish population.

TABLE K-4. SUMMARY OF PROPOSED FISHERIES ACTIONS—PREFERRED ALTERNATIVE

Number ¹	Name	Habitat Improvements		Monitor		Area of Critical Environmental Concern		Minimum Filings		Access Required ²
		Miles	Surface Acres	Miles	Surface Acres	Miles	Surface Acres	Stream-flow	Pool Level	
King Mountain Capability Unit										
1	Cedar Creek.....			0.6						
2	Rock Creek.....			3.1				X		
3	Egeria Creek.....			7.6						7.6
4	Deep Creek.....			3.9						
5	*Cabin Creek.....			1.4						
6	Sunnyside Creek.....			2.0						
7	Willow Creek.....			0.5						
8	Hack Lake.....		2.0				2.0		X	
9	Sheep Creek West Fork.....	2.7						X		
10	Sheep Creek.....			0.5						
11	Sweetwater Creek.....			0.5						
12	Derby Creek.....			0.8						
13	Horse Lake.....				2.1				X	
14	Red Dirt Creek.....	1.0				1.0		X		
15	Upper Colorado River.....	25.1						X		
Castle Peak Capability Unit										
16	Pinyon River.....			1.9						
17	Castle Creek.....	2.9						X		2.9
18	Edges Lake.....		3.0						X	
19	*Catamount Creek.....	2.0						X		2.0
20	*Norman Creek.....	1.2						X		

STREAMS AND LAKES PROPOSED FOR MANAGEMENT

TABLE K-4. SUMMARY OF PROPOSED FISHERIES ACTIONS—PREFERRED ALTERNATIVE—
Continued

Number ¹	Name	Habitat Improvements		Monitor		Area of Critical Environmental Concern		Minimum Filings		Access Required ²
		Miles	Sur-face Acres	Miles	Sur-face Acres	Miles	Sur-face Acres	Stream-flow	Pool Level	
Eagle-Vail Capability Unit										
21	Eagle River.....	5.0								
22	*Frost Creek.....			0.7						
23	Salt Creek.....			0.2						
24	Cottonwood Creek.....			0.8						
25	Abrams Creek.....	1.9				1.9		X ^a	1.9	
Roaring Fork Capability Unit										
26	Prince Creek.....			1.3						
27	Thompson Creek.....			2.5						
28	Thomas Creek.....			0.8						
29	Crystal River.....			0.1						
30	Sopris Creek West.....			1.3						
31	Sopris Creek East.....			0.6						
32	Snowmass Creek.....			0.2						
33	*Red Canyon Creek.....			0.5						
34	Fryingpan River.....			2.9						
35	*Coulter Creek West.....			1.9						
36	Cattle Creek.....	0.5		0.9				X		
37	Fourmile Creek.....			0.2						
38	Thompson Creek North.....			2.3						
39	Threemile Creek.....			0.3						
40	Roaring Fork River.....			1.2						
41	*Mesa Creek.....			0.6						
42	Mitchell Creek.....			0.8		0.8				
43	Colorado River.....			1.0						
Garfield Capability Unit										
44	Rifle Creek.....			0.6						
45	Elk Creek Main.....			0.2						
46	Harris Gulch.....			1.9						
47	Butler Creek.....			1.8						
48	Rifle Creek Middle.....			1.8						
49	George Creek.....			0.8						
50	Rifle Creek East.....			0.3						
51	Piceance Creek.....			0.5						
52	Harris Reservoir.....				12.0					
53	Elk Creek East.....			0.1						
54	Keyser Creek.....			0.9						
55	*Dry Possum Creek.....			0.4						
56	Canyon Creek East.....			2.0						
57	Possum Creek.....	0.1		4.6		4.7		X		4.7
58	Canyon Creek.....			1.4						
59	Colorado River.....			1.8						
60	Wallace Creek North.....			0.9						
61	Wallace Creek.....			1.2						
62	Battlement Creek.....			1.9						
63	Cache Creek.....			0.4						
64	*Baldy Creek.....	1.0		1.0				X		
65	Garfield Creek.....			0.3						
66	Second Anvil Creek*.....	1.0		0.5		1.5				
67	Parachuta Creek, East Middle Fork*.....	1.2		1.2		1.2				
68	Northwater Creek*.....	3.2		1.0		4.2				
69	Parachuta Creek, East Fork*.....	6.4		6.4		6.4				
70	Trapper Creek*.....	2.3		3.4		5.7				5.7
71	Fravert Reservoir.....				12.0					
72	JOS Gulch*.....	0.5		0.9		1.4				

APPENDIX K

TABLE K-4. SUMMARY OF PROPOSED FISHERIES ACTIONS—PREFERRED ALTERNATIVE—
Continued

Number ¹	Name	Habitat Improvements		Monitor		Area of Critical Environmental Concern		Minimum Filings		Access Re-quired ²
		Miles	Sur-face Acres	Miles	Sur-face Acres	Miles	Sur-face Acres	Stream-flow	Pool Level	
73	First Water Gulch			0.6		0.6				
74	First Anvil Creek*	1.0		1.5		2.5				
75	Lower Colorado River			1.0						
Total		60.2	5.0	75.4	26.1	*31.9	2.0			24.8

¹This number corresponds to the number shown on Map 3-10.

²This number corresponds to the miles of stream that would require additional legal access for public use.

*Below the diversion at SE ¼ SW ¼ T. 5 S., R. 84 W., 6th P.M.

⁴Management of these streams is outlined in the BLM *Naval Oil Shale Reserve Aquatic Habitat Management Plan*.

⁵This number includes streams designated for improvement as well as those listed for monitoring.

*These streams have potential as a fishery, but presently do not support a fish population.

GLOSSARY

- ACRE-FOOT.** The quantity of water or other material required to cover 1 acre to a depth of 1 foot or a volume of 43,560 cubic feet.
- ACTIVE PREFERENCE.** That portion of the total preference for which grazing use may be authorized.
- ACTUAL USE.** The use made of forage on any area by livestock and/or wildlife without reference to permitted or recommended use.
- ALLOTMENT.** An area designated and managed for grazing of livestock.
- ALLOTTEE.** Holder of a license or permit for grazing on an allotment. A permittee.
- ALLOTMENT MANAGEMENT PLAN (AMP).** A concisely written program of livestock grazing management for a specific grazing allotment.
- ALLUVIUM.** Unconsolidated rock or soil material such as gravel, sand, silt, or clay deposited by running water.
- ALLUVIAL FAN.** A fan-shaped deposit of alluvium concentrated at the foot of a steep slope.
- ANIMAL UNIT (AU).** One mature (1,000 pound) cow or the equivalent based upon average daily forage consumption of 26 pounds dry matter.
- ANIMAL-UNIT MONTH (AUM).** The amount of forage required by an animal for one month. Tenure of one animal unit for one month.
- AQUIFER.** A water-bearing layer of permeable rock such as sandstone.
- BACKGROUND.** The area visible from a travel route, use area, or other observer position usually from a minimum of 3 to 5 miles of a maximum of about 15 miles.
- BASEFLOW.** Water that enters stream channel from springs or ground water seepage.
- BASIN.** A land area drained by a river and its tributaries.
- BIOGEOGRAPHICAL.** Pertaining to the study-of the geographical distribution of living things.
- BROWSE.** The part of a leaf and twig growth of shrubs, woody vines, and trees alkalized by animals for consumption.
- CATCHMENT.** A structure built to collect and retain water.
- CIST.** A box or chest especially for sacred utensils. A prehistoric sepulchral tomb or casket.
- CLEAR CUTTING.** An even-aged silvicultural system in which the old crop is cleared at one time; regeneration is generally natural through seeding from adjacent stands or from cone-bearing slash.
- CONTRAST.** The effect of a striking difference in the form, line, color, or texture of the landscape features within the area being viewed.
- CRUCIAL WINTER RANGE.** That portion of the winter range to which a wildlife species is confined during periods of heaviest snow cover.
- CULTURAL MODIFICATION.** Any man-caused change in the land or water form or vegetation or the addition of a structure that creates a visual contrast in the basic elements (form, line, color, texture) of the naturalistic character of a landscape.
- CULTURAL RESOURCES.** The fragile and nonrenewable remains of human activity, occupation, or endeavor that were of importance in human events.
- DOLOMITIC.** A rock consisting largely of calcium magnesium carbonate.
- EASEMENT.** A right acquired by the United States to use or control private property for a road, trail, or other specified purpose.
- ECOLOGICAL.** Pertaining to subspecies or race that is especially adapted to a particular set of environmental conditions.
- ECOSYSTEM.** A community, including all the component organisms, together with the environment, forming an interacting system.
- ENDANGERED SPECIES.** Any species in danger of extinction throughout all or a significant portion of its ranges.
- EROSION CONDITION CLASS.** A classification system for ranking soil erosion in increments of 20 points. 0-20 = stable; 21-40 = slight; 41-60 = moderate; 61-80 = critical; and 81-100 = severe.
- ESCARPMENT.** A long precipitous, clifflike ridge of land, rock, or the like commonly formed by faulting or fracturing of the earth's crust.
- FLOOD PLAIN.** Level land that may be submerged by flood water.
- FORAGE.** All browse and herbaceous foods that are available to grazing animals.
- FOREGROUND-MIDDLEGROUND.** The area visible from a travel route, use area, or other observer position to a distance of 3 to 5 miles.
- GROUND WATER.** The part of subsurface water that completely saturates the rocks and is under hydrostatic pressure.
- GULLY.** A channel (6 inches or deeper) cut by concentrated runoff through which water commonly flows during or immediately after heavy rains or during the melting of snow.
- HABITAT.** A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are food, water, cover, and living space.
- INFILTRATION.** The downward entry of water into the soils.
- LEACHING.** The removal of materials in solution from the soil.
- LITHIC SCATTER.** Stone debris left as the result of tool manufacture or reshaping.
- MITIGATION.** The alleviation or lessening of possible adverse effects on an action upon a resource by application of appropriate protective measures or adequate scientific study.
- NATIONAL REGISTER OF HISTORIC PLACES.** The official list, established by the Historic Preservation Act of 1966, of the nation's cultural resources worthy of preservation.
- OFF-ROAD VEHICLE (ORV).** Any motorized vehicle capable of or designed for travel on or immediately over land, water, or other natural terrain.
- OFF-ROAD VEHICLE DESIGNATIONS.**
- OPEN.** Designated area and trails where off-road vehicles may be operated (subject to operating regulations and vehicle standards set forth in BLM Manuals 8341 and 8343).
 - LIMITED.** Designated areas and trails where the use of off-road vehicles is subject to restrictions such as limiting the number or types of vehicles allowed, dates and times of use (seasonal restrictions), limiting use to existing roads and trails, or limiting use to designated roads and trails. Under the designated roads and trails designation, use would be allowed only on roads and trails that are signed for use. Combinations of restrictions are possible such as limiting use to certain types of vehicles during certain times of the year.
 - CLOSED.** Designated areas and trails where the use of off-road vehicles is permanently or temporarily prohibited. Emergency use of vehicles is allowed.
- OLITE.** Limestone composed of minute rounded concretions resembling fish roe, in some places altered to ironstone by replacement with iron oxide.
- PALEONTOLOGY.** A science dealing with the life of past geological periods as known from fossil remains.
- PERCOLATION.** Downward movement of water through soils.
- PETROGLYPH.** A figure, design, or indentation carved, abraded, or pecked on a rock.
- PHYSIOGRAPHIC REGION.** An extensive portion of the landscape normally encompassing many hundreds of square miles which portrays similar qualities of soil, rock, slope, and vegetation of the same geomorphic origin.
- PRODUCTIVE FOREST LAND.** Land that supports timber species, generally referred to as sawtimber, sold on a board-foot measure. Lodgepole pine, Englemann spruce, Douglas-

GLOSSARY

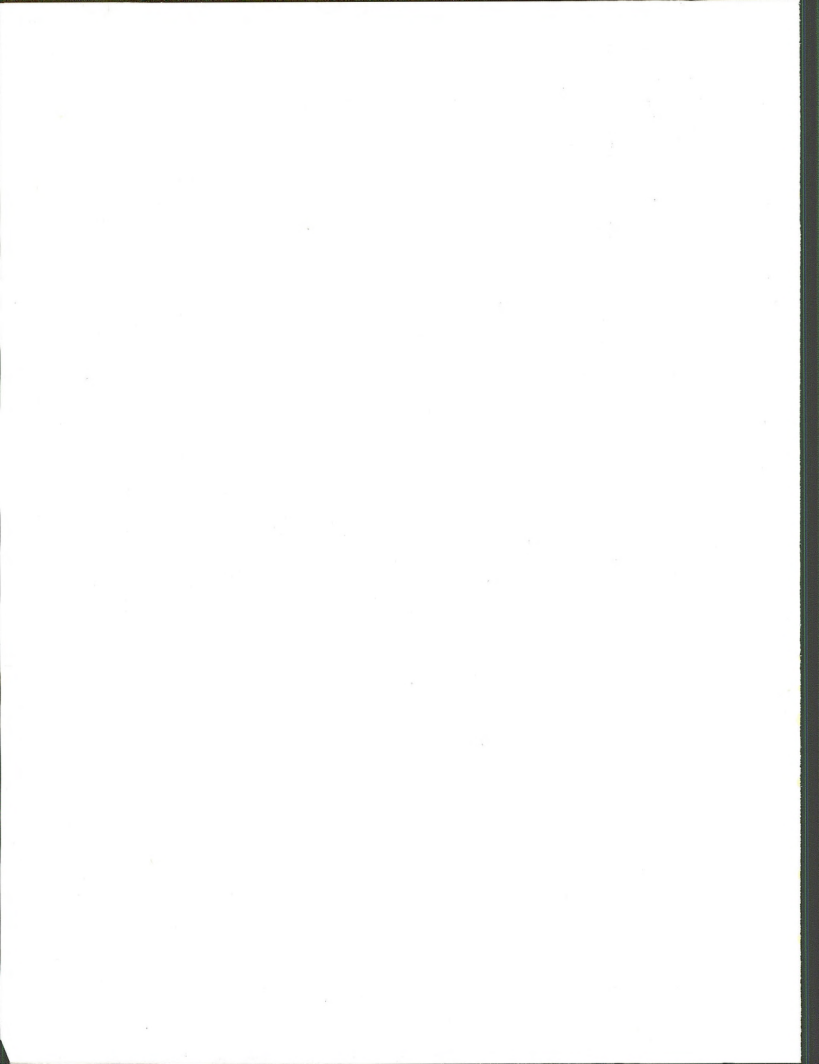
- fir, ponderosa pine, subalpine fir, and aspen comprise this group within the Glenwood Springs Resource Area.
- PYROCLASTIC.** Composed chiefly of fragments of volcanic origin, as agglomerate, tuff, and certain other rocks.
- PUBLIC LAND.** Land administered by the Bureau of Land Management.
- RAPTOR.** Birds of prey, with sharp talons and strongly curved beaks; e.g., hawks, owls, vultures, eagles.
- RILL.** A small (less than 6 inches deep) intermittent water course with steep sides.
- RECREATION OPPORTUNITY SPECTRUM (ROS).** A continuum used to characterize recreation opportunities in terms of setting, activity, and experience opportunities. (See Appendix E for description of specific classes.)
- RECREATION DAY.** The presence of one person on an area of land or water for the purpose of engaging in a recreational activity during all or part of a calendar day.
- RIPARIAN.** Situated on or pertaining to the bank of a river, stream, or other body of water. Normally used to refer to the plants of all types that grow rooted in the waterable of streams, ponds, and springs.
- SCENIC QUALITY.** The degree of harmony, contrast, and variety within a landscape.
- SEDIMENT YIELD.** The amount of sediment given up by a watershed, ordinarily expressed as tons, acre-feet, or cubic yards of sediment per unit of drainage area per year.
- SELECTIVE CUTTING.** Removal of mature timber, usually the oldest or largest trees, either as single scattered trees or small groups at relatively short intervals by means of which the continuous establishment of natural reproduction is encouraged and an uneven-aged stand is maintained.
- SOIL ASSOCIATION.** A mapping unit used on general soil maps, in which two or more defined taxonomic units occurring together in a characteristic pattern are combined because the scale of the map of the purpose for which it is being made does not require delineation of the individual soils.
- SOIL PRODUCTIVITY.** The capability of a soil to produce a specified plant or sequence of plants under a specified system of management.
- STAND.** An aggregation of trees or other growth occupying a specific area and sufficiently uniform in composition (species), age, arrangement, and condition to be distinguished from the forest or other growth on adjoining areas.
- SUSPENDED PREFERENCE.** That portion of the total preference that is placed in a suspended category because the preference exceeds the present available livestock grazing capacity. Suspended non-use.
- TAXONOMIC.** Process of classifying organisms in established categories.
- TERRACE.** A step-like surface bordering a valley floor or shoreline that represents the former position of an alluvial plain, lake, or seashore.
- THREATENED SPECIES.** Any species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
- TOTAL PREFERENCE.** The total number of animal-unit months of livestock grazing on public land apportioned and attached to base property owned or controlled by a permittee or lessee.
- TOTAL SUSPENDED PARTICULATES (TSP).** All solid or semi-solid material found in the atmosphere.
- UNALLOTTED ALLOTMENT.** Allotment where a previous permittee has relinquished preference or BLM has cancelled preference. Not currently used by livestock.
- VEGETATION MANIPULATION.** Alteration of present vegetation by using fire, plowing, spraying, or other means to manipulate natural successional trends.
- VEGETATION TYPE.** A plant community with immediately distinguishable characteristics based upon and named after the apparent dominant plant species.
- VERTEBRATE.** An animal having a backbone or spinal column.
- VISITOR DAY.** The presence of one or more persons on an area of land or water for the purpose of engaging in one or more recreational activities for a period of time aggregating 12 hours.
- VISUAL RESOURCE.** Land, water, vegetation, animal, and other visible features.
- VISUAL RESOURCE MANAGEMENT (VRM).** The planning, designing, and implementation of management objectives to provide acceptable levels of visual impacts for all BLM resource management activities.
- VISUAL RESOURCE MANAGEMENT CLASSES.** The degree of acceptable visual change within a characteristic landscape. A class is based upon the physical and ecological characteristics of any given homogeneous area and serves as a management objective.
- CLASS I areas (preservation)** provide for natural ecological changes only. This class includes primitive areas, some natural areas, some wild and scenic rivers, and other similar sites where landscape modification activities should be restricted.
- CLASS II (retention of the landscape character)** includes areas where changes in any of the basic elements (form, line, color, or texture) caused by management activity should not be evident in the characteristic landscape.
- CLASS III (partial retention of the landscape character)** includes areas where changes in the basic elements (form, line, color, or texture) caused by a management activity may be evident in the characteristic landscape. However, the changes should remain subordinate to the visual strength of the existing character.
- CLASS IV (modification of the landscape character)** includes areas where changes may subordinate the original composition and character; however, they should reflect what could be a natural occurrence within the characteristic landscape.
- CLASS V (rehabilitation or enhancement of the landscape character)** includes areas where change is needed. This class applies to areas where the landscape character has been so disturbed that rehabilitation is needed. This class would apply to areas where the quality class has been reduced because of unacceptable intrusions. It should be considered an interim short-term classification until one of the other classes can be reached through rehabilitation or enhancement.
- VISUAL SENSITIVITY.** Degree of concern expressed by the user toward scenic quality and existing or proposed visual change in a particular characteristic landscape.
- WICKIUP.** A frame hut covered with matting, board, or brush.
- WILDERNESS.** An area formally designated by Congress as a part of the National Wilderness Preservation System.
- WILDERNESS CHARACTERISTICS.** The definition contained in section 2(c) of the Wilderness Act (78 Stat. 891).
- WILDERNESS STUDY AREA.** A roadless area having wilderness characteristics and, thus, having potential as a wilderness.
- WOODLAND.** Land that supports forest species, generally referred to as fuelwood, sold on a cord or post basis. Piñon pine and juniper commonly comprise the manageable woodland type in the Glenwood Springs Resource Area. Gambles oak and cottonwood are nonmanagement components of this type.

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