

4.0 CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

Chapter 4 in the DRMP/DEIS described and compared components of each of the five alternatives (Appendix L) and consequences from implementing them. We have narrowed the analysis down in Chapter 4 of this PRMP/FEIS to focus on the No Action (Alternative I), Preferred Action (Alternative V) and the Proposed Plan (Alternative VI) alternatives. While Chapter 4 now focuses on Alternatives I, V and VI, we have included a summary of actions for all alternatives (I-VI) at the end of each resource section. This, along with Appendix L, show the complete range of alternatives analyzed for this plan. In terms of complying with the NEPA, the specific purpose of this chapter is to present the analyses of these alternative management actions and to disclose the potential impacts of the Federal action on the human and natural environment. For this PRMP/FEIS, the Federal action is the BLM's selection of a Proposed Plan, which will serve as the framework for future activity level planning and implementation activities in the Monument.

The potential consequences or impacts of the three alternatives are addressed in the same order of resource topics as was presented in Chapter 3 (e.g., Resources, Resource Uses, Special Designations, and Social and Economic Conditions). This parallel organization will allow readers to compare existing resource conditions (Chapter 3) to potential impacts (Chapter 4) for the same resource(s). The impacts analysis of environmental consequences emphasizes key planning issues (see Chapter 1) raised during the scoping process.

Potential impacts on a resource are described in terms of changes resulting from the management of that and other resources. For example, impacts on cultural resources would result from:

- the management of cultural resources;
- the anticipated level of oil and gas development;
- the management of livestock grazing;
- the management of recreation and/or transportation; and,
- the management of other resources or resource use under discussion.

The two exceptions to this organization occur in the discussion of Air Quality (Section 4.2.1) and Social and Economic Conditions (Section 4.4.). In the case of Air Quality, the impact analysis model for oil and gas development was run in terms of the highest level of potential air quality impacts of the action alternatives (although not at "worst-case" scenario level). The highest level of potential impact would result from Alternative IV, described in the DRMP/DEIS (Appendix L). This analysis will be used for both the Preferred and the Proposed alternatives in this PRMP/FEIS and since oil and gas development is not planned to be as high in these alternatives as was predicted for Alternative IV, air quality impacts from the Preferred and Proposed alternatives are assumed to be potentially less than those presented.

It is also important to note that the actions described under each alternative would not necessarily be *permitted* by the adoption of any alternative as a result of the planning process. For example, although new oil and gas leasing may be *allowed* under some of the alternatives, actual development would only occur after an area has been leased; and/or after any proposed well locations, route and/or pipeline alignments, and/or other facilities/infrastructure have gone through a permitting process. Furthermore, while the assumptions associated with the alternatives represent reasonable projections of what could occur, it is impossible to predict with certainty the precise location of potential development or structure, or the precise outcome of any of the alternatives, due to the large number of variables involved.

4.1. Impact Analysis Methods and Assumptions

4.1.1. Analysis of Alternatives

The analysis of alternatives presented in this chapter describes how each different alternative may potentially affect (impact) baseline conditions of individual resources within the planning area. If a particular use or management action is not discussed for a particular resource, it is because negligible impacts are expected.

4.1.2. Impact Analysis

When applicable, definitions of the following types of impacts, which can overlap and are not mutually exclusive, are included in the evaluation of environmental consequences (all possible impacts are not described and, unless otherwise stated, impacts described in this chapter are assumed adverse), including:

- **Direct/Indirect Impacts:** In general, direct impacts result from activities authorized by the BLM and, generally, occur at the same time and place as the management activity or action causing the impact. For example, for the action of building a route, a direct adverse impact is surface disturbance. Surface disturbance is the impact (the effect) of heavy equipment (the cause) removing existing vegetation as it grades the proposed route location. Indirect impacts often occur at some distance or time from the action. In the above example, an indirect impact could occur days after the surface is disturbed, as well as some distance from the disturbance. Heavy precipitation following the removal of vegetation and/or disturbance of the ground surface may erode soil and transport sediment into streams. The impact on stream-water quality is considered an indirect adverse impact.
- **Onsite/Offsite Impacts:** Onsite impacts occur within the Monument. Offsite impacts occur outside of the Monument; however, they result from an action taken within the Monument. The degree to which land uses, management actions, and environmental changes under the alternatives would affect other lands depends upon the absolute and relative amount of onsite changes, the causal linkage between onsite changes and offsite consequences, and the relationship between changes resulting from the alternative and those that would occur without the alternative.
- **Short- or Long-Term Impacts:** When applicable, the short-term or long-term aspects of impacts are described. For the purposes of this PRMP/FEIS, short-term impacts occur during or after the activity or action, and may continue to occur for up to 2 years. Long-term impacts occur beyond the first 2 years. Five years is an approximation of the time required to restore or reclaim an area following surface disturbance.
- **Cumulative Impacts:** Cumulative impacts are the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (40 CFR 1508.7). Cumulative impacts may include activities on private lands within the Monument, ongoing activities on Federal lands within the Monument, or activities on both private and public lands outside of the Monument.

Quantifying cumulative impacts in relation to the resources, land uses, and management actions can be difficult due to:

- uncertainties regarding the location, scale, and/or rate of changes on BLM lands within the Monument resulting from the various alternatives;

- uncertainties about the location, scale, and/or rate of changes on private lands adjacent to, or near, the Monument that would occur irrespective of the alternative; and
- uncertainties about the location, scale, and/or rate of changes resulting from the general human population growth of the adjacent counties.

All of the environmental impacts associated with the implementation of any of the alternatives would be in addition to ongoing existing impacts occurring on Federal lands within the Monument, on private lands within the Monument, and on both public and private lands adjacent to, or near, the Monument. Even where an estimate of cumulative impacts resulting from offsite causes is available (such as the number of oil and gas wells in Montezuma County in 20 years), there is no way of knowing with certainty how much long-term surface disturbance would result; to what degree adverse impacts would be avoided or mitigated; or how the impacts would affect other resource values and land uses (such as hunting, off-road travel, visual quality, livestock grazing, and so forth). Therefore, the descriptions of cumulative impacts for the individual resources are often qualitative.

Also germane to the discussion of cumulative impacts are the boundaries used to define impact sources and levels. These differ by resource. For example:

- for wide-ranging wildlife, such as deer and elk, the cumulative impact area may include offsite habitats that are used to some extent by onsite populations (habitats that are subject to impacts from development in the offsite areas);
- for air quality, the cumulative impact area may be an entire air shed, including all emission sources that affect the same air quality parameters potentially impacted by the implemented alternative;
- for surface water quality, the cumulative impact area may be one or more watersheds, including all pollutant sources that affect the same water quality parameters potentially impacted by the implemented alternative; and
- for socioeconomics, the cumulative impact area may be one or more towns or counties, including all sources of beneficial and adverse impacts on tax revenues, employment, housing, and/or on quality of life considerations reasonably (i.e., not too remotely) affected by changes related to the implemented alternative.

These are only examples; however, they illustrate the fact that cumulative impact boundaries may not only differ considerably among resources, but that the boundaries may be either natural or artificial.

4.1.3. Methods and Assumptions

Due to the programmatic and strategic nature of this PRMP/FEIS, the timing and specific location of project-specific actions that could impact resource values are not defined. Moreover, the relationship between cause (future actions) and effect (impact on resources) is not always known or quantifiable. For these reasons, the analysis of alternatives is both qualitative and quantitative, and is based on a series of assumptions. The methods and assumptions listed below (as well as in relation to each resource in the following sections) are disclosed to provide a basis for the conclusions reached. Assumptions common to all alternatives and all resources are listed below, whereas assumptions unique to specific resources and resource uses are listed under the appropriate resource section.

- All alternatives are implemented in compliance with standards, best management practices (BMPs), guidelines for surface-disturbing (ground-disturbing) activities, applicable laws, and implementation plans, as well as with all BLM polices and regulations.
- An oil and gas lease grants the lessee the “right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits” in the leased lands, subject to the terms and conditions incorporated in the lease (BLM Form 3100-11, Lease for Oil and Gas). The Secretary of the Interior has the authority, and the responsibility, to protect the environment within Federal oil and gas leases; therefore, restrictions are imposed on the lease terms. Restrictions can be in the form of stipulations, Conditions of Approval (COAs), BMPs, mitigation measures, and other restrictions.
- References to impacts resulting from activities on private land assume private surface/private mineral, not a split-estate (private surface lands over Federal minerals).
- Provisions in leases that expressly give the BLM the authority to deny or restrict development, in whole or in part, depend upon a Biological Opinion (BO). This BO results from a Section 7 consultation (under the provisions of the Endangered Species Act [ESA]) provided by the U.S. Fish and Wildlife Service (USFWS) regarding impacts to endangered or threatened species, or to habitats of plants and animals that are listed or proposed for listing. If the USFWS concludes that the development likely would jeopardize the continued existence of any endangered or threatened plant or animal species, then the development may be denied in whole or in part.
- Comparison of impacts among resources is intended to provide an impartial assessment designed to inform the decision-maker and the public. The impact analysis does not imply or assign a value or numerical ranking to impacts. Actions resulting in adverse impacts to one resource may result in a beneficial impact to other resources. The same action may be perceived as positive (beneficial) and/or negative (adverse) with regard to the same resource.
- Cumulative impact analysis is based upon Proposed Plan actions only.
- Key planning issues identified in Chapter 1 provide the focus for the scope of impact analyses in this chapter.
- In general, adverse impacts described in this chapter are considered if they result from, or relate to, the following:
 - the key planning issues described in Chapter 1;
 - potential impacts to public health and safety;
 - a potential for violating legal standards, laws, and/or the protective status of resources; and/or;
 - potential impacts to unique resources.

4.1.4. Impact Analysis Components

The starting point for analysis of the alternatives is the Analysis of the Management Situation (AMS) (BLM 2005b) and the RFD (BLM 2005c) for oil and gas development within the Monument. The AMS describes the current management activities occurring within the Monument, as well as the physical environment and the regulatory requirements related to

those activities. The RFD is intended as a technical and scientific approximation of anticipated levels of oil and gas development that could potentially take place during the planning timeframe. As such, neither the RFD, nor the planning process of which it is a part, are intended to define the specific numbers and locations of wells and pads needed to develop the oil and gas resource.

Table 4-1 summarizes the quantifiable components of resource management actions that are used for the impact analysis.

Table 4-1 Impact Analysis Components			
Resource	Alternative I (No Action)	Alternative V (Preferred)	Alternative VI (Proposed)
Cultural Resources			
Sites Developed	Develop new sites for controlled visitation.	Develop 13 – 25 sites for visitation.	
Sites Stabilized	Stabilize up to 240 sites.	Document and allow standing walls to deteriorate; stabilization authorized under Monument Manager’s discretion, with particular consideration for human-caused impacts.	
Protection	Apply National Historic Preservation Act (NHPA) Section 106.	Apply NHPA Section 106. Protect individual sites and settlement clusters. Protect cultural resource settings on the landscape.	
Fire Management Zones (FMZs)			
Fuels and Fire	Manage Monument as combination of FMZs A, B, and C. Manage 157,258 acres (95%) with no specific fire suppression requirements. Manage 7,983 acres (5%) with specific fire suppression requirements.	Manage entire Monument (165,000 acres) as FMZ B, with specific fire suppression requirements.	Manage entire Monument (166,390 acres) as FMZ B, with specific fire suppression requirements.
Soil/Water^a			
Soil Resources	Apply Site-Specific Relocation (SSR)/Controlled Surface Use (CSU) stipulations to protect slopes greater than 40 % (21,036 acres) with 10,864 acres of rock outcrop.	Apply NGD/NSO stipulations to protect slopes greater than 30% (36,504 acres) with 10,864 acres of rock outcrop.	Apply NGD/NSO stipulations to protect slopes greater than 30% (36,607 acres) with 11,042 acres of rock outcrop.
Riparian Protection	Manage 2,415 riparian acres.	Apply NGD/NSO stipulations to protect canyon bottoms, riparian,	Apply NGD/NSO stipulations to protect canyon bottoms, riparian,

Table 4-1 Impact Analysis Components			
Resource	Alternative I (No Action)	Alternative V (Preferred)	Alternative VI (Proposed)
		floodplain areas (5,312 acres).	floodplain areas (5,528 acres).
Water Development	Apply no restrictions on groundwater and/or new water developments.	Discourage groundwater and/or new water development.	
Visual Resource Management Class (VRM)			
VRM I acres	Manage 25,549 acres in WSA as VRM Class I. Other areas: establish site-specific visual quality objectives and design guidelines for landscape development projects during activity planning.	Designate 38,598 acres as VRM I.	Designate 41,834 acres as VRM I.
VRM II acres		Designate 126,643 acres as VRM II.	Designate 100,394 acres as VRM II.
VRM III acres		Designate 94 acres as VRM III.	Designate 14,190 acres as VRM III.
VRM IV acres		Designate No acres as VRM IV.	Designate 9,972 acres as VRM IV.
Fluid Minerals^b			
New Leases			
Number of acres available for new leases	No new acres available for lease.	Lease up to 880 acres.	
New well pads on new leased lands	Permit no new wells.	Permit up to 2 new wells.	
New roads on new leased lands	Allow no new roads.	Allow up to 1 mile of new roads.	
Total Disturbance on new leased lands	Allow no new disturbance.	Allow up to 18 acres of disturbance on new leased lands. Although there is an NSO on all new leases, disturbances could occur on neighboring leased lands to obtain mineral from new leased lands.	

Table 4-1 Impact Analysis Components			
Resource	Alternative I (No Action)	Alternative V (Preferred)	Alternative VI (Proposed)
Existing leases (Projected through the life of the Plan)			
Number of acres within existing leases	127,895 acres		
Potential new wells on existing leased lands	150 wells (121 well pads)		
Potential new roads on existing leased lands	67 miles		
Total potential new disturbance on existing leased lands	1,985 acres		
Livestock Grazing			
Animal Unit Months (AUMs) (Active Preference)	Permit 8,492 AUMs.	Permit 6,437 AUMs.	
AUMs Suspended or Cancelled (Different from Active AUMs)	No suspended or cancelled AUMs.	Suspend 2,055 AUMs.	All suspended AUMs would be cancelled.
Number of Livestock Grazing Allotments	28 allotments	23 allotments	

Table 4-1 Impact Analysis Components			
Resource	Alternative I (No Action)	Alternative V (Preferred)	Alternative VI (Proposed)
Percent Monument Lands within Grazing Allotments	97%	94%	
Recreation			
Promotion Strategy, Facility Development, Visitation Management	Promote no specific recreation strategy. Allow facility development, as needed. Maintain developed recreation sites at Lowry, Painted Hand, and Sand Canyon Pueblos for interpretation.	Promote a combination of strategies, including undeveloped with minimal facilities for local visitors, as well as destination strategy with support facilities for regional, national and international visitors. Manage 7,875 acres for public visitation. Manage 157,460 acres for backcountry use.	Promote a combination of strategies, including undeveloped with minimal facilities for local visitors, as well as destination strategy with support facilities for regional, national and international visitors. Manage 7,875 acres for public visitation. Manage 158,515 acres for backcountry use.
Special Recreation Permits (SRPs)	Allow no new commercial SRPs.	Allow up to 10 SRPs.	
Special Recreation Management Area (SRMA) and Recreation Setting (Front, Middle, Back)			
Pueblo Sites (front country)	No SRMAs	240 acres	
Sand /Rock (front country)		7,541 acres	
Mock/Rincon (backcountry)		109,637 acres	110,692 acres
Cross/Squaw (backcountry)		37,604 acres	

Table 4-1 Impact Analysis Components			
Resource	Alternative I (No Action)	Alternative V (Preferred)	Alternative VI (Proposed)
Goodman (backcountry)		10,219 acres	
AHC (front country)		94 acres	
Recreation Setting Totals			
backcountry	No Settings	157,460 acres	158,515 acres
front country		7,875 acres	
Transportation^c			
Total route miles with associated acres of disturbance (motorized, nonmotorized, plus new minerals)	149 miles (864 acres)(1985 RMP Decision) 213 miles (1,235 acres) (2000-2002 Inventory)	169 miles (980 acres)	172 miles (997 acres)
Route Density (includes new mineral routes)	0.58 miles/square mile (1985 RMP Decision) 0.83 miles/square mile (2000-2002 Inventory)	0.66 miles/square mile	
Off-Highway Vehicle (OHV) Management	Manage 25,976 acres as closed. Manage 139,359 acres for limited OHV use.	Manage 38,598 acres as closed. Manage 126,737 acres for limited OHV use.	Manage 39,653 acres as closed. Manage 126,737 acres for limited OHV use.
Number of Support Facilities	7 facilities	9 facilities	

Table 4-1 Impact Analysis Components			
Resource	Alternative I (No Action)	Alternative V (Preferred)	Alternative VI (Proposed)
Special Designations Areas			
Special Designation Areas	25,549 acres as Wilderness Study Areas No Wild and Scenic Rivers designations 427 acres Resource Natural Area 165,335 acres ACEC	25,549 acres as WSA, plus 5,223 acres for wilderness character No river segments suitable as WSR 7,826 acres RNA/7,826 acres ACEC	25,549 acres as WSA, plus 5,223 acres for wilderness character No river segments suitable as WSR 8,881 acres RNA/8,881 acres ACEC
Research Natural Areas			
McElmo		427 acres	
McElmo Expansion	---	2,738 acres	3,793 acres
Cannonball	---	2,797 acres	
Sand Canyon	---	1,864 acres	
Total	427 acres	7,826 acres	8,881 acres
Wilderness Study Area			
Existing WSA		25,549 acres	
Wilderness Characteristics			
Citizen's Proposed Expansion	---	5,223 acres	
Areas of Critical Environmental Concern			
Acres managed as ACEC	165,335 acres	7,826 acres	8,881 acres

Table 4-1 Impact Analysis Components			
Resource	Alternative I (No Action)	Alternative V (Preferred)	Alternative VI (Proposed)
Additional Figures			
<p>^aFigures used in Chapter 3 of this PRMP/FEIS and used throughout the DRMP/DEIS for acres of rock were extrapolated from ecological site information (Table 3-16). The figures used in Chapter 4 of this PRMP/FEIS are from a combination of vegetative cover map, aerial photo interpretation, and ecological site data and include newly acquired property for Alternative VI. For further explanation refer to Section 3.1.8.1.</p>			
<p>^bFigures are for new leased lands only. Although there is an NSO on all new leases, these disturbances could occur on neighboring leased lands to obtain minerals from new leased lands.</p>			
<p>^cIt was estimated that for every mile of road, approximately 5.8 acres of ground are disturbed, using the average for local roads, which is a 24' road crown width and 48' disturbance width (BLM 9113 Roads Manual, 1985).</p>			
Total Planning Area: 165,335 acres in the Draft; 166,390 in the Final (includes newly acquired lands)			
Cultural Resource Site Density Estimates: 112/square mile; 1 site/5.72 acres; 28,674 sites/ Monument; 5,157 sites currently recorded			
Inholding Landownership: Draft- 17,562 acres private and 400 acres National Park Service Final- 16,618 acres private (excludes lands acquired after DRMP) and 400 acres National Park Service			
Number of acres leased for fluid mineral development - 147,403 acres - Draft 127,895 acres - Final Number of acres not leased for fluid mineral development - 17,932 acres - Draft 38,495 acres - Final The difference is due to mapping/calculation differences between Draft and Final plans and expired leases.			
EXISTING FLUID MINERAL LEASES: New development figures for existing leased lands are as follows: - number well pads =121 - miles of road = 67 - number of treatment facilities = 8 - miles of pipeline = 53 - Total potential new acres of disturbance on existing leases: 883 acres + 1,102 acres disturbed for geophysical exploration =1,985 acres (RFD 2005). -Total cumulative acres of disturbance from fluid mineral development : 18 acres new disturbance on new leases + 1,985 acres new disturbance on existing leases + 1,165 acres old disturbance on existing leases = 3,168 acres.			
While the No Action Alternative shows 149 miles of routes on the Monument (based on the RMP decision in the San Juan/San Miguel RMP, 1985) the actual number of routes on the ground is 213 miles which includes user-created, unauthorized routes.			

4.1.4.1. Protective Stipulations and Other Restrictions on Surface Use

The RFD does not incorporate all of the land management direction and multiple-use considerations that the BLM must take into account as part of its responsibilities under the Federal Land Policy and Management Act (FLPMA). Therefore, in developing the alternatives, assumptions stated within the RFD were subjected to various “screens” or “filters” representing restrictions designed to protect specific resource values and to meet the BLM’s multiple-use and sustainability mandates. These restrictions have become part of the analysis of impacts. The protection of specific resources is accomplished by a combination of management actions and surface-use stipulations.

Public lands are available for oil and gas leasing only after they have been evaluated through the BLM’s multiple-use/sustained-yield planning process. In areas where development of oil and gas resources would conflict with the protection or management of other resources or public land uses, mitigating measures are identified and may appear on leases as either stipulations to uses or as restrictions on surface occupancy.

Stipulations are conditions, promises, or demands that are to be made part of a lease when the environmental and planning record demonstrates the necessity for the stipulations. Stipulations, as such, are neither “standard” nor “special.” They are a necessary modification of the terms of the lease. In order to accommodate the variety of resources encountered on BLM-administered lands, these stipulations are categorized as to how the stipulation modifies the lease rights, not by the resource(s) to be protected. The specifics as to what, why, and how this mitigation/protection is to be accomplished is determined by the land management agency through the development of the RMP and through the NEPA analysis, in this case by the BLM management and staff at the Monument.

If upon weighing the relative resource values, uses, and/or users during the development of the Proposed Plan, it is determined that conflict with oil and gas operations exist that cannot be adequately managed under the BLM Standard Lease Terms (SLTs), a lease stipulation is deemed necessary. Documentation of the necessity for a stipulation is disclosed in planning documents, such as in this one, or through site-specific analysis.

Stipulations may be necessary if the authority to control the activity on the lease does not already exist under laws, regulations, and/or orders. The authorized officer, the Monument Manager (in this case), has the authority to modify the site location and design of facilities, control the rate of development and timing of activities, and require additional mitigation under Sections 2 and 6 of the SLTs (BLM Form 3100-11) and 43 CFR 3101.1-2.

Key definitions related to fluid minerals leasing stipulations are as follows:

- **Site-Specific Relocation (SSR):** Under this stipulation, the BLM may require special restrictions, including shifting a ground-disturbing activity by more than 645 feet (200 meters) from the proposed location to another location to protect a specific resource.

In oil and gas leases, this stipulation is termed Controlled Surface Use (CSU). Under a CSU stipulation, use and occupancy is allowed unless restricted by another stipulation. Identified resource values requiring special operational constraints may modify the lease rights. A CSU stipulation is used for operating guidance, not as a substitute for the NSO or for TL stipulations. The CSU stipulation is intended for application where standard lease terms and permit-level decisions are deemed insufficient to achieve the level of resource protection necessary to protect the public interest, but where an NSO stipulation is deemed overly restrictive. A CSU stipulation allows the BLM to require that

a proposed facility or activity be relocated, if necessary, to achieve the desired level of protection.

- **No Surface Occupancy (NSO):** Under this stipulation, the BLM would not allow any ground-disturbing activities related to oil and gas leases. Under a NSO stipulation, use or occupancy of the land surface for fluid minerals exploration or development is prohibited to protect identified resource values. The NSO stipulation is intended for application only when other stipulations are deemed insufficient to achieve the level of resource protection necessary to serve the public interest.
- **No Ground Disturbance (NGD):** Under this stipulation, the BLM would not allow any ground-disturbing activities.
- **Timing Limitation (TL):** Under this stipulation, the BLM may allow specified activities within the area, and/or at a proposed location, but not during certain sensitive areas (including in raptor nesting areas, bald eagle winter roosting areas, and big game winter range) and/or seasons. TL restrictions can apply to NGD/NSO and SSR/CSU areas, as well as to areas with standard restrictions and limitations. A TL stipulation prohibits surface use during specified time periods to protect identified resource values. The scope of the TL stipulation goes beyond ground-disturbing activities to encompass any source of protracted or high-intensity disturbance that may interfere with normal wildlife behavior and/or adversely affect (impact) habitat use. Typically, the limitation is applied annually for a specified period of time.

On split-estate lands (private surface lands over Federal minerals), the NGD/NSO, SSR/CSU, and TL stipulations would only be applied in relation to fluid minerals exploration and development, such as with drilling for oil and gas. This is because the BLM may regulate aspects of these activities that occur on the surface as well as those that affect the subsurface. The BLM does not regulate or manage other types of activities on split-estate lands (such as grazing, recreation, utilities rights-of-ways [ROWs], etc.).

In addition to the restrictions and limitations on surface uses and management activities outlined above, the BLM may require the use of BMPs (see Appendix E). Examples include the required use of:

- culverts at stream crossings;
- special route design and/or dust suppression techniques designed to reduce impacts resulting from aerial deposition of particulates on nearby streams and vegetation;
- biodegradable erosion-control fabrics designed to ensure soil stability and enhance revegetation;
- fences designed to exclude livestock from sensitive habitats; and/or
- specialized revegetation that uses only native species and, possibly, requires woody plants (trees and shrubs) to be included in the seed mix and/or planted as containerized stock ("tubelings").

These measures, as well as the protective stipulations and restrictions cited above, would be applied to oil and gas development, as well as to other resource activities, as appropriate.

4.2. Resources

The following impact analysis includes the evaluation of all resources and resource uses. Cultural resources, fluid minerals, rangelands, recreation, and transportation are the resources, and resource uses, that would result in the most impacts within the Monument; therefore, these

resource/resource uses are the focus of this analysis. Each resource is discussed in the same order as it is presented in Chapter 3, Affected Environment.

4.2.1. Air Quality

The primary goal of air quality management is to protect air quality within, and adjacent to, the Monument. The management objectives related to this goal are to:

- ensure that the air quality within the Monument meets State and Federal air quality standards and regulations;
- protect visibility at scenic and important vistas located within the Monument; and
- cooperate with the State of Colorado, the National Park Service (NPS), and the U.S. Forest Service (USFS) with regard to air quality issues at nearby Federal Class I (Clean Air Act) areas (Mesa Verde National Park and the Weminuche Wilderness Area).

Under the FLPMA and the Clean Air Act, the BLM cannot conduct or authorize any activity that does not conform to all applicable local, county, State, Native American tribal, and other Federal air quality laws, statutes, regulations, standards, policies, and implementation plans. Therefore, an extensive air quality impact assessment, based upon atmospheric dispersion modeling, was conducted to analyze potential impacts. In comparison to oil and gas drilling and production (including CO₂), other management actions considered throughout this analysis are expected to result in extremely minor impacts to air quality. The modeled impacts, therefore, incorporate parameters for the maximum estimated oil and gas development (as described under Alternative IV, DRMP/DEIS) over a 20-year period, as characterized in the RFD (BLM 2005c). This analysis was applied to all action alternatives, including the Preferred Alternative and the Proposed Alternative.

Atmospheric dispersion models, including the one used for this environmental impact analysis, are computer programs designed to simulate how pollutants in the ambient atmosphere disperse and, in some cases, how they react in the atmosphere. The dispersion models are used to estimate, or to predict, the downwind concentration of air pollutants emitted that can impact ambient air quality. The dispersion models require the input of data that includes:

- meteorological conditions (such as wind speed and direction), the amount of atmospheric turbulence, the ambient air temperature, and the height to the bottom of any inversion aloft that may be present;
- emissions parameters (such as source location and height), source vent-stack diameter and exit velocity, exit temperature, and mass-flow rate;
- terrain elevations at the source location and at the receptor location; and
- location, height, and width of any obstructions (such as buildings or other structures) in the path of the emitted gaseous plume.

AERMOD, the EPA-approved atmospheric dispersion model used in this analysis, is an integrated system that includes three modules:

- a steady-state dispersion model designed for short-range (up to 50-kilometers) dispersion of air pollutant emissions from stationary industrial sources;
- a meteorological data preprocessor (AERMET) that accepts surface meteorological data, upper air soundings and, optionally, data from onsite instrument towers (which then calculates atmospheric parameters needed by the dispersion model, such as atmospheric turbulence characteristics, mixing heights, friction velocity, etc.); and

- a terrain preprocessor (AERMAP) whose main purpose is to provide a physical relationship between terrain features and the behavior of air pollution plumes (which generates location height data for each receptor location and provides information that allows the dispersion model to simulate the effects of air flowing over hills or splitting to flow around hills).

This analysis compares potential air quality impacts under Alternative IV to applicable air quality standards, prevention of significant deterioration (PSD) increments, significant impact levels (SILs), and air quality related values (AQRVs). However, it does not represent a regulatory air quality permit analysis. Comparisons to the PSD Class I and Class II increments are intended to evaluate a “threshold of concern” for potentially significant direct project impacts; however, they do not represent a cumulative regulatory PSD Increment Consumption Analysis. Such a regulatory PSD increment analysis is the responsibility of the State air quality agency (under EPA oversight), and would be conducted during the permitting process.

AERMOD was used to evaluate both direct project and cumulative Class I increment impacts and deposition AQRV analyses at Mesa Verde National Park (the closest Class I area). VISCREEN (a model that calculates the impact of specified emissions for specific transport and dispersion conditions) was used to evaluate visibility impacts. (This air quality analysis is described in Appendix J, including all accepted criteria and parameters, as well as complete methodology and results.)

All dispersion models, regardless of their level of complexity, are mathematical approximations of the behavior of the atmosphere. Therefore, especially given the uncertain nature of the number and potential location of sources under the analyzed alternatives, the results need to be appropriately viewed as estimates of possible future concentrations and not as exact predictions in time and space.

Generally, dispersion modeling is conducted using assumptions that ensure that the modeled results do not underestimate actual future impacts, so that appropriate planning decisions can be made. For example, sources may be assumed to operate for longer periods or emit more pollutants than actual conditions to ensure that health-based standards are protected. On the other hand, analyses are not conducted assuming “worst-case” conditions across the board, because this typically leads to results that are unreasonable and unrealistic. Hence, dispersion modeling uses the best available information and methods (EPA-approved models, emission factors, etc.) when possible, combined with the best scientific and professional judgment in an attempt to ensure that projections of future air quality are neither under-predicted nor unrealistically over-predicted.

4.2.1.1. Evaluation Criteria and Assumptions

Potential air quality impacts were analyzed to determine maximum “near-field” (local or Class II) ambient air pollutant concentrations and hazardous air pollutant impacts. Potential air quality impacts were also analyzed to determine maximum “far-field” (regional or Class I) impacts on ambient air pollutant concentrations, visibility, and atmospheric deposition of sulfur and nitrogen (“acid rain” constituents). This section describes the results for modeling of near-field and far-field air quality within the Monument based upon the maximum expected oil and gas development during the 20-year period of analysis.

Near-field and far-field air quality parameters, grouped by Class I and Class II analyses, were inventoried and analyzed and are described below.

Near-Field (Class II)

- Criteria Pollutant Emissions (National Ambient Air Quality Standard (NAAQS) and PSD increments): NO_x (including NO₂), CO, SO₂, PM₁₀, and PM_{2.5}
- Hazardous Air Pollutants (HAPs): formaldehyde

Far-Field (Class I)

- Emissions of Criteria Pollutants (NAAQS and PSD increments): NO_x (including NO₂), CO, SO₂, PM₁₀, and PM_{2.5}
- Visibility
- Sulfur and nitrogen deposition

For this analysis, it is assumed that all fluid minerals companies operating within the Monument are in compliance with current standards. However, some fluid minerals operations have been in existence for a long time; therefore, out-of-date equipment may not meet current standards. Monument staff continues to work with companies to bring them into compliance, which is an administrative issue outside of the scope of this PRMP/FEIS.

For this PRMP/FEIS, two inventories of air emissions were developed. The project inventory considered foreseeable oil, natural gas, and CO₂ development activities within the Monument, and includes air emissions from both construction and production operations. The cumulative inventory considered emissions from other existing sources and reasonably foreseeable future sources within the study area that are not already represented in the background air quality and AQRV data (such as sources that were not in operation as of the end date of the monitoring data, which was December 2004). The cumulative inventory area has been defined as the region within 31 miles (50 km) from the center of the Monument (approximate Universal Transverse Mercator [UTM] coordinates of 685 km E and 4145 km N, Zone 12, NAD83).

The cumulative inventory also addressed existing production emission sources within the Monument. The maximum historical natural gas compression capacity within the Monument is known to be approximately 1,000 hp; therefore, emissions for three 350-hp compressors were modeled to conservatively represent existing natural gas production (along with one new 350-hp compressor to represent increased project natural gas production). The estimated project oil production rates are five times greater than current oil production rates; equal to the historical maximum annual production rates for the Monument. Many of the new oil wells would replace exhausted wells that cease production during the 20-year period. Therefore, the project oil production emissions (including fugitive emissions from oil haul trucks and well servicing) effectively include existing oil production emissions. Finally, because existing CO₂ compression is electrical (with power provided by the utility grid), there are no significant existing CO₂ production emissions.

This section on air quality concludes with a consideration of the role of this proposed development scenario within the context of global warming.

4.2.1.2. Alternative Analysis

The model used to determine air quality impacts was based upon the alternative with the most potential oil and gas development, which is Alternative IV (see the DRMP/DEIS). The results of the modeling, however, are being used to discuss impacts resulting from all of the action alternatives, including the Preferred Alternative and the Proposed Plan. These alternatives propose less development than Alternative IV does; therefore, impacts are assumed to be less than those modeled.

Alternative I (No Action Alternative)

Under Alternative I (the No Action Alternative), the existing air quality and climate conditions described in Section 3.1.1, would continue, based on continuing current management.

Preferred and Proposed Alternatives

The following discussion summarizes air quality modeling results for maximum assumed oil and gas development (see Alternative IV in the DRMP/DEIS). Modeled direct and cumulative impacts are added to these background concentration values. The air quality impacts resulting from the project and offsite cumulative impacts were compared to EPA Class I and II Area SILs, PSD Class II increments, and State of Colorado Ambient Air Quality Standards (AAQs) and National Ambient Air Quality Standards (NAAQs).

The nearest Class I area to the Monument is Mesa Verde National Park, which is located approximately 25 miles (40 km) east of the locations in the Monument where development may occur. The next closest Class I area is the Weminuche Wilderness Area, which is located approximately 70 miles (112 km) from the Monument. Given the close proximity of Mesa Verde National Park, versus the other Class I areas, it is highly likely that the Class I impacts of the project will be the greatest at Mesa Verde National Park. Therefore, the Class I analysis was only performed for Mesa Verde National Park.

Criteria Pollutants: Assessment of Class II Air Quality Impacts

Table 4-1 summarizes air quality standards and increments, SILs, and AQRV criteria against which modeled results are compared. A summary of total project emissions, which includes construction and production direct and indirect emissions for CO₂ development and oil and gas development, is presented below in Table 4-3.

The air quality analyses compare the predicted direct project and cumulative air impacts to the Class II SILs, PSD Class II increments, and to State AAQs and NAAQs.

The EPA and the State of Colorado have established SILs to define an impact level that is considered “insignificant” and that does not warrant further review. Under the PSD review process, a project that demonstrates, via modeling, that project-only emissions result in impacts that are less than the established SILs is exempt from additional modeling analysis for that pollutant. For this NEPA air quality analysis, the PSD review criteria are not directly applicable. However, the direct project impacts are compared to the Class II SILs in Table 4-3 to evaluate the relative magnitude of the impacts. The NO₂, PM₁₀, and SO₂ impacts are greater than the Class II SILs.

The direct project impacts (excluding temporary construction sources) were also evaluated in comparison to the Class II PSD increments, and these results are presented in Table 4-4. This increment analysis is for information purposes only, and does not represent a cumulative regulatory PSD Increment Consumption Analysis. Such a regulatory PSD increment analysis is the responsibility of the State air quality agency (under EPA oversight), and would be conducted during the permitting process. The impacts are all less than the Class II PSD increments.

Finally, the model-predicted direct project and cumulative impacts were added to the background data and then compared to the NAAQs in Table 4-5. The impacts are all less than the applicable NAAQs.

Hazardous Air Pollutant Analysis Result

The Hazardous Air Pollutant (HAP) analysis evaluated the formaldehyde direct project impacts for both short-term (acute) and long-term (chronic) exposure assessment, as well as evaluated formaldehyde cancer risks.

Formaldehyde emissions for both the construction and production phases were modeled. The modeling methodology used the same near-field source layout and receptor configuration previously described in Section 3.4. The maximum modeled hourly formaldehyde concentration was 16.9 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), and the maximum annual average concentration was $0.116 \mu\text{g}/\text{m}^3$.

The short-term analysis evaluated modeled impacts against the EPA Acute Exposure Guideline Level (AEGL) Level-1, 1-hour concentration threshold for formaldehyde of 0.90 ppm, which is equivalent to $1,107 \mu\text{g}/\text{m}^3$. The maximum modeled 1-hour concentration is 1.5 percent of the AEGL concentration.

The long-term analysis evaluated modeled annual impacts against a chronic threshold of concern. The EPA has not established a long-term reference concentration (or proper functioning condition [PFC]) for formaldehyde. However, the Agency for Toxic Substances and Disease Registry (ATSDR) has established a chronic inhalation minimal risk level (MRL) of 0.003 ppm, which is equivalent to $3.7 \mu\text{g}/\text{m}^3$ (ATSDR 1997). The MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health impacts over a specified duration of exposure. The maximum modeled annual concentration is 3.1 percent of the MRL concentration.

The incremental risk analysis considered exposure over a 70-year lifetime, using EPA's unit risk factor (ATSDR 1997b) for formaldehyde (1.3×10^{-5}). The most likely exposure (MLE) scenario was considered. The duration of exposure for the MLE scenario is assumed to be 50 years, to represent the project (well field) lifetime, corresponding to an exposure adjustment factor of $50/70 = 0.71$. A second adjustment can be made for time spent at home, versus time spent elsewhere; however, the MLE scenario assumes that the individual is at home 100 percent of the time, for a final MLE adjustment factor of $(0.71 \times 1.0) = 0.71$. To calculate the excess cancer risk, the maximum annual predicted formaldehyde concentration was multiplied by the adjustment factors, and then multiplied by the unit risk factor. The resulting estimated cancer risk is 1.07×10^{-6} , which is at the very low end of the generally accepted cancer-risk range of 1×10^{-6} to 100×10^{-6} as presented in the "Superfund" National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300).

Criteria Pollutants: Assessment of Class I Air Quality Impacts

The Class I air quality impact analyses compare the predicted direct and cumulative air impacts of the project to the Class I SILs, PSD Class I increments, and AQRV threshold values.

The EPA and the State of Colorado have established Class I SILs to define an impact level for Class I areas that is considered "insignificant" and that does not warrant further review under the PSD permitting process. For this NEPA air quality analysis, the PSD review criteria are not directly applicable. However, the direct project impacts are compared to the Class I SILs in Table 4-6 in order to evaluate the relative magnitude of the impacts. The 24-hr PM_{10} , 3-hr SO_2 , and annual NO_2 impacts are greater than the Class I SILs.

Table 4-2 Summary of Project Emissions			
Project Maximum Annual Emissions			
Constituent	Construction Emissions (tpy)	Production Emissions (tpy)	Total Emissions (tpy)
NO _x	215.3	144.7	360.0
CO	48.7	183.9	232.6
SO ₂	14.5	0.2	14.7
PM ₁₀	41.8	55.0	96.8
PM _{2.5}	18.7	9.3	28.0
VOC	22.4	1671.9	1694.3
Formaldehyde	7.9	2.4	10.3

Table 4-3 Comparison of Direct Project Impacts to Class II SILs				
Pollutant (Averaging Interval)	Project Near-Field Maximum (µg/m ³)	Project Mid-Field Maximum (µg/m ³)	Class II SIL (µg/m ³)	Greater than SIL?
CO (1-hour)	357	802	2000	No
CO (8-hour)	184	147	500	No
NO _x (Annual)	20.5	3.7	1	Yes
PM ₁₀ (24-hour)	70.6	28.3	5	Yes
PM ₁₀ (Annual)	12.6	3.9	1	Yes
SO ₂ (3-hour)	94.5	12.5	5	Yes
SO ₂ (24-hour)	26.9	2.7	25	Yes
SO ₂ (Annual)	3.6	0.2	1	Yes

Table 4-4 Comparison of Project and Cumulative Impacts to Class II PSD Increments						
Pollutant (Averaging Interval)	Project Near-Field Maximum ($\mu\text{g}/\text{m}^3$)	Project Mid-Field Maximum ($\mu\text{g}/\text{m}^3$)	Cumulative Mid-Field Maximum ($\mu\text{g}/\text{m}^3$)	Overall Maximum ($\mu\text{g}/\text{m}^3$)	Class II PSD Increment ($\mu\text{g}/\text{m}^3$)	Percent (%) Increment
NO_x (Annual)	20.0	1.7	4.9	20.0	25	80%
PM₁₀ (24-hour)	0.47	28.0	29.5	29.5	30	98%
PM₁₀ (Annual)	0.11	3.6	4.0	4.0	17	23%
SO₂ (3-hour)	0.078	0.037	11.5	11.5	91	13%
SO₂ (24-hour)	0.025	0.0051	2.9	2.9	512	1%
SO₂ (Annual)	0.004	0.0005	0.3	0.3	20	1%

Table 4-5 Comparison of Project and Cumulative Impacts to NAAQS								
Pollutant (Averaging Interval)	Project Near-Field Maximum (µg/m³)	Project Mid-Field Maximum (µg/m³)	Cumulative Mid-Field Maximum (µg/m³)	Overall Maximum Impact (µg/m³)	Background Concentration (µg/m³)	Total Concentration (µg/m³)	NAAQS (µg/m³)	Percent (%) of NAAQS (µg/m³)
CO (1-hour)	357	802	1613	1612.8	2288	3901.2	40000	10%
CO (8-hour)	184	147	300	300.5	1831	2131.1	10000	21%
NO_x (Annual)	20.5	3.7	6.8	20.5	16.9	37.4	100	37%
PM₁₀ (24-hour)	70.6	28.3	30.1	70.6	64.0	134.6	150	90%
PM₁₀ (Annual)	12.6	3.9	4.3	12.6	21.0	33.6	50	67%
PM₂₅ (24-hour)	29.7	5.9	6.7	29.7	22.5	52.2	65	80%
PM₂₅ (Annual)	4.3	0.8	0.9	4.3	6.9	11.2	15	75%
SO₂ (3-hour)	94.5	12.5	12.6	94.5	68	162	365	45%
SO₂ (24-hour)	26.9	2.7	2.9	26.9	21	48	1300	4%
SO₂ (Annual)	3.6	0.2	0.3	3.6	5	8.8	80	11%

Pollutant (Averaging Interval)	Project Maximum ($\mu\text{g}/\text{m}^3$)	Class I SILs ($\mu\text{g}/\text{m}^3$)	Greater than SIL?
NO_x (Annual)	0.15	0.1	Yes
PM₁₀ (24-hour)	1.1	0.3	Yes
PM₁₀ (Annual)	0.1	0.2	No
SO₂ (3-hour)	0.5	0.2	Yes
SO₂ (24-hour)	0.1	1.0	No
SO₂ (Annual)	0.01	0.1	No

The direct project impacts (excluding temporary construction sources) were also evaluated in comparison to the Class I PSD increments, and these results are presented in Table 4-8. This increment analysis is for information purposes only, and does not represent a cumulative regulatory PSD Increment Consumption Analysis. The impacts are all substantially less than the Class I PSD increments.

Pollutant (Averaging Interval)	Project Maximum ($\mu\text{g}/\text{m}^3$)	Cumulative Maximum ($\mu\text{g}/\text{m}^3$)	Overall Maximum ($\mu\text{g}/\text{m}^3$)	Class I PSD Increment ($\mu\text{g}/\text{m}^3$)	Percent (%) Increment
NO_x (Annual)	0.034	0.360	0.360	3	14
PM₁₀ (24-hour)	1.02	1.020	1.020	10	10
PM₁₀ (Annual)	0.07	0.162	0.162	5	3
SO₂ (3-hour)	0.00061	0.967	0.967	5	19
SO₂ (24-hour)	0.00008	0.126	0.126	25	0.5
SO₂ (Annual)	0.00001	0.017	0.017	2	0.8

Visibility: Assessment of Class I Air Quality Impacts

Direct and cumulative visibility impacts were determined using VISCREEN Level 1 with a “virtual point source” approach to better account for the geographic separation of emissions. The total project emissions (peak construction plus full production) were input to VISCREEN to conservatively assess visibility impacts. Model results indicate that impacts are less than those for the screening criteria. (See Appendix J for complete VISCREEN input and output results for the Monument analysis.)

The cumulative visibility analysis also used VISCREEN to assess impacts for other cumulative sources (with distances adjusted, as necessary, to account for geographic separation of emission units at each source). The only cumulative source outside of the Monument was a

project in the Monticello Field Office (Utah); therefore, that project was modeled using an actual distance of 53 miles (85 km) added to a virtual point-source increase in downwind distance of 80 km (50 miles). These results indicate that impacts are less than the screening criteria (see Appendix J). Conservatively adding the Monument and the Monticello impacts together to estimate cumulative impacts still results in cumulative visibility impacts less than the screening criteria.

Sulfur and Nitrogen Deposition: Assessment of Class I Air Quality Impacts

Direct and cumulative Class I deposition impacts were determined using the Level 1 method described in Section 5.1.3 of the “Interagency Workshop on Air Quality Modeling (IWAQM) Phase 1 Recommendations” (1993). This method uses the maximum modeled project and cumulative PSD increment concentrations at Mesa Verde National Park, along with the conservative assumption that all SO₂ and NO_x are converted and deposited. Table 4-8 compares deposition impacts to USFS levels of concern, which are defined as 5 kilograms per hectare per year (kg/ha-yr) for sulfur, and 3 kg/ha-yr for nitrogen. All direct project deposition impacts, and cumulative sulfur deposition impacts, are less than the levels of concern. The cumulative nitrogen deposition impact is greater than the level of concern; however, this is likely the result of the extremely conservative methodology used in this deposition analysis.

Table 4-8 Sulfur and Nitrogen Deposition Impacts				
	Direct Project Sulfur Deposition (µg/m³)	Direct Project Nitrogen Deposition (µg/m³)	Cumulative Sulfur Deposition (µg/m³)	Cumulative Nitrogen Deposition (µg/m³)
SO₂ PSD Class I Annual Concentration (µg/m³)	0.00971	NA	0.017	NA
NO₂ PSD Class I Annual Concentration (µg/m³)	NA	0.034	NA	0.360
Mole Weight Adjustment Factor	0.5	0.30	0.5	0.30
Number seconds/year (µ)	3.1536E(+07)	3.1536E(+07)	3.1536E(+07)	3.1536E(+07)
Deposition Velocity	0.005	0.05	0.005	0.05
Dry Deposition (kg/ha-yr)	0.05	1.1	0.09	12.1
Effects Threshold (kg/ha-yr)	5.0	3.0	5.0	3.0

Global Climate Change

Several activities occur within the planning area that may generate GHG emissions. Oil and gas development, large fires, and recreation using combustion engines, can potentially generate CO₂ and methane. However, the assessment of so-called “greenhouse gas” emissions and climate change is in its formative phase; therefore, it is not yet possible to know with confidence the net impact to climate. However, the Intergovernmental Panel on Climate Change (IPCC 2007) recently concluded that “warming of the climate system is unequivocal” and “most of the observed increase in globally average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic [man-made] greenhouse gas concentrations.”

The lack of scientific tools designed to predict climate change on regional or local scales limits the ability to quantify potential future impacts. However, potential impacts to air quality due to

climate change are likely to be varied. For example, if global climate change results in a warmer and drier climate, increased particulate matter impacts could occur due to increased windblown dust from drier and less stable soils. Cool season plant species' spatial ranges are predicted to move north and to higher elevations, and extinction of endemic threatened/endangered plants may be accelerated. Due to loss of habitat, or due to competition from other species whose ranges may shift northward, the population of some animal species may be reduced. Less snow at lower elevations would be likely to impact the timing and quantity of snowmelt, which, in turn, could impact aquatic species.

4.2.1.3. Cumulative Impacts

The cumulative impacts to air quality, including visibility and sulfur and nitrogen deposition, are discussed in detail throughout section 4.2.1.2 above. An emissions inventory of existing sources and other reasonably foreseeable future sources within the study area was created for the cumulative analysis. The AERMOD and VISCREEN models were then used to evaluate cumulative impacts in addition to project impacts. As presented in Tables 4-4, 4-6, and 4-8 above, cumulative impacts of the Action Alternatives do not exceed the NAAQS, PSD Class I or Class II increments, or visibility screening criteria. However, as presented in Table 4-8, the cumulative impacts of the Action Alternatives are predicted to be greater than the level of concern for nitrogen deposition. Again, it should be noted that this is likely attributable to the conservative nature of the method used in the deposition analysis.

4.2.2. Cultural Resources

The primary goals of cultural resources management within the Monument are to identify, preserve, and protect significant cultural resources to ensure long-term public benefits, including those resulting from research, education, and preservation of cultural heritage (FLPMA Sections 103(C), 201 (A), 202 (C); the National Historic Preservation Act [NHPA] Sections 106 and 110; the Archaeological Resources Protection Act [ARPA] of 1979, Section 14(a); and the Antiquities Act of 1906 (Section 2)). The management objectives related to this goal include:

- allocate all cultural resources currently recorded, and/or projected to occur on the basis of existing data synthesis, to uses according to their nature and relative preservation value;
- inventory, document, and evaluate cultural resources to facilitate proper management, protection, and research; and
- cooperate with Hovenweep National Monument (NPS) in relation to the protection and management of cultural resources.

It is also the goal of cultural resources management to ensure that the objects of the Monument are protected at the landscape level, and that all multiple-use resource management and authorizations for land and resource uses are conducted in compliance with Sections 106 and Section 110 of the NHPA, as amended. The management objectives related to this goal include:

- manage and protect cultural resources on a landscape level;
- manage multiple-uses to ensure the protection of cultural resources, in compliance with Section 106 of the NHPA;
- manage cultural resources for their protection and preservation, as well as for the realization of BLM cultural use allocations (Section 110 of NHPA);
- preserve the existing character of the cultural and physical landscape to the maximum extent possible;

- encourage, foster, and conduct scientific research on cultural resources within the Monument;
- manage all Monument/Anasazi Heritage Center (AHC) collections in compliance with 36 CFR Part 79; U.S. Department of the Interior (USDOI) Departmental Manual, Part 411; and USDOI Museum Property Handbook, 411 DM, Vols. I-II; and
- ensure sensitive stewardship and management of traditional cultural heritage values associated with cultural resources and landscapes.

The following assumptions are implicit to the above-stated management objectives:

- There will continue to be subsurface discoveries of cultural resources throughout the planning area.
- There is a direct correlation between the number of sites that are potentially impacted by undertakings and the frequency, location, and nature of disturbance.
- There is a direct relationship between the amount of human use in an area and the potential for cultural resources to be impacted.
- Protection of cultural resources will be in accordance with State Historic Preservation Office (SHPO) coordination requirements; and with input from local publics, interested parties, and Native American tribes; as well as with all applicable Federal regulations.

Under the Proposed Plan, the cultural resource program would be involved in all Monument projects, as required by Section 106 of the NHPA. Prior to any Federal undertaking within the planning area, the BLM must consider impacts to heritage and cultural resources.

Archaeological sites are non-renewable resources that would lose integrity, heritage value, and potentially important information if destroyed or altered. The first priority for sites eligible to the National Register of Historic Places would be to avoid these sites, and to protect these sites from direct, indirect, and cumulative impacts. When avoidance is not possible, treatments designed to minimize or mitigate negative impacts may include project relocation, redesign or modification, physical protection measures (including fencing or padding), stabilization, restoration, rehabilitation, documentation, monitoring, repair, and data recovery. Any treatment of an eligible site must be consistent with Federal standards, guidelines, policies, and directions.

Under the Proposed Plan, the cultural resource program would continue to include proactive inventory, documentation, analysis, preservation, monitoring, stabilization, research, stewardship, and public interpretation and education. Positive (beneficial) impacts may result from minimizing or preventing surface disturbance and by avoiding archaeological sites, as well as through the use of measures designed to protect sites. Another goal of cultural resources management is to uphold Native American trust responsibilities and to accommodate traditional uses within the Monument. The management objective related to this goal is to develop a policy, in consultation with Native American tribes that specifies how the Monument would provide products for traditional cultural use.

The concept of “positive” or “beneficial” impacts is not contained within NHPA; however, Monument management and staff recognize that positive impacts may result from proactive management actions (including minimizing and/or preventing surface disturbance, avoiding archaeological sites, and/or taking measures designed to protect sites from disturbance). Generally, negative impacts result from ground-disturbing activities that damage archaeological sites and/or that disrupt cultural landscapes, thereby reducing their informational potential. Direct impacts to cultural resources may include ground disturbance that disrupts or removes soil-containing artifacts and/or other cultural materials, disturbance of cultural features, and disturbance of above-ground structural remains and/or rock art. Impacts occur as a result of the

public accessing areas with cultural resources, which may, in turn, result in inadvertent damage, as well as in vandalism and looting. Erosion, resulting from livestock grazing, recreation, and/or other means of surface disturbances, may also result in negative impacts to cultural resources.

Cultural resources management within the Monument is dictated by Section 106 of the NHPA, which requires Federal agencies to take into account the impacts of their actions on eligible historic properties. Sites that have the potential of incurring direct impacts would be avoided or would be protected, whenever possible. If protection or avoidance is not possible, the negative impacts would be mitigated through an appropriate method of scientific investigation.

The impacts of livestock grazing on cultural resources vary, due to the non-uniform grazing patterns that occur as a result of differences in terrain, forage abundance and preference, soil attributes, and/or cultural resource type and distribution. Livestock grazing may result in impacts to cultural resources, in that cultural deposits may be trampled, trails through sites may be created, and masonry walls may experience damage from livestock rubbing against them. A cultural resource inventory for the Monument found that 40 percent of sites within the study area sustained minor damage from livestock (Hovezak et al. 2003). Cultural sites located at, or near, water sources, fence lines, and/or in shaded areas, where livestock congregate, are most likely to result in heavy damage.

Recreational use within the Monument may result in unintentional damage to cultural resources that, although individually minor, may accumulate and result in negative impacts over time. Examples of such impacts include those resulting from the collection of rocks/stones from cultural sites to create fire rings; the construction of campfires in cultural deposits; the creation of trails through sites (which, in turn, may accelerate erosion); visitors sitting, standing, and/or climbing on walls; people shooting rock art panels; and the relocation of artifacts through the creation of “collector’s piles.”

Impacts from fire vary, depending upon the extent, intensity, and duration of the fire, as well as upon the type of resource(s) that are burned. Examples of such impacts include the total loss of flammable site elements; spalling (which is the spontaneous chipping, fragmentation, and/or separation of a surface or surface coating) of rock faces; the alteration of time-dating potential; and post-fire erosion. Disturbance to cultural resource sites may also result from fire suppression activities, such as from ground disturbance associated with the creation of hand lines and/or the use of mechanized equipment.

4.2.2.1. Evaluation Criteria and Assumptions

Most direct impacts to cultural resources result from surface disturbances; therefore, the number of acres of disturbance is the primary parameter for the comparison of impacts. Estimates of surface disturbance areas associated with potential management actions were calculated using data from the AMS (BLM 2005b) and the RFD (BLM 2005c), and are summarized in Table 4-1. Proposed surface-use stipulations and other restrictions are listed and summarized in Appendix K. In some instances, when impacts cannot be quantified, a descriptive, qualitative analysis is used. (NOTE: Since cultural resource professionals do not all concur with our definition of cultural “communities” where this concept was used in the DRMP/DEIS, the concept is now referred to as settlement clusters. A definition of settlement cluster is included in the text of this Proposed Plan, as well as in the Glossary).

Assumptions used in analyzing impacts to cultural resources include the following:

- The potential total number of cultural sites within the Monument is estimated using the total number of sites recorded to date (5,157), which is averaged for the number of acres surveyed to date. The resulting average site density is 112 known sites per square mile

(mi²) [one site per 5.72 acres], or a total of 28,671 sites. This assumption is used in the analysis, with the acknowledgment that cultural sites do not occur uniformly across the Monument.

- The word adverse holds specific meaning when tied to cultural resource impacts under Section 106 of the NHPA; therefore, for this section, impacts will be referred to as negative. The concept of positive or beneficial impacts is not contained within NHPA; however, Monument management and staff recognize that positive effects may result from proactive management actions.
- Quantitative assessments of impacts to cultural resources resulting from Special Recreation Management Area (SRMA) acreages, and the average number of cultural resource sites per acre, are used.
- For the purpose of comparing alternatives, no distinction is made between motorized (paved and natural surface), mechanized, and non-motorized route width when it comes to calculating acres of disturbance and their impacts to cultural resources.
- The method used to measure impacts to cultural resources related to the transportation (travel management) system within the Monument incorporates the BLM protocol regarding NHPA Section 106 requirements for comprehensive travel and transportation management planning. The protocol defines the area of potential effect (APE) of a road as a 100-foot-wide corridor (i.e., 50 feet on each side of the centerline).
- Not all existing routes were surveyed for cultural resources prior to their construction; therefore, the number of cultural sites originally impacted by these routes is unknown.
- New surface disturbance (undertakings) must meet the requirements of NHPA Section 106 compliance by taking into account the potential impacts on cultural resources. Potential disturbance attributed to new fluid minerals development may require application of specific cultural resource stipulations. Old disturbances (such as existing routes) were mostly in place prior to Section 106; therefore, it is likely that impacts to cultural resources have already occurred. Calculations for both new and old ground disturbances are used in a relative sense to compare alternatives.
- It is assumed that all routes planned for new oil and gas leases would be new routes.
- It was not possible to determine the number of sites that could be impacted by livestock grazing and range management. Impacts were assumed to accrue in proportion to the relative number of active AUMs available under each analyzed alternative.
- Potential impacts resulting from fuels and fire management actions could not be quantified; therefore, they were compared on the basis of which action alternative would provide greater, or lesser, degrees of protection to cultural resources.
- Federal lands within the boundary of the Monument were used as the impacts analysis area.
- Watersheds associated with the Monument were used as the cumulative impacts analysis area.

4.2.2.2. Alternative Analysis

Impacts to cultural resources within the Monument may differ depending upon specific management actions proposed under each alternative. The following sections describe the impacts anticipated from the management actions proposed for cultural resources, as well as

those from the actions proposed for fluid minerals, livestock grazing, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Cultural Resources Management

Under Alternative I, cultural resources would continue to be protected under the NHPA Section 106 compliance requirements. Some would be developed for visitation and interpretation. Currently, 5 cultural sites have been developed for public use. Opening sites to public visitation may result in positive impacts, in that site interpretation may help educate the public about the importance of cultural resources. However, visitation may also create the potential for physical damage to cultural sites, because trampling, soil compaction, and erosion may increase. Some of this visitor-caused damage may be prevented, or lessened, through management techniques such as rerouting or hardening routes, controlling access, and stabilization. Within the Monument, 240 sites are identified as needing stabilization and/or repair.

Alternative I would allow research on cultural resources by qualified institutions and individuals. Development of research goals, research requirements, and the evaluation of investigation-initiated research would be conducted by Monument staff.

Fluid Minerals Management

Fluid minerals development would result in both direct and indirect impacts to cultural resources. New fluid minerals development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance which could impact up to 347 cultural resource sites.

Under the No Action Alternative (Alternative I), areas currently not leased for fluid minerals development would remain unavailable for new fluid minerals leases; therefore, no impacts would occur from new leases.

Guidelines for geophysical surveys would include the following additional protective measures for cultural resources: 1) explosives would be kept at least 645 feet (200 meters) from standing walls and would have a maximum of a 20- to a 40-pound charge to minimize impacts from concussion and vibration; and 2) bulldozers and other earth-moving equipment would be allowed, but would generally be limited to maintenance and/or to the repair of existing routes.

Cultural resources would continue to be managed under NHPA Section 106 compliance requirements to protect sites eligible to the National Register of Historic Places (NRHP). This alternative would not protect the landscape setting or the relationship of individual sites to one another. Disrupting the setting of sites may result in the loss of information related to settlement patterns, the interaction of sites in settlement clusters, and other aspects of Ancestral Pueblo lifestyle.

Livestock Grazing Management

Under Alternative I, livestock grazing is based upon 8,492 active AUMs. Ninety-seven percent of Monument lands fall within grazing allotments under this alternative. Livestock grazing would continue to be administered in accordance with BLM Instruction Memorandum No. CO-2002-029, Interim Historic Preservation Guidelines and Procedures for Evaluating the Effect of Rangeland Management Activities on Historic Properties (BLM 2002b). Existing conditions would be analyzed and, when necessary, additional inventories and site monitoring would be conducted to determine impacts to sites. Impacts to cultural resources may be addressed by management techniques such as livestock grazing reductions and/or increased controlled

grazing. Adverse impacts, including trampling, soil compaction, and/or erosion may occur at a small number of sites where livestock concentrate. Where livestock do not congregate, a large number of sites may exhibit these same impacts, but to a lesser degree. The number of sites impacted and the degree to which impacts occur may vary according to the location of the site(s), the type of site(s), and the movements/habits of livestock within the allotment where the site(s) are located.

Recreation and Transportation Management

The No Action Alternative would continue to allow dispersed recreational camping throughout the Monument. Few restrictions, with regard to camping, campfires, geocaching, and/or rock climbing, would be put in place under the No Action Alternative. This type of recreational use (which includes the clearing of campsites, the development of trails, the construction of campfires, etc.) would have the potential to impact all of the 28,671 cultural resource sites estimated to be present within the Monument. Under this Alternative, impacts would continue to result from trampling, soil compaction, erosion, and increased looting. The magnitude of such impacts may be low, however, given the remote nature of much of the Monument and the level of dispersed camping that occurs.

Under Alternative I, the transportation system would include up to 149 miles of routes. Using the area of potential effect (APE) measurements, there may be the potential for direct and indirect impacts to up to 151 cultural resource sites. These figures are based on the 1985 RMP decision. The 2000-2002 transportation inventory recorded 213 miles of routes and 1,235 acres of disturbance. This situation indicates that up to 215 sites are potentially being impacted at this time.

Based on current trends, an increase in the number of user-created routes may be anticipated. This is because under this alternative, a Travel Management Plan would not be written; therefore, no official travel map or associated travel guidance would be provided. The public may be confused regarding authorized means of travel and travel routes. Illegal cross-country travel, and/or travel on unauthorized routes, may result in damage to cultural resource sites.

Other Resources Management

Under Alternative I, suppression of wildfires would be guided by a number of fire management zones (FMZs), which offer varying degrees of protection to cultural resources. The focus on fire suppression is intended to protect cultural resources. However, indirect impacts of fire suppression may result in a build-up of fuels (such as an increase in dead-and-down trees), which, in turn, may increase the risk of larger wildfires (see Map 6).

Current management has few requirements regarding the proximity of mechanical fuels management or prescribed fires to cultural resources. If these activities occur in, or near, cultural sites, direct damage may occur. Under the No Action Alternative, motorized equipment would be permitted during fire-suppression activities if a cultural resource specialist is present to monitor ground-disturbing activities. Prescribed fire activities would be required to clear areas in accordance with Section 106 compliance requirements. Inadvertent damage to cultural sites resulting from the use of heavy equipment may occur. Prescribed fire activities may result in small areas of intense heat (such as when brush piles are burned). Rock spalling caused by the heat and sooting associated with prescribed fire activities may impact rock art and architectural/structural site components.

Alternative V (Preferred Alternative)

Cultural Resources Management

Cultural resources would continue to be managed under the NHPA Section 106 compliance requirements. In addition, this alternative would emphasize the protection of cultural resources on a landscape scale and the protection of settlement clusters and individual sites. This alternative would emphasize how sites relate to one another and to their setting. This would provide important information regarding the relationship of sites to topography and views, to settlement patterns, to the interaction of sites in settlement clusters, and to other aspects of Ancestral Pueblo lifestyle. The result of managing cultural resources on a landscape scale would be a possible reduction in the approval of ground-disturbing activities.

Alternative V would emphasize the outdoor museum concept, which involves a self-discovery experience of cultural resources in their natural setting. Under this alternative, 13 developed sites would continue to be used for public visitation and, based on a long-range interpretive plan, 12 additional sites may be developed. The developed sites would be hardened and signed and would have publicized locations. Minimal stabilization and interpretive signage, infrastructure, and/or visitor services would be allowed, which may help keep impacts to cultural resources to a minimum. Opening sites to public visitation may result in positive impacts to the resource, in that site interpretation may help to educate the public about the importance of cultural resources. However, it may also create the potential for physical damage to developed sites resulting from visitor use (trampling, soil compaction, and erosion).

Standing architecture at undeveloped sites would be thoroughly documented. Sites would then be allowed to deteriorate through natural erosive forces. There may be exceptions, at the discretion of the Monument Manager, especially when deterioration is the result of human-caused impacts. Documentation would be more cost efficient since stabilization and continued long-term maintenance are very expensive and labor intensive. In addition, this method of preservation would honor the request of Native American tribes to allow sites to return to the earth through natural forces.

Under this alternative, Special Recreation Permits (SRPs) for group visits to archaeological sites would be issued. These SRPs would require that experienced and knowledgeable supervisors be provided for groups as a means of educating participants about the cultural history of the Monument, backcountry site visitor etiquette, and stewardship. Permittees would be trained in site monitoring, would be required to complete monitoring inspections for each visit, and would be required to submit their written results to the BLM. This may help the BLM monitor site conditions, track damage resulting from vandalism, and educate the public about cultural resource values.

The BLM would rely on Monument staff, with peer review, to evaluate research proposals. Peer review could increase opportunities that arise from involving diverse perspectives.

Fluid Minerals Management

Under this alternative, in addition to current fluid minerals leases, up to 880 acres of new leases could be issued with NSO stipulations designed to protect cultural resources from ground disturbance. Up to 18 acres of ground disturbance could occur on neighboring leased lands to obtain minerals from new leased lands and could impact up to three cultural resource sites.

A Geographic Area Development Plan (GADP) approach would be used for all fluid minerals development related to new and existing leases within the Monument (Appendix M). Completion of GADP resource inventories, and the associated up-front planning, may provide protection of cultural resources. GADP inventories provide for focused planning which may result in a clearer

understanding of Monument resources across the landscape, and may allow for better protection and preservation through avoidance.

The use of existing disturbed areas for directional/horizontal drilling would minimize ground disturbance, as well as the associated loss of vegetative cover and soil (due to soil exposure and to wind/water erosion), and may reduce impacts to cultural and natural resources (see Map 17).

Subsurface discoveries of prehistoric sites and/or features resulting from well pad construction, pipeline and utility construction, access construction, etc. are expected. Archaeological monitors would be required for all initial ground-disturbing activities. Discoveries would be evaluated and mitigated in consultation with the SHPO and with Native American tribal representatives.

Under Alternative V, seismic operation-related work by bulldozers and/or other earthmoving equipment would be prohibited. Geophysical operations using vibroseis or explosives (with up to a maximum of 20- to 40-pound charges) would be allowed no closer than 645 feet (200 meters) from any cultural resource site (including rock art). These management actions may limit ground disturbance within the Monument, and may reduce the potential for impacts to cultural resources.

This alternative would promote the maintenance of current air quality, which, in turn, may contribute to the preservation of sensitive cultural resources (such as rock art). The maintenance of air quality is also important for maintaining the quality of site setting and viewshed.

Fluid minerals management actions resulting in construction that is visible on, or above, the surface may result in direct impacts to the visual integrity of cultural properties that derive their significance from natural settings or from settings relatively devoid of modern intrusion. This alternative incorporates BMPs, COAs, stipulations, and mitigation measures that may reduce these impacts (see Appendix M).

Livestock Grazing Management

Under Alternative V, livestock grazing would be managed to reduce conflicts between livestock grazing, recreational activities, and the Monument's mandate to protect cultural resources. Under Alternative V, livestock would be permitted up to 6,437 active AUMs. Ninety-four percent of Monument lands fall within grazing allotments under this alternative. Generally, a healthy ecosystem is considered beneficial to cultural resources.

Livestock grazing is administered in accordance with BLM Instruction Memorandum No. CO-2002-029, Interim Historic Preservation Guidelines and Procedures for Evaluating the Effect of Rangeland Management Activities on Historic Properties (BLM 2002b). Five (5) allotments (124 AUMS) would be closed, which may decrease impacts to cultural resource sites in these areas. Throughout the Monument, existing conditions would be analyzed and, when necessary, additional inventories and site monitoring would be conducted to determine impacts to sites. Impacts to cultural resources may be addressed by implementing livestock reductions and/or additional control of livestock grazing (for example, fencing). All cultural resource sites within livestock concentration areas would be assessed for impacts resulting from livestock grazing. Such impacts would be mitigated. The reduction in AUMs and focused management may expedite land health improvement. Cultural resources may sustain fewer impacts resulting from livestock rubbing and trampling. Increased vegetative cover and native vegetation may reduce erosion and may help keep cultural resource artifacts in situ.

The number of sites impacted and the degree to which impacts occur may vary depending on the location of the site(s), the type of site(s), and the movements/habits of livestock within the

allotment where the site(s) are located. Certain site types, such as sites with standing architecture (prehistoric and historic), rock art, and rock shelters, are considered more sensitive and, thus, more vulnerable to impacts related to livestock grazing.

Impacts related to livestock grazing include:

- damage to architecture, including collapse of standing walls, as a result of rubbing and/or accelerated erosion;
- damage to rock shelters as a result of animals seeking shelter from sun or weather; increased erosion from livestock trailing up slopes to reach rock shelters; and increased trampling, mixing, and chemical alteration/deterioration from concentrations of urine and dung of trash middens and site contents (Preservation of perishable archaeological materials is often exceptional in rock shelters because of the dry, protected environmental conditions. These rare and fragile materials are especially vulnerable to damage or destruction.);
- damage to rock art images as a result of rubbing and abrasion by animals;
- damage to cultural resource sites where livestock concentrate, including water sources, shade trees and sheltered locations, salt/mineral block locations, and along fencelines (Depending upon topography in areas where livestock do concentrate, the rate of erosion may be greatly increased.);
- erosion of cultural sites as a result of degraded vegetation conditions (such as expanses of bare soil, decreased ground litter, and damaged biological crusts).

Recreation and Transportation Management

Alternative V would identify and manage RMZs and SRMAs. Overall, minimal facilities and infrastructure would be developed to support recreation and transportation use. Recreational shooting (target shooting) and/or geocaching would be prohibited within the Monument. Camping and campfires would not be permitted within the Pueblo Sites, Sand Canyon/Rock Creek, and/or the AHC SRMAs (7,875 acres). However, camping and campfires would be allowed within the Mockingbird Mesa-Rincon, Squaw-Cross Canyons, and Goodman Point SRMAs. Rock climbing would only be allowed in designated location(s). Dispersed camping would be allowed on up to 157,460 acres. This area would have the potential to contain as many as 27,529 cultural resource sites (based upon the Monument's average site density of 1 site per 5.72 acres). Camping in cultural resource sites would be prohibited; however, impacts are likely because campers may not recognize site boundaries. The use of campsites, the development of trails, the construction of campfires, and other similar backcountry recreational actions, may result in impacts to cultural resource sites, in that trampling, soil compaction, erosion, and looting may increase. Recreational use of the Monument may result in unintentional damage to cultural resources that, although individually minor, may result in widespread, negative impacts through time.

Under Alternative V, the establishment of a Travel Management Plan would be required within 1 year of the signing of the Record of Decision (ROD). Implementation of this alternative may help visitors to know where, and what kind of, legal access exists within the Monument. Law enforcement officers would be provided with the means to enforce travel restrictions. Most existing user-created routes would be closed and reclaimed. Under this alternative, approximately 44 miles of routes would be closed. This may prevent further impacts to approximately 45 cultural resource sites. The remaining transportation system would consist of up to 169 miles of routes, which equates to the potential for direct and indirect impacts to 171 cultural resource sites. Where possible, routes would be surveyed and realigned to avoid cultural resource sites. Additional mitigation measures may be needed to protect sites where routes cannot be redirected.

Other Resources Management

Under this alternative, the entire Monument would be designated as one FMZ. Natural fire would not be desired, and wildfire suppression would be emphasized. The focus on fire suppression is intended to protect cultural resources; however, indirect impacts of fire suppression may result in a build-up of fuels (such as dead-and-down trees) which, in turn, may increase the risk of large wildfires.

Disturbance to cultural resource sites may also result from fire suppression activities (such as from ground disturbance associated with the creation of hand-lines and/or with the use of mechanized equipment). Under Alternative V, the use of ground-disturbing, mechanized equipment would be allowed during fire-suppression activities if permitted and fireline-qualified Cultural Resource Monitor (CRM), or agency CRM, monitors the use of such equipment to avoid cultural resource sites. Fire retardants and other chemicals may impact soil chemistry, which may impact the integrity of archaeological deposits and architectural/structural elements. Rock spalling caused by heat and sooting impacts rock art and architectural/structural site components. Ground disturbance associated with post-fire rehabilitation activities may result in impacts to cultural resources.

Under Alternative V, the allowed proximity of prescribed fire and/or mechanical fuels treatment methods to cultural resources would be determined through the site-specific environmental review process. Actions could then be designed in a manner to avoid cultural resource sites. Under this alternative, in comparison to the No Action Alternative, fuels and fire management may be considered more restrictive, in that resource-benefit fires (natural ignition) would not be allowed to burn, due to the risk to cultural resources.

Alternative VI (Proposed Plan)***Cultural Resources Management***

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V. In addition, to avoid cultural resources, the Proposed Plan would require adequate physical buffers to protect surface and subsurface cultural resources and the associated setting.

Early and careful planning, and the use of all available technologies and design criteria, including directional/horizontal drilling, would be required to avoid cultural resources, and to minimize disturbance and visual fragmentation of the landscape. In addition to site protection for Section 106 of the NHPA, BMPs associated with monitoring, fencing, and site-specific cultural resources protection, would be required (see Appendix M, Map 17).

The development of existing fluid minerals leases would be carried out using the BMP strategy entitled "Geographic Area Development Plan (GADP)," described in BLM Instruction Memorandum No. 2003-152. The use of pre-APD (application for permit to drill) interdisciplinary planning involving multi-year development plans and larger survey areas would allow resource managers and fluid minerals developers to work together to avoid and/or minimize damage to sensitive resources. Completion of GADP surveys and issuance of new leases with NSO stipulations may help to protect cultural resources within the Monument. This is because they may result in a clearer understanding of the Monument's resources on a landscape scale, which, in turn, may allow for better protection and preservation of Monument objects through avoidance.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V. In addition, rock climbing would be allowed in designated location(s) only, within the Mockingbird Mesa-Rincon SRMA. Dispersed camping would be allowed on 158,515 acres. This area would have the potential to contain as many as 27,712 cultural resource sites (based on the Monument's average site density of 1 site per 5.72 acres).

Under the Proposed Plan, approximately 41 miles of routes would be closed. This would prevent further impacts to approximately 42 cultural resource sites. The remaining transportation system would consist of up to 172 miles of routes, with the potential for direct and indirect impacts to 175 cultural resource sites. The realignment of routes and/or other mitigation measures may be employed to reduce or eliminate impacts.

Other Resources Management

The impacts would be the same as those described under Alternative V.

Table 4-9 Comparison of Impacts to Cultural Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Cultural Resources	Protect cultural resource sites. Stabilize up to 240 sites. Develop new sites for controlled visitation. Allow scientific research. Identify no specific evaluation process.	Protect cultural resource settlement clusters, sites, and isolated finds. Standing walls documented and allowed to deteriorate. Develop 13 sites. Rely on broad-based standing committee of researchers to evaluate research proposals.	Protect cultural resource settlement clusters and sites. Standing walls documented and allowed to deteriorate. Develop 13 to 25 sites. Rely on an ad-hoc peer review committee of researchers to evaluate research proposals.	Protect cultural resource settlement clusters and sites. Stabilize standing walls. Develop 13 to 25 sites. Rely on Monument staff to evaluate research proposals, while seeking input from knowledgeable researchers.	Protect cultural resource settlement clusters and sites. Standing walls documented and allowed to deteriorate. Stabilization allowed under discretion of Monument Manager. Develop 13 to 25 sites. Rely on an ad-hoc peer review committee of researchers to evaluate research proposals.	Protect cultural resource settlement clusters and sites. Standing walls documented and allowed to deteriorate. Stabilization allowed under discretion of Monument Manager. Develop 13 to 25 sites. Rely on Monument Staff, with peer review, to evaluate research proposals.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance, and up to 13 sites potentially impacted).	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance, and up to 78 sites potentially impacted).	Same as Alt. II.	Same as Alt. II.

Table 4-9 Comparison of Impacts to Cultural Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	Continued development of existing leases (127,895 acres) and up to 1,985 acres new disturbance and up to 347 sites potentially impacted).	form new leased lands). Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Livestock Grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.
Recreation and Transportation	864 acres of disturbance (with 151 sites potentially impacted, per 1985 RMP decision). 1,235 acres of disturbance (with 215 sites potentially impacted, per	806 acres of disturbance (with 141 sites potentially impacted).	1,096 acres of disturbance (with 192 sites potentially impacted).	1,235 acres of disturbance (with 216 sites potentially impacted).	980 acres of disturbance (with 171 sites potentially impacted).	997 acres of disturbance (with 174 sites potentially impacted).

Table 4-9 Comparison of Impacts to Cultural Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	2000-2002 inventory).					
Other Resources: Fuels and Fire	Manage Monument as combination of FMZs A, B, and C. Continue with current fire suppression requirements to protect cultural resources.	Manage entire Monument as FMZ B. Increase fire suppression requirements to protect cultural resources.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.

4.2.2.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-10 Past, Present, and Future Activities Influencing Cultural Resources
Past Activities
Vandalism and looting
Livestock grazing
Chaining and other ground-disturbing vegetation treatments
Recreation and motorized and mechanized transportation
Oil, gas, and CO ₂ development
Enforcement of the Antiquities Act enforced and compliance with the National Historic Preservation Act
Designation of the Anasazi Cultural Multiple Use Area and Area of Critical Environmental Concern (1985)
Present Activities
OHV use
Increased Monument visitation and demand for recreation opportunities
Increased fluid minerals development
Management to include Public Land Health Standards
Looting and vandalism
Increased risk of large-scale wild fires, with continued drought and die-off of pinyon trees
National Monument designation by Presidential Proclamation to protect the objects; managing valid existing rights so as not to create any new impacts to the objects
Future Activities (Proposed Plan)
Cultural resource inventories of routes and route closures
Continued increase in fluid mineral development

Table 4-10 Past, Present, and Future Activities Influencing Cultural Resources
Lease 880 new acres for fluid minerals development, with NSO stipulations
Increased demand for fluid minerals development
GADPs required for long-range planning
Protection of cultural and natural resources on a landscape scale to minimize cumulative impacts; management for resource setting

Prior to the passage of the NHPA, many activities occurred without protection of cultural resources. Vegetation treatments included pulling chains across the ground surface to remove trees and shrubs. This and other mechanical treatments impacted many archaeological sites. In addition, many routes within the Monument were created and resulted in the destruction of, or damage to, cultural sites. Current routes may continue to impact sites.

An estimate of cumulative acres of disturbance within the Monument is listed in Table 4-11:

Table 4-11 Cumulative Acres of Disturbance (Past, Present, and Projected Future Acres)	
Development Type	Disturbance Area (acres) (Maximum, including what may be reclaimed)
Fluid Minerals Development	3,168 acres (1,165 past leased + 880 future leased + 18 future new leases + 1,102 seismic)
Routes	1,235 acres (213 miles - maximum number to exist)
1960s Chained/Harrowed Vegetation Treatments	15,000 acres
Total Acres	21,624 acres

Given the density of sites found in the Monument, it is estimated that over 3,000 sites may potentially be impacted. The degree of disturbance, however, may vary depending upon the activity.

In order to minimize impacts, the Proposed Plan would implement the protection of cultural resources on a landscape scale. Using previously discussed management strategies, (for example the GADP) would facilitate protection of cultural resources at the landscape level and facilitate development in areas where resource conflicts would be minimized.

Additional actions that may, cumulatively, result in impacts to cultural resources include livestock grazing, looting and vandalism and ongoing natural erosion. These impacts occur in,

and adjacent to, the Monument. Quantifying these impacts is difficult, especially in relation to vandalism and erosion. It can be predicted that more livestock grazing (either in animal numbers or in time), may result in more impacts to cultural resources (i.e. from trampling, rubbing, and associated erosion).

In the future, after archaeological inventories are completed for the Monument Travel Management Plan, route locations may be adjusted to avoid sites and, consequently, prevent additional impacts. Under the Proposed Plan, closing routes (42 miles) and complying with Colorado Public Land Health Standards and Guidelines for Livestock Grazing Management (BLM 1997) (Public Land Health Standards) may increase ground cover over time, reduce soil erosion, and prevent damage to cultural resource sites.

Currently, no laws protect cultural resources on private land (except human burials). An estimated 870 cultural resource sites may exist on the 4,975 acres of private surface/private minerals within the Monument boundary and currently leased for oil and gas development (see Section 3.2.5). These sites may likely be impacted or destroyed.

Cultural resources on Federal lands outside of the Monument are currently managed in compliance with Section 106 of the NHPA. Cultural resource inventories are conducted in advance of proposed development on Federal lands. Sites determined to be eligible for the NRHP require mitigation of adverse impacts. Sites determined to not be eligible for the NRHP, as well as isolated finds, may be destroyed once the information potential of these noneligible sites and isolates is exhausted.

Cultural resources on public lands are a non-renewable resource. The trend for increased impacts to, or destruction of, cultural resources through time comes from an increase in development, including urban expansion; widespread drilling for oil and gas; the construction of pipelines, transmission lines, and travel routes; increased visitation to cultural resources; and continued livestock grazing. These impacts may continue on a regional scale, and may be in addition to the impacts expected to result from land uses and resource management activities within the Monument. If negative impacts to cultural resources on private land continue to increase as expected, the preservation of cultural resources on public lands may become even more critical. As the landscape becomes fragmented as the result of increased development, the importance of protecting cultural resources across that landscape becomes even more important. Information regarding Ancestral Puebloan people, their settlement and movement patterns, their lifestyle (as it relates to farming, hunting, and social gathering), and the context in which life occurred, is lost as artifacts and sites are destroyed.

4.2.3. Fuels and Fire Management

The primary goal for fuels and fire management within the Monument is to preserve and protect cultural and natural resources and public and private property while, at the same time, allowing fire to play a natural role in fire-dependent ecosystems. The management objectives related to this goal are to maximize firefighter and public safety; minimize suppression costs, resource loss, and damage; and use prescribed fire to realize resource benefits (such as improving landscape diversity within the Monument's vegetation mosaic). A Fire Management Plan (FMP) would be developed and would integrate objectives from the SJPL 2003 FMP and the Montezuma and Dolores County Community Fire Plans.

Additional goals for fuels and fire management are the application of fuels and vegetation management treatments designed to reduce resource damage from wildfire, improve firefighter and public safety, and achieve vegetation resource management objectives. The management objectives related to this goal include:

- reduce hazardous fuels in and around sensitive cultural resources, critical infrastructure, and designated wildland-urban interface (WUI) boundary areas; and
- utilize prescribed fire treatment methods to improve vegetation conditions in fire-adapted ecosystems.

Another goal for fuels and fire management is to use a collaborative approach that achieves fuels and fire management goals and objectives. The management objectives related to this goal include:

- continue to develop and improve the Monument's fire program in partnership with relevant governments, agencies, and private landowners; and
- integrate fire management strategies with the SJPL FMP, as well as with the Montezuma County and Dolores County Community Fire Plans.

Under this alternative, beneficial impacts to fuels and fire may include manual and/or mechanical vegetation treatments that reduce fuels and return the ecosystem to a natural fire regime. Adverse impacts to fuels and fire may include conflicts between fuels and fire management objectives and those of other resources, resulting in the potential for increased risk of impacts to Monument resources due to wildfire; and compromised public and firefighter safety.

4.2.3.1. Evaluation Criteria and Assumptions

Due to the unpredictable nature of fire, and to the general lack of long-term quantitative data, assessment of potential impacts resulting from the management of other resources on the management of fuels and fire is difficult to quantify. However, if a location is developed for public use, it is more likely to have less fuel and, therefore, greater protection from fire. These sites can be quantified.

Assumptions used in analyzing impacts to fuels and fire resources include the following:

- Wildfires pose a significant threat to all cultural resources.
- Factors that increase the risk of catastrophic wildfire within the Monument include a documented density increase in pinyon-juniper stands, consecutive growing seasons stressed by severe drought conditions, regional *IPS* beetle infestations (and resulting widespread tree mortality), and a deterioration of the natural understory to now favor invasive weeds (such as cheatgrass).
- There is a 90 percent risk of very high to extreme fire danger within the Monument, with the greatest impact to the ecology of pinyon-juniper woodlands and big sagebrush habitat types (which cover close to 75 percent of the Monument area).
- Federal lands within the boundary of the Monument were used as the impacts analysis area.
- Cumulative impacts include the WUI zones that border the Monument for potential landscape-scale impacts resulting from catastrophic wildfire and/or long-range smoke dispersion.

4.2.3.2. Alternative Analysis

Impacts to fuels and fire within the Monument may differ depending upon specific management actions proposed under each alternative. The following sections describe the impacts anticipated from the management actions proposed for the management of fuels and fire as well

as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, and recreation and transportation.

Alternative I (No Action Alternative)

Fuels and Fire Management

Under Alternative I, the BLM would maintain existing fuels and fire management practices. Currently, there are 3 FMZs identified within the Monument (in accordance with the San Juan/San Miguel RMP), each with specific management strategies, parameters, and constraints. Alternative I would designate 317 acres of the Yellowjacket Canyon Riparian Zone as FMZ A, with an emphasis on preservation of the habitat. Six (6) areas, totaling up to 7,666 acres, would be designated FMZ B, where natural fire would be actively suppressed and hazardous fuel mitigation would be emphasized. FMZ B includes 3 significant cultural resource sites, and 3 existing communication infrastructure sites. The remainder of the Monument, 95 percent of the management area (157,258 acres), would be designated as FMZ C, where, under specific conditions and constraints, natural fire would be allowed to burn to achieve other resource management objectives. Alternative I would further identify a number of fire management strategies, burned area rehabilitation guidelines, fuels treatment parameters, and general conditions that would be common across all management polygons (zones). Alternative I would incorporate the fuels and fire management objectives of the National Fire Plan and the Healthy Forest Restoration Act. In order to reduce fuels, this alternative would provide a wide-range of options for managing vegetation within the Monument; however, there may be a greater risk of impacts to the objects of the Monument.

Alternative I would provide fire managers the opportunity to use fire as a resource management tool for areas of up to 1,000 acres, or greater, if conditions warrant. Smoke dispersion resulting from such fires may pose a public relations issue, due to the potential negative public health and safety implications. Alternative I would propose no strategies for addressing the surrounding WUI hazards, which may, in turn, put people and property at risk should a wildfire occur. In addition, Alternative I may set up conflicting objectives among the various resources, which may, in turn, increase confusion during fire suppression efforts with regard to what the priorities are, as well as how to manage for them.

Cultural Resources Management

Under this alternative, ongoing cultural resource inventory, site assessment, development, and preservation are the primary objectives. Alternative I would identify specific sites for inclusion in FMZ B for hazard assessment and mitigation. New discoveries are likely in FMZ C, where cultural resource preservation objectives conflict with the utilization of resource-benefit fires. The lack of clarity on resource priorities may inadvertently result in damage to cultural resources. Allowing natural ignition fires to burn under management prescription may result in rock spalling caused by heat. Spalling and sooting may impact rock art and architectural/structural site components.

Fluid Minerals Management

Approximately 80 percent of Monument lands are currently leased for fluid minerals development. Under Alternative I, the remaining 20 percent would not be leased; therefore, no impacts would occur from new leases.

New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance. As development increases on these current leases, the presence of

structures and people would also increase. This increase may result in a greater risk of human-caused fires, and greater hazards in fighting fire to prevent damage to property and people. More resources (personnel, equipment, budget resources, etc.) may be required to fight fires where oil and gas development exists.

Livestock Grazing Management

Rangeland management provides for livestock access to specific allotments within the Monument for grazing. Cheatgrass burns with greater intensity and contributes to a greater potential rate of spread in the event of a wildfire. The majority of livestock grazing allotments are located in FMZ C, where the presence of cheatgrass is likely to complicate efforts to manage naturally occurring fire regimes for resources benefit. Maintaining current livestock grazing levels, may promote the proliferation of cheatgrass and may, in turn, create long-term adverse impacts to fuels and fire management.

Recreation and Transportation Management

With the exception of the Lowry, Painted Hand, and Sand Canyon Pueblos, dispersed, low-impact recreational opportunities are emphasized throughout the Monument. Low-impact recreation (such as hunting, dispersed camping, and backpacking) has little impact on current fuels and fire management. The presence of campfires, however, may increase the risk of a wildfire. Under this alternative up to 7 transportation sites would be developed for public visitation. These sites would have reduced fuels.

Under Alternative I, the Monument travel system would include up to 149 miles of roads (on up to 864 acres). The transportation network may present an immediate and long-term benefit to fuels and fire management by providing local and backcountry access routes for faster incident response, as well as anchor points for firelines and burn-out operations. In addition, routes would facilitate the use of Minimum Impact Suppression Tactics (MIST) that target existing transportation networks for tactical use during indirect attack. On the other hand, the transportation system would allow the public access into backcountry areas, where fire can start as the result of firearm discharge, cigarettes, catalytic converters, and campfires.

Alternative V (Preferred Alternative)

Fuels and Fire Management

Alternative V would eliminate multiple FMZ categories for the Monument and would designate the entire area as FMZ B (where natural fire is not desired under current conditions and suppression is emphasized). Alternative V would broaden the scope and flexibility of potential wildfire hazard assessment and hazardous fuels treatment sites within the Monument. Prevention would be the primary tool for wildfire management. The surrounding Wildland Urban Interface (WUI) would be incorporated into strategic planning actions. From a tactical incident support perspective, Alternative V would provide Fire Management Officers (FMOs) with constant and cohesive guidelines for mitigation and suppression across the Monument. These guidelines would emphasize firefighter safety while, at the same time, prioritizing the protection and preservation of all cultural sites, as well as of industrial and public infrastructure.

Alternative V would provide clear and consistent directives from which fire incident management decisions could be guided. Management would be comprehensive and consistent with other Monument resource objectives, as well as with the FMPs of surrounding jurisdictions. Alternative V would eliminate the conflict between cultural site protection and preservation and the use of natural fire as a potential resource management tool. Resolving this conflict may help to simplify potentially complex incident management assignments, which may, in turn, create a safer environment for firefighters. Under this alternative, WUI factors would also be

taken into consideration. These factors may include incident preplanning with surrounding jurisdictions, identification of offsite risks and hazards, and the development of potential emergency resources.

Cultural Resources Management

Alternative V would enhance public access to cultural sites through the development of 13 to 25 sites. This would emphasize site protection and visitation, and would define appropriate levels of resource maintenance at highly visible sites. Supporting infrastructure development would be minimal. The greater numbers of people at these sites may increase the risk of a human-caused fire; however, these areas would have site-specific fuels reduction to minimize the risk of damage resulting from fire. Consistent and cohesive tactical incident objectives throughout the Monument would provide all sites the same potential level of assessment, mitigation, and protection. This may reduce confusion with regard to priorities for fire suppression and management.

The protection of cultural resources within the Monument may require the placement of restrictions on wildfire suppression activities. The use of bulldozers to construct firelines would be a management action of last resort, and would require the participation/supervision of an archaeologist to clear areas before line construction.

Fluid Minerals Management

In addition to impacts from current fluid mineral leases as described in Alternative I, Under Alternative V, up to 880 acres of the available 24,462 acres would be available for leasing to protect against drainage. Infrastructure expansion may result in minor impacts to fuels and fire management, since management requirements for fire suppression may increase to protect property and people. Temporary drilling facilities may result in short-term impacts; permanent structures may result in long-term impacts. Under Alternative V, both new and existing fluid minerals facilities would be designated as FMZ B-5 (Map 16), and would automatically be considered for wildfire hazard assessment and hazardous fuel reduction treatments. Any significant expansion of industrial infrastructure within the Monument may adversely impact fuels and fire management due to the resulting increase in the number of facilities needing fire defense zones. New facilities would also require hazardous fuels assessment and possible mitigation work. Modified suppression tactics would be required in the vicinity of all current and future facility sites. Fluid minerals development may also impact fire management due to the introduction of additional ignition sources and to the increased fire-risk potential resulting from the increased access. The increased access may result in a beneficial impact, in that it would provide access to remote areas for emergency equipment and personnel for fire suppression.

Livestock Grazing Management

Alternative V would authorize reductions in livestock grazing use, delineate the extent and duration of spring livestock grazing, and implement rest-rotation grazing schedules. Rangelands would be managed to increase land health and to improve soil and vegetation conditions. A reduction in cheatgrass is not likely; however, a reduction in its spread may result from improved range conditions. This may result in a beneficial impact to fuels and fire management.

Recreation and Transportation Management

Under Alternative V, RMZs and SRMAs would be established to promote a destination management strategy for recreation and site visitation. These areas would be supported with minimal facilities and infrastructure. All facilities would be considered for wildfire hazard

assessment and for hazardous fuels treatment. Adversely, any additional infrastructure would increase the number of potential defensible sites.

Recreational activities (such as camping, backpacking, and OHV use) may have the potential to increase fire frequency, (i.e. from campfires and catalytic converters). Restrictions on allowing ignition sources during periods of high fire danger, with the associated public service announcements and newspaper articles, may help alleviate much of the risk.

Under Alternative V, there would be up to 169 miles of routes (on up to 980 acres). The transportation network may benefit tactical incident response and suppression support, in that it would provide better access, as well as fuel breaks that aid in fragmenting forest continuity.

Alternative VI (Proposed Plan)***Fuels and Fire Management***

The impacts would be the same as those described under Alternative V.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, there would be up to 172 miles of routes (on up to 997 acres).

Table 4-12 Comparison of Impacts to Fuels and Fire Management

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Fuels and Fire	Conflicting objectives increased risk of damage to Monument resources; compromised public and firefighter safety. More likely to have large wild fires.	Eliminate conflicts between cultural resource preservation and use of natural fire as a resource management tool. Fires likely to be small and site specific.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.
Cultural Resources	Propose no specific hazardous fuel reduction.	Reduce hazardous fuel at 13 developed sites.	Same as Alt. II	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres.	Make up to 880 new acres available for lease (with up to 18 acres of disturbances. (although there is an NSO on all new leases, these disturbances could occur on neighboring leased lands to obtain minerals form new leased lands)).	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance).	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance).	Same as Alt. II.	Same as Alt. II.
	Continue existing leases of 127,895	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.

Table 4-12 Comparison of Impacts to Fuels and Fire Management

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	acres (with up to 1,985 acres new disturbance).					
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments	Same as Alt. V.
Recreation and Transportation	Manage 149 miles of routes; 864 acres of disturbance. Develop 7 facilities.	Manage 139 miles of routes; 806 acres of disturbance. Develop 7 facilities.	Manage 189 miles of routes; 1,096 acres of disturbance. Develop 13 facilities.	Manage 213 miles of routes; 235 acres of disturbance. Develop 20 facilities.	Manage 169 miles of routes; 980 acres of disturbance. Develop 9 facilities.	Manage 172 miles of routes; 997 acres of disturbance. Develop 9 facilities.

4.2.3.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-13 Past, Present, and Future Activities Influencing Fuels and Fire Management
Past Activities
Unmanaged livestock grazing
Increased spread of invasive plant species (such as cheatgrass)
Ineffective reclamation efforts
Encroachment of pinyon-juniper woodlands into grasslands
Long-term removal of fuels through firewood collecting
Large-scale vegetation treatments
Fire exclusion
Oil, gas and CO ₂ development
Increased vehicular access and cross-country travel from user-created routes
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Present Activities
Increased fluid mineral development
Fuelwood cutting restrictions
OHV use
Management to include meeting Public Land Health Standards
Prolonged drought and die-off of pinyon trees
Future Activities (Proposed Plan)
Increased development of subdivisions; increased WUI acreage
Continued increase in fluid mineral development

Table 4-13 Past, Present, and Future Activities Influencing Fuels and Fire Management

Fuels management using mechanical thinning for prevention. No fire use fires allowed. Suppression tactics employed for all fires.
Decreased vehicular access through closure of user-created routes

Over time, changes in vegetative structure within the Monument have altered the fire regime. Cheatgrass invaded over-grazed areas, and existed, compatibly, with pinyon-juniper woodlands. Firewood gathering removed some of the large fuel component but fire suppression allowed widespread fuels accumulation.

WUI areas have increased in the form of buildings and other structures associated with fluid minerals development and housing subdivisions. Access for firefighting has increased with this development (but the demands to protect life and property have increased). This situation, along with the need to protect a high density of cultural resource sites, has resulted in fuel management tactics that focus on mechanical removal rather than on prescribed fire or wildland fire use.

Whether considering the past, present, or future, cumulative impacts to fuels and fire management are similar. Impacts include smoke dispersion (adverse, event-based/temporary), escaped fire from private lands and surrounding WUI areas (adverse, event-based/temporary, localized, with long-term implications), and potential flash-flooding into Monument streams from destabilized burned areas on private lands (adverse, event-based/temporary, localized, with long-term implications). Current conditions in areas within, and adjacent to, the Monument, including pinyon-juniper woodland tree density, cheatgrass invasion, mortality from insect infestation, and long-term drought, may increase the likelihood of high-intensity, stand-replacement wildfires. The impacts of unchecked fuels build-up may complicate suppression and control efforts, and may compromise firefighter safety.

4.2.4. Geologic Resources

The primary goal for geologic resources within the Monument is to manage multiple-use activities in a manner that preserves and protects geologic objects protected under the Proclamation. The management objectives related to this goal include:

- manage uses to prevent damage to sensitive geologic and geomorphologic features; and
- facilitate appropriate geologic research to improve understanding of geological resources and processes.

An additional goal for geologic resources management is to protect visitors from geologic hazards.

Direct beneficial impacts to geologic resources may include reduced erosion and the preservation of geologic features, including outstanding examples of rock formations (such as scenic outcrops, type sections, faults, ripple marks, cross-bedding, lithified mudcracks, unconformities, and geomorphic features). Direct adverse impacts to geologic resources may include those actions that would physically disturb and/or destroy geologic features. Additional direct adverse impacts may include increased rockfalls, landslides, flash floods, and erosion, as well as those resulting from human-caused actions (including those that mar the surface of

rocks, break and/or erode rock surfaces, and/or those that result in unstable rock outcrops or rock falls.)

4.2.4.1. Evaluation Criteria and Assumptions

Quantifying individual impacts to geologic resources involves determining the location and the extent of potential impacts. The location and/or the extent of human-caused disturbance resulting from Monument visitors cannot be predicted. Likewise, the location and/or the extent of disturbance resulting from oil and gas exploration and production cannot be predicted. However, comparing disturbance factors in terms of miles, AUMs, and acres can provide a relative risk under each alternative.

Assumptions used in analyzing impacts to geologic resources include the following:

- Estimates of disturbance were compiled from the AMS (BLM 2005b) and the RFD (BLM 2005c).
- Approximately 7 percent of Monument land is rock outcrop.
- The number of routes predicted for construction, based upon new acres leased for mineral development, would all be new routes.
- Federal lands within the boundary of the Monument were used as the impact analysis area for both individual and cumulative impacts.

4.2.4.2. Alternative Analysis

Impacts to geologic resources within the Monument may differ depending upon specific management actions proposed under each alternative. The following sections describe the impacts from the actions proposed for geologic resources, as well as those from the management actions proposed for cultural resources, fluid minerals, livestock grazing, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Geologic Resources Management

Alternative I would continue current Monument management goals and objectives, including managing multiple-use activities to preserve and protect geologic objects, and minimizing activities in geologic high-hazard areas. No specific management actions would be identified; therefore, no impacts are anticipated.

Cultural Resources Management

Preservation of the Monument's cultural resources may serve to protect geologic resources. This is because Alternative I would protect sites from all activities except for those related to scientific, archaeological, and/or historical investigations (where surface disturbance is required to be minimal). Impacts may occur as the result of the stabilization of up to 240 cultural resource sites; however, the ground disturbance associated with this activity would be site-specific, small, and isolated.

Fluid Minerals Management

Approximately 80 percent of Monument lands are currently leased for fluid minerals development. Under Alternative I, the remaining 20 percent would not be leased; therefore, no impacts would occur from new leases.

New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. This new development on existing leases is estimated to cause 1,985 acres of new disturbance. Threats to geologic resources from existing leases may intensify as development increases. These threats include exposure of bedrock resulting from soil erosion caused by ground disturbance over larger areas within the Monument.

Livestock Grazing Management

Rangeland resources management, including management designed to meet Public Land Health Standards, may not impact geologic resources. This is because viable forage is not generally available on exposed geologic resources. Maintaining healthy rangelands may minimize soil erosion and the resulting exposure of bedrock.

Recreation and Transportation Management

Under Alternative I, recreation management would include the development of 7 facilities on an as-needed basis, as well as the maintenance of developed sites at Lowry, Painted Hand, and Sand Canyon Pueblos. Under this alternative, no restrictions on rock climbing within the Monument would be proposed. Any of the activities mentioned may, over time, result in soil erosion and exposure of underlying geologic surfaces.

Under this alternative, the Monument travel system would include 149 miles of routes (on 864 acres) for motorized, mechanized, and/or non-motorized use. Cross-country motorized and mechanized travel would be prohibited. Erosion may occur as a result of route-closure activities. Maintenance of the transportation network may expose rock surfaces that, over time, could erode.

Other Resources Management

Under this alternative, soil SSR/CSU stipulations would be applied for slopes greater than 40 percent (including 10,864 acres of rock outcrop where fossils may be present). The SSR/CSU stipulations would require an engineering/reclamation plan that demonstrates how site productivity would be restored, how surface runoff would be controlled, and how offsite areas would be protected from accelerated erosion. In addition, surface-disturbing activities would not be allowed during extended wet periods. This restriction may result in beneficial impacts to geologic resources, in that ground disturbance and exposure of bedrock may be reduced.

Alternative V (Preferred Alternative)

Geologic Resources Management

Under Alternative V, geologic resources management would include restricting access to sensitive geologic features, encouraging interdisciplinary projects, identifying high-hazard areas (landslides and rockfalls), and requiring a geologic hazard analysis prior to construction projects. These management actions may result in beneficial impacts to geologic resources, in that ground disturbance may be reduced, and that planning for potential impact mitigation may be increased.

Cultural Resources Management

Preservation of the Monument's cultural resources would serve to protect geologic resources. Alternative V would protect cultural resource settlement clusters and sites from ground-disturbing activities, except for scientific, archaeological, and/or historical investigations (where surface disturbance is required to be minimal). Impacts, including those resulting from trampling, soil compaction, and erosion, may occur as the result of the development of 13 to 25 cultural resource sites for visitation; however, development would likely include stabilization and/or be

small in scale and site specific. In addition, development design may direct people away from sensitive geologic resources.

Fluid Minerals Management

In addition to new impacts from current fluid mineral leases as described in Alternative I, under Alternative V, up to 880 acres would be available for leasing to protect against drainage. Up to 18 acres of new ground disturbance would be possible under this alternative. New leases would have NGD/NSO stipulations that protect cultural, natural, and scenic resources, however disturbance may occur on existing leased lands to access minerals associated with new leases. New leases would only be allowed for the purposes of promoting the conservation of oil and gas resources, and/or to protect against drainage in existing reservoirs under production.

Under this alternative, geophysical operations would be restricted to BLM-designated routes. Temporary access routes would require reclamation. If water is present in washes, alluvial valleys, and/or in perennial water features, geophysical vehicles would only be allowed to cross channels on BLM-designated routes. In addition, in areas where riparian/wetlands vegetation is present, geophysical vehicles would only be allowed to travel on BLM-designated routes. Seismic operations requiring bulldozers, earthmoving equipment, and/or explosives would be prohibited. Soil resource NGD/NSO stipulations for slopes greater than 30 percent (including 10,864 acres of rock outcrop where fossils may be present) would apply. BMPs would be included in COAs for new leases.

Little or no impacts to sensitive geologic resources are expected from fluid minerals management on new leases.

Livestock Grazing Management

Generally, viable forage is not available on exposed geologic resources; therefore, livestock use of these areas is generally low. Management actions designed to meet Public Land Health Standards may better maintain vegetative cover, thereby reducing soil erosion and further exposure of geologic resources. Some areas where livestock congregate may result in trampling and soil erosion, thereby exposing bedrock. This may impact sensitive geologic resources in site-specific areas.

Recreation and Transportation Management

Under Alternative V, recreation management would include a combination of strategies. Undeveloped areas with minimal facilities would be combined with destination management strategies for Painted Hand and Sand Canyon Pueblos, as well as for the AHC and Lowry Pueblo RMZs. Approximately 7,875 acres would be managed as visitation areas, and 157,460 acres would be managed as backcountry areas. Rock climbing would be allowed in designated sites only. Rock climbing may impact sensitive geologic resources by the placement of climbing hardware; however, this activity would be restricted to a few specific sites that have been clearly identified and surveyed. Any time people use areas where sensitive geologic resources may be present the result may be disturbance due to increased erosion.

Under this alternative, the Monument travel system would include up to 169 miles of routes (on up to 980 acres) for motorized, mechanized, and/or non-motorized use and the development of 9 facilities. There would be routes specifically designated for OHV, mountain bike, and/or OHM travel. Cross-country motorized and mechanized travel would be prohibited. Travel corridors would be planned for resource surveys; however, route locations may be adjusted should potential impacts occur. Impacts resulting from unauthorized travel that occurs off of designated

routes may be the greatest threat to the resources. Sensitive geologic resources at, or near, the ground surface may become exposed or damaged by ground disturbance and/or by the associated erosion.

Other Resources Management

Under this alternative, soil NGD/NSO stipulations for slopes greater than 30 percent (including 10,864 acres of rock outcrop where fossils may be present) would apply. BMPs would be required for all ground-disturbing activities. This restriction, along with the BMPs, may result in beneficial impacts to geologic resources, in that soil erosion may be minimized and the associated risk of exposing bedrock may be reduced.

Alternative VI (Proposed Plan)***Geologic Resources Management***

The impacts would be the same as those described under Alternative V.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, soil resource NGD/NSO stipulations for slopes greater than 30 percent would apply which includes 11,042 acres of rock outcrop where fossils may be present. In addition, BMPs would be included in COAs for new leases.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, 158,515 acres would be managed as backcountry areas. In addition, the Monument travel system would include up to 172 miles of routes (on up to 997 acres) for motorized, mechanized, and/or non-motorized use and include the development of 9 facilities.

Other Resources Management

The impacts would be the same as those described under Alternative V. However, slopes greater than 30 percent cover 11,042 acres of rock outcrop where fossils may be present.

Table 4-14 Comparison of Impacts to Geologic Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Geologic Resources	Take no specific management actions.	Restrict access to sensitive sites. Restricts public activities in high-hazard area sites.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.
Cultural Resources	Protect cultural resource sites. Develop new sites for controlled visitation.	Protect cultural resource settlement clusters, sites, and isolated finds. Develop 13 sites.	Protect cultural resource settlement clusters and sites. Develop 13 to 25 sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new leased lands). Apply NGD/NSO, CSU/SSR, TL, and Condition of Approval (COA) restrictions.	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Same as Alt. II.	Same as Alt. II.
	Continued development of existing leases	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.

Table 4-14 Comparison of Impacts to Geologic Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	(127,895 acres) with up to 1,985 acres new disturbance.					
Livestock grazing	No Impact.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Recreation and Transportation	Manage 149 miles of routes; 864 acres of disturbance. Develop 7 facilities.	Manage 139 miles of routes; 806 acres of disturbance. Develop 7 facilities.	Manage 189 miles of routes; 1,096 acres of disturbance. Develop 13 facilities.	Manage 213 miles of routes; 235 acres of disturbance. Develop 20 facilities.	Manage 169 miles of routes; 980 acres of disturbance. Develop 9 facilities.	Manage 172 miles of routes; 997 acres of disturbance. Develop 9 facilities.
Other Resources: Soil Resources	Apply SSR/CSU to protect slopes greater than 40 percent (21,036 acres, with 10,864 acres of rock outcrop).	Apply NGD/NSO to protect slopes greater than 30 percent (36,504 acres, with 10,864 acres of rock outcrop).	Apply NGD/NSO to protect slopes greater than 30 percent (36,504 acres, with 10,864 acres of rock outcrop).	Same as Alt. III.	Same as Alt. III.	Apply NGD/NSO to protect slopes greater than 30 percent (36,607 acres, with 11,042 acres of rock outcrop).

4.2.4.3. Cumulative Impacts

Generally, impacts to geologic resources are thought to be water/wind erosion occurring within “geologic” time; however, the list of activities also involves impacts resulting from human influences that have occurred in the recent past; impacts that have continued or that may intensify in the present or future.

Table 4-15 Past, Present, and Future Activities Influencing Geologic Resources
Past Activities
80% of the Monument leased for fluid mineral development with standard stipulations
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Present Activities
Increased fluid minerals development
Protection mandate for VRM Classifications Standards within the Monument, in accordance with the 1985 San Juan/San Miguel RMP; mandate to prevent canyon rim cutting.
National Monument designation by Presidential Proclamation to protect the objects; managing valid existing rights so as not to create any new impacts to the objects. Closure of the Monument to hard-rock mining.
Future Activities (Proposed Plan)
Continued increase in fluid mineral development
Lease 880 new acres for drainage with restrictive stipulations
Protection of cultural and natural resources on a landscape level to minimize cumulative impacts; management for resource setting
Management of VRM Classification Standards

Fluid minerals development on existing leased areas within the Monument may result in up to 3,149 acres of cumulative disturbance through the life of the Proposed Plan. Fluid minerals development (including federal surface/federal minerals; private surface/federal minerals; and private surface/private minerals) may result in considerable ground disturbance resulting from construction of well pads, pipelines, compressor stations, routes, and/or other facilities. Increased erosion and potential rockfall and/or landslide hazards may result especially if/when these activities are not subject to BMPs, COAs, stipulations, and/or mitigation measures.

Under the Proposed Plan, 880 acres of new leased lands could be developed. New stipulations would be enforced in relation to these lands, including NGDs/NSO stipulations that protect scenic, natural, cultural, and/or archaeological values, and that protect rare flora and fauna

species habitats. Although these stipulations would be in place, up to 18 acres of disturbance may occur on existing leased lands to access minerals associated with new leases. SSR/CSU stipulations would be established in relation to surface disturbance on slopes greater than 30 percent, as well as in relation to the protection of perennial water impoundments and streams, and riparian/wetlands vegetation zones. COAs would be included in all new leases with additional restrictions applied to geophysical operations.

The management of Monument resources (including fluid minerals, livestock grazing, fire and fuels, recreation, transportation, and other resources) may result in ground disturbance that impacts geologic resources. Such management actions may expose bedrock, require rock removal, and/or result in trampling and soil erosion. Wildfire suppression activities (including the construction of firelines, use of bulldozers, and general movement of heavy equipment) may impact geologic resources. Generally, due to the unplanned nature of wildfires, the associated impacts would not be mitigated. Reclamation efforts following wildland fires, while providing the long-term benefits of stabilizing soils and promoting the resprouting of vegetation, may result in additional ground disturbance. Fire prevention activities may provide a beneficial impact, in that they may reduce the risk of wildfire, which may, in turn, reduce the ground disturbance associated with such fires.

4.2.5. Paleontological Resources

The primary goals for paleontological resources management within the Monument are to preserve and protect scientifically important paleontological resources, and to ensure that they are available for appropriate uses by present and future generations. The management objectives related to this goal include:

- identify areas and geological units containing paleontological resources, and evaluate the potential of such areas to contain vertebrate fossils and/or noteworthy occurrences of invertebrate or plant fossils;
- develop management recommendations (including mitigation measures in specific locations) to promote scientific research and other uses of fossils;
- protect and preserve important paleontological localities from natural and human-caused impacts; and
- monitor areas where important paleontological localities have been identified.

Under this alternative, direct adverse impacts to paleontological resources may include those that may physically disturb and/or destroy fossils and fossil localities. Erosion may result in adverse impacts to fossils, as the result of downcutting strata and the exposure of fossils to degradation, weathering, theft, and/or to vandalism. Direct impacts are the result of human activity; activity that may, in turn, directly or indirectly result in the loss of and/or damage to paleontological resources due to erosion, trampling, ground disturbance, and/or to vandalism and illegal collecting. Beneficial impacts occur when fossil resources are protected, as would occur when ground disturbance is avoided or minimized and when vegetative cover is maintained.

4.2.5.1. Evaluation Criteria and Assumptions

The location and/or the extent of human-caused disturbance resulting from Monument visitors cannot be predicted. Likewise, the location and/or the extent of disturbance resulting from oil and gas exploration and production cannot be predicted. However, the risk to paleontological

resources can be comparatively measured by quantifying disturbance factors in terms of miles or acres.

Assumptions used in analyzing impacts to paleontological resources include the following:

- Approximately 7 percent of Monument land is rock outcrop.
- Approximately 33 percent of Monument rock outcrop is likely to contain fossils.
- Federal lands within the boundary of the Monument were used as the impacts analysis area.
- The number of routes predicted for construction, based upon new acres leased for fluid minerals development, would all be new routes.

4.2.5.2. Alternative Analysis

Impacts to paleontological resources within the Monument may differ depending upon specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed for paleontological resources, as well as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Paleontological Resources Management

Alternative I would continue current Monument management goals, objectives, and actions. This would include completing the ongoing compilation and analysis of available paleontological resource data; restricting paleontological collecting to scientific purposes (and, only then, through use of valid BLM Paleontological SRPs); and prohibiting recreational fossil collecting, regardless of type (vertebrate, invertebrate, plant, and trace fossils). The beneficial impacts resulting from these management actions would be the preservation of fossils and fossil localities. Better documentation of site locations would allow for protection, through avoidance, during project implementation.

Cultural Resources Management

Preservation of the Monument's cultural resources would serve to protect paleontological resources. Alternative I would protect sites from all activities, except for those related to scientific, archaeological, and/or historical investigations (where surface disturbance is required to be minimal). The protection of cultural sites would reduce ground disturbance, which would, in turn, reduce the associated erosion that may expose paleontological resources. Some adverse impacts, including those resulting from trampling, soil compaction, and erosion, may occur as the result of the stabilization of up to 240 cultural resource sites; however, management techniques used to stabilize cultural resources may also stabilize erosive and/or unstable paleontological resources as well.

Fluid Minerals Management

Approximately 80 percent of Monument lands are currently being leased. Under Alternative I, the remaining 20 percent would not be leased and no new wells would be drilled; therefore, no impacts to paleontological resources would be expected as the result of new fluid minerals leases. Development on existing leases is expected to increase, resulting in larger areas of disturbance throughout the Monument. New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well

pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance.

Ground disturbance from fluid mineral development may increase soil erosion, thereby exposing bedrock and paleontological resources. Increased mineral development may result in a greater number of people present in areas where exposed bedrock occurs, which may, in turn, result in increased fossil gathering.

Livestock Grazing Management

Livestock management may not impact paleontological resources. This is because viable forage is not generally available on exposed rock outcrops. Areas where livestock grazing may result in the most impacts to fossils would be in the limited riparian/wetlands areas where springs or streams have cut into fossiliferous strata, or in overhangs and/or rock shelters where livestock seek shade. Livestock concentration areas may result in trampling, soil compaction, and erosion that may, in turn, expose bedrock and fossil resources.

Recreation and Transportation Management

Under Alternative I, recreation management would include the development of facilities on an as-needed basis, as well as the maintenance of developed sites at Lowry, Painted Hand, and Sand Canyon Pueblos. Under this alternative, no restrictions would exist for rock climbing within the Monument. The Monument travel system would include up to 149 miles of routes (on up to 864 acres) for motorized, mechanized, and/or non-motorized use. Cross-country motorized and mechanized travel would be prohibited. The transportation system associated with a backcountry recreation setting, as outlined under this alternative, may help minimize impacts to paleontological resources, in that minimized route development would reduce ground disturbance.

Other Resources Management

Under this alternative, soil SSR/CSU stipulations would be applied for slopes greater than 40 percent (including approximately 10,864 acres of rock outcrop where fossils may be present). The SSR/CSU stipulations would require an engineering/reclamation plan that demonstrates how site productivity would be restored, how surface runoff would be controlled, and how offsite areas would be protected from accelerated erosion. In addition, surface-disturbing activities would not be allowed during extended wet periods. These requirements may minimize soil disturbance, which may, in turn, help prevent paleontological resources from being exposed.

Alternative V (Preferred Alternative)

Paleontological Resources Management

Under Alternative V, proposed management actions would include a program for evaluating and monitoring fossil localities, thereby establishing a paleontological research standard for the Monument. This program would require paleontological clearances and/or mitigation measures prior to surface disturbance. The beneficial impacts resulting from these management actions would be the preservation of fossils and fossil localities. Better documentation of site locations would allow for protection, through avoidance, during project implementation.

Cultural Resources Management

Under Alternative V, cultural resource development would be marketed as an outdoor museum, allowing visitors to experience Monument resources through self-discovery. Visitors exploring the Monument may engage in activities that result in adverse impacts to paleontological resources, in that such activities may cause erosion, and in that they may engage in unauthorized fossil collecting. Surveys for cultural resources would coincide with surveys for

paleontological resources, thereby increasing the chances of new discoveries. The preservation of Monument cultural resources, both at the site and at the settlement cluster levels, may serve to protect paleontological resources, in that ground disturbance would be minimized. Alternative V would protect sites from all activities, except for those related to scientific, archaeological, and/or historical investigations (where surface disturbance is required to be minimal).

Fluid Minerals Management

Under this alternative, the overall goal for fluid minerals management is to ensure the proper care and management of the objects protected under the Proclamation prior to authorizing continued exploration, development, production, and/or reclamation activity for fluid minerals (including oil, gas, and CO₂) within the Monument. Paleontological resources are considered one of the objects warranting protection under the Proclamation.

New fluid mineral leases would have NGD/NSO stipulations that protect cultural, natural, and scenic resources. In addition to impacts from current fluid mineral leases as described in Alternative I, Under Alternative V, up to 880 acres would be available for leasing to protect against drainage. Up to 18 acres of new ground disturbance would be possible under this alternative. New leases of up to 880 acres would only be allowed for the purposes of promoting the conservation of oil and gas resources and/or of protecting against drainage in existing reservoirs under production. Under this alternative, up to 18 acres of new ground disturbance would be possible on existing leased lands to access minerals associated with new leases. Geophysical operations would be restricted to BLM-designated routes. Temporary access routes would require reclamation. If water is present in washes, alluvial valleys, and/or in perennial water features, geophysical vehicles would only be allowed to cross channels on BLM-designated routes. In addition, in areas where riparian/wetlands vegetation is present, geophysical vehicles would only be allowed to travel on BLM-designated routes. Seismic operations requiring bulldozers, earthmoving equipment, and/or explosives would be prohibited. Soil resource NGD/NSO stipulations for slopes greater than 30 percent (on 10,864 acres of rock outcrop where fossils may be present) would apply. BMPs would be included in COAs for new leases.

Any ground disturbance has the potential to damage sensitive paleontological resources. Considering the limited area available for lease, and the protective measures listed above, especially the NSO/NGD stipulations, little or no impacts to sensitive paleontological resources would be expected to result from fluid minerals management on new leases. Threats to geologic resources resulting from existing leases may continue, and may intensify as development increases. These threats would include exposure of bedrock due to soil erosion resulting from ground disturbance over larger areas within the Monument.

Livestock Grazing Management

Under Alternative V, rangeland resources management would provide beneficial measures for paleontological resources, in that there would be a reduction in AUMs and 5 allotments would be closed to grazing. This may result in greater vegetative cover and less soil erosion. These actions may reduce trampling, soil compaction, and subsequent soil erosion in livestock concentration areas. Grazing seldom occurs on rock ledges or cliffs; therefore, livestock grazing may result in the most impact on fossils in the limited riparian/wetlands areas where springs or streams cut into fossiliferous strata, or in overhangs and rock shelters where animals seek shade. Reducing the number of AUMs, especially where riparian/wetlands areas occur, may reduce these impacts.

Recreation and Transportation Management

Under Alternative V, recreation management would include a combination of strategies. Undeveloped areas with minimal facilities would be combined with destination management strategies for Painted Hand and Sand Canyon Pueblos, as well as for the AHC and Lowry Pueblo RMZs. Approximately 7,875 acres would be managed as visitation areas, and 157,460 acres would be managed as backcountry areas. Rock climbing would only be allowed in designated sites. However, any time people use areas where paleontological resources may be present, the result may be disturbance due to increased erosion, as well as to the possibility of fossil gathering. Maintaining large portions of the Monument as backcountry areas would help to minimize human-caused disturbance.

Under this alternative, the Monument travel system would include up to 169 miles of routes (on up to 980 acres) for motorized, mechanized, and/or non-motorized use. There would be routes specifically designated for OHV, mountain bike, and/or OHM travel. Cross-country motorized and mechanized travel would be prohibited. Travel corridors would be planned for the survey of cultural, as well as paleontological, resources; however, route locations may be adjusted should impacts to these resources be predicted. Impacts resulting from unauthorized travel that occurs off of designated routes may be the greatest threat to the resources. Paleontological resources at, or near, the surface may become exposed or damaged by ground disturbance and/or by the associated erosion.

Under this alternative, transportation and recreation management actions may result in potential adverse impacts to paleontological resources, in that route mileage would be increased. Expanding public access may increase the threat of vandalism and/or of unauthorized fossil collecting, as well as result in impacts associated with ground disturbance (including soil compaction and erosion).

Other Resources Management

Under this alternative, soil NGD/NSO stipulations for slopes greater than 30 percent (on 10,864 acres of rock outcrop where fossils may be present) would apply. BMPs would be required for all ground-disturbing activities. These restrictions may result in beneficial impacts to paleontological resources, in that the maintenance of soil cover over bedrock where fossils are found may reduce their exposure to erosion, as well as to illegal gathering.

Alternative VI (Proposed Alternative)***Paleontological Resources Management***

The impacts would be the same as those described under Alternative V.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, slopes greater than 30 percent would include 11,042 acres of rock outcrop where fossils may be present.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, 158,515 acres would be managed as backcountry areas. In addition, the Monument travel system would include up to 172 miles of routes (on up to 997 acres) for motorized, mechanized, and/or non-motorized use.

Other Resources Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, soil NGD/NSO stipulations for slopes greater than 30 percent would include 11,042 acres of rock outcrop where fossils may be present.

Table 4-16 Comparison of Impacts to Paleontological Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Paleontological Resources	Prohibit recreational fossil collecting.	Prohibit recreational fossil collecting. Require clearances and/or mitigation for projects.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.
Cultural Resources	Protect cultural resource sites. Develop new sites for controlled visitation.	Protect cultural resource settlement clusters, sites, and isolated finds. Develop 13 sites.	Protect cultural resource settlement clusters and sites. Develop 13 to 25 sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new leased lands). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Same as Alt. II.	Same as Alt. II.

Table 4-16 Comparison of Impacts to Paleontological Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	Continued development of existing leases (127,895 acres) with up to 1,985 acres new disturbance.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.
Recreation and Transportation	Manage 149 miles of routes; 864 acres of disturbance. Develop 7 facilities.	Manage 139 miles of routes; 806 acres of disturbance. Develop 7 facilities.	Manage 189 miles of routes; 1,096 acres of disturbance. Develop 13 facilities.	Manage 213 miles of routes; 235 acres of disturbance. Develop 20 facilities.	Manage 169 miles of routes; 980 acres of disturbance. Develop 9 facilities.	Manage 172 miles of routes; 997 acres of disturbance. Develop 9 facilities.
Other Resources: Soil Resources	Apply SSR/CSU to protect slopes greater than 40 percent (21,036 acres, with 10,864 acres of rock outcrop.	Apply NGD/NSO to protect slopes greater than 30 percent (36,504 acres, with 10,864 acres of rock outcrop.	Apply NGD/NSO to protect slopes greater than 30 percent (36,504 acres, with 10,864 acres of rock outcrop.	Same as Alt. III.	Same as Alt. III.	Apply NGD/NSO to protect slopes greater than 30 percent (36,607 acres, with 11,042 acres of rock outcrop.

4.2.5.3. Cumulative Impacts

Like geologic resources, paleontological resources develop within “geologic” time. Activities similar to those that impact geologic resources also impact paleontological resources. In addition, fossil gathering impacts the overall resource found within the Monument since the resource, and their invaluable information, are then lost from the paleontological record.

Table 4-17 Past, Present, and Future Activities Influencing Paleontological Resources
Past Activities
Lease 80% of the Monument for fluid mineral development with standard stipulations
Unmanaged fossil gathering
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Present Activities
Increased fluid minerals development
Protection mandate for a VRM Class II management standard within the Monument in accordance with the 1985 San Juan/San Miguel RMP; mandate to prevent canyon rim cutting
Fossil gathering restricted to scientific purposes only
National Monument designation by Presidential Proclamation to protect the objects; managing valid existing rights so as not to create any new impacts to the objects. Closure of the Monument to hard-rock mining.
Establishment of protection mandates for visual quality management
Future Activities (Proposed Plan)
Continued increase in fluid mineral development
Lease 880 new acres for drainage only, with restrictive stipulations
Protection of cultural and natural resources on a landscape level to minimize cumulative impacts; management for resource setting

Fluid minerals development on existing leased areas within the Monument may result in up to 3,149 acres of disturbance through the life of the Proposed Plan. Fluid minerals development (including federal surface/federal minerals; private surface/federal minerals; and private surface/private minerals) may result in considerable ground disturbance resulting from construction of well pads, pipelines, compressor stations, routes, and/or other facilities. Increased erosion and potential rockfall and/or landslide hazards may result especially if/when these activities are not subject to BMPs, COAs, stipulations, and/or mitigation measures.

Under this alternative, up to 880 acres of new leased lands may be developed. New stipulations would be enforced on these lands, including NGD/NSO stipulations that protect scenic, natural, cultural, and/or archaeological values, and that protect rare flora and fauna species habitats. Up to 18 acres of disturbance may occur on existing leased lands to access minerals associated with new leases. SSR/CSU stipulations would be established for surface disturbance on slopes greater than 30 percent, with the protection of perennial water impoundments and streams, and riparian/wetlands vegetation zones. COAs would be included in all new leases, with additional restrictions applied to geophysical operations.

The management of Monument resources (including fluid minerals, livestock grazing, fire and fuels, recreation, transportation and other resources) may result in ground disturbance that impacts paleontological resources. Such management actions may expose bedrock, require rock removal, and/or result in trampling and soil erosion. Wildfire suppression activities (including the construction of firelines and the use of mechanized equipment) may impact paleontological resources, in that they may expose soils and bedrock. Generally, due to the unplanned nature of wildfires, the associated impacts would not be mitigated. Reclamation efforts following wildland fires, while providing the long-term benefits of stabilizing soils and promoting the resprouting of vegetation, may result in additional ground disturbance. Fire prevention activities may provide beneficial impacts, in that they may reduce the risk of wildfire, which may, in turn, reduce the ground disturbance associated with such fires.

Fossil collecting is not restricted on private land. The area is known for its fossil resources and attracts collectors from around the region, as well as from around the World. As long as there is a commercial demand for these resources, pressure to collect and sell would continue. As pressures increase a greater need for law enforcement presence may be warranted.

Paleontological resources are protected, in part, under all alternatives through the prohibition on recreational (non-permitted) fossil collecting. However, rock and fossil enthusiasts have traditionally collected these resources within the area. Overall, any increase in public access, livestock grazing, route development, and/or fluid minerals development may impact paleontological resources adversely, in that it may result in vandalism and/or increased erosion, as well as in the loss of paleontological resources. However, in addition to paleontological resources management, other resource management actions may minimize these adverse impacts. Such management actions include controlling public access through a variety of route designations, implementing protective stipulations and BMPs, and limiting the numbers of AUMs.

4.2.6. Soil Resources

The primary goal for soil resources within the Monument is to manage them in a manner that sustains multiple-uses, and preserves and/or enhances existing ecological soil integrity and function. The management objectives related to this goal include:

- manage uses to ensure that the Public Land Health Standards for upland soils are met, or that significant progress is being made toward meeting these standards;
- manage uses to prevent damage to soil resources by protecting them from surface disturbance and by maintaining vegetative cover on slopes greater than 30 percent (as well as in other areas with high erosion potential); and
- manage soil resources to support other resource management objectives.

Beneficial impacts to soil resources may include increased soil productivity and/or soil stabilization, increased plant and litter cover, and reduced soil disturbance. Adverse impacts to soil resources may include the removal of topsoil, loss of vegetative cover, disruption of soil

stability, compaction, contamination, reduction of soil organic matter and soil productivity, reduction and/or loss of litter cover, and/or loss of diversity in plant communities.

Typically, direct impacts to soil resources are the result of surface-disturbing actions that remove vegetative cover, loosen surface soil, result in compacted soil layers, and expose soil to wind/water erosion. Indirect impacts resulting from soil disturbance may include reduced soil productivity, increased sedimentation, reduced infiltration, decreased air quality (as a result of wind erosion), and increased ground-surface runoff.

In general, the livestock management actions delineated in the San Juan/San Miguel RMP ROD (BLM 1985) and Public Land Health Standards have guided management of the Monument's soil resources. In arid and semi-arid environments, livestock spend a disproportionate amount of time in riparian/wetlands habitats; consequently, impacts are concentrated in these ecosystems. Soils in these areas are damp; therefore, compaction may easily occur. Impacts may affect riparian/wetlands vegetation, stream morphology, and, eventually, water quality through increased erosion, compaction, and/or streambank trampling. Livestock grazing impacts in upland areas may include reduced litter and/or vegetative cover, loss of native species that protect soil, and soil compaction. Once soil is exposed, both wind and water erosion may occur. Upland soils can wash downhill into dry, ephemeral canyon/gully systems and may, eventually, reach major drainages.

Soil resources may be impacted by many management actions. Restricted access and prohibitions on ground-disturbing activities at, and near, cultural resources, along with soil stabilization in some areas, may result in beneficial impacts to soil resources. Managing for Public Land Health Standards, as well as closing livestock grazing allotments, may result in reduced erosion and, thus, in localized beneficial impacts. Fluid minerals management may directly impact soil resources as a result of ground-disturbing activities, including seismic operations and the construction of routes, well pads, pipelines, and/or of other facilities. As the number of routes increases, the associated recreation and transportation management actions may result in increased erosion; however, prohibitions on cross-country motorized and/or mechanized travel may result in beneficial impacts. Fires may impact soil resources through the removal of plant cover, the destruction of surface organic matter, the alteration of soil temperature and moisture regimes (by altering the amount and type of plant overstory), the alteration in patterns of snow accumulation and snowmelt, and (if they are sufficiently hot) the modification of soil infiltration rates (by creating a hydrophobic or "water-repellent" surface soil). Benefits resulting from cool surface fires may include the improvement of nutrient cycling (by releasing minerals from burned litter and duff), and the reduction of ground fuels that increase the potential for catastrophic wildfires.

Soil resource management actions include ground-disturbance restrictions; reclamation activities tied to fluid minerals development; closure and/or rehabilitation of routes and campsites; and intensive management of livestock (such as reductions in AUMs, better distribution of livestock, and/or construction of livestock enclosures).

4.2.6.1. Evaluation Criteria and Assumptions

It is difficult to measure individual adverse impact components resulting from a variety of sources; however, the number of acres of ground disturbance can be used as a relative comparison factor for soil impacts. Estimates of disturbance were compiled from the AMS (BLM 2005b) and the RFD (BLM 2005c). The number of acres reclaimed or improved through increased vegetative cover, and/or through other methods of soil stabilization, may be used to measure beneficial impacts. In some instances, when impacts cannot be quantified, a descriptive analysis is used.

Assumptions used in analyzing impacts to soil resources include the following:

- Erosion can be expected with the majority of soil types present within the Monument, most of which are characterized as having severe water erosion and high runoff properties.
- BMPs are required for all ground-disturbing activities.
- Approximately 7 percent of Monument land is rock outcrop and, therefore, not subject to erosion.
- It is assumed that the number of routes predicted for construction, based upon new acres leased for fluid minerals development, would all be new routes.
- Federal lands within the boundary of the Monument were used as the impacts analysis area.
- Watersheds associated with the Monument were used as the cumulative impacts analysis area.

4.2.6.2. Alternative Analysis

Impacts to soil resources within the Monument may differ depending upon specific management actions proposed under each alternative. The following sections describe the impacts from management actions proposed for soil resources, as well as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Soil Resources Management

Alternative I would continue current soil resource management activities. This includes reporting soil disturbing activities occurring outside of Monument lands that are resulting in, or may result in, soil degradation, water-quality deterioration, and/or other damage to Monument resources. Under this alternative, management actions would include maintaining site-specific erosion control measures in Cultural Resource Management Plans (CRMPs), maintaining soil productivity, minimizing erosion, minimizing human-caused soil erosion in Emphasis Areas A (Livestock Management), C (Recreation Resources), H (Public Land Disposal), and L (ACECs), as well as stabilizing and rehabilitating areas with severe human-caused soil erosion. This alternative would require these protective measures, along with the requirement to meet Public Land Health Standards. Current conditions and trends show that Public Land Health Standards for soil are not being achieved; therefore, it can be assumed that actions outlined in this alternative are insufficient to protect soil resources.

Under this alternative, soil SSR/CSU stipulations would apply for slopes greater than 40 percent, which would protect approximately 21,036 acres. Short-term impacts may be allowed on fluid minerals development sites (well pads, routes, etc.); however, operating plans would need to demonstrate how site productivity would be restored, how surface runoff would be controlled, and how offsite areas would be protected from accelerated erosion. In addition, no surface-disturbing activities would be allowed during extended wet periods, and construction activities would be prohibited when soils are frozen. When enforced, these measures would help to alleviate soil erosion. Where measures are not enforced, vegetative cover would remain low, allowing for the continued exposure of soil to wind and water erosion.

Cultural Resources Management

Preservation of the Monument's cultural resources would serve to protect soil resources. Alternative I would protect sites from disturbance; however, it would allow scientific, archaeological, and/or historical investigations (where surface disturbance is required to be minimal). Impacts such as trampling, soil compaction, and soil erosion may occur as a result of cultural resource stabilization and excavation; however, techniques used to stabilize cultural resource sites typically also stabilize erosive soils. Impacts from cultural resource activities on soil resources may be isolated and short-term, with greater benefits realized over the long-term.

Fluid Minerals Management

Approximately 80 percent of Monument lands are currently leased for fluid minerals development. Under Alternative I, the remaining 20 percent would not be leased; therefore, no impacts would occur from new leases.

Fluid mineral development would result in both direct and indirect impacts to soil resources on currently leased lands. New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance.

Under this alternative, development on existing leases is expected to increase, which would, in turn, result in larger areas of disturbance across the Monument. Existing stipulations would be enforced, including NSOs that protect scenic, natural, cultural, and archaeological values, and that protect rare flora and fauna habitats. TLs would be applied for big-game winter range. SSR/CSU stipulations would be established for surface disturbance on slopes greater than 40 percent, on perennial water impoundments and streams, and on riparian/wetlands vegetation zones. Additional restrictions may be applied to geophysical operations. However, even with these protective measures, an increase in ground disturbance is likely and, as a result, soil erosion may increase. There may also be an increase in soil contamination (as may occur, for example, from an oil spill) due to the increase in people, vehicles, and mineral extraction operations.

Livestock Grazing Management

Up to 8,492 active preference AUMs are currently permitted with ninety-seven percent of Monument lands falling within grazing allotments under this alternative. Alternative I would continue this current level of use.

During the summer of 2001, a Rangeland Health Evaluation and an Ecological Site Inventory (BLM 2001i) were conducted. The inventory identified 15 livestock grazing allotments (covering 141,000 acres) in need of intensive management (as described in the AMS, BLM 2005b). As part of this inventory, the condition of the upland soil in many areas of the Monument was generally considered "at risk with a reversible loss in productive capability and increased vulnerability to irreversible degradation." This condition is likely due to more than 100 years of heavy livestock grazing on Monument lands (Horn 2004). Currently, there are 28 livestock grazing allotments within the Monument. Each allotment has been categorized as: 1) having achieved; 2) making progress toward achieving; or 3) having not achieved soil standards (although not every acre within a given allotment falls within a single category). Tallying acres for each category provides an overview of soil conditions within the Monument. Specifically, 5 grazing allotments have achieved upland soil standards (10,056 acres), 1 allotment is making progress toward achieving soil standards (247 acres), and 22 allotments have not achieved standards (149,393 acres).

The results of these evaluations indicate that current management has either not been successful or has been extremely slow in moving soil resources toward achieving Public Land Health Standards.

Recreation and Transportation Management

Under this alternative, recreation activities that may impact soils include the construction of facilities, the development of travel routes, ground clearing for dispersed camping and campfires, and cross-country travel by hikers and horseback riders. Any time vegetation is removed and ground is cleared, soil erosion may occur. Exposed soils in linear features (such as those associated with paths/routes) may result in channels for water flow during high intensity rain showers or periods of snowmelt. Damage to biological crusts from overland travel may result in soil erosion.

Under Alternative I, most existing user-created routes that have developed since the 1985 San Juan/San Miguel RMP decision would be allowed to reclaim naturally, or would be actively closed and reclaimed. Reclamation of routes would disturb soils on a temporary basis until vegetation is established (exposed soils may erode prior to the establishment of vegetation). The transportation system would include up to 149 miles of routes, including up to 131 miles of routes open to the public for all forms of travel. No routes would be specifically designated for bicycle or OHV travel. Under this alternative, a total of up to 864 acres may be disturbed as a result of routes. The 2000-2002 route inventory recorded 213 miles of routes and 1,235 acres of disturbance.

Other Resources Management

Under Alternative I, more than 95 percent of the Monument would remain classified as FMZ C, with management strategies intended to ensure that wildfire is contained within natural or human-made barriers/firebreaks. FMZ C areas have a lower suppression priority in multiple wildland fire situations than in FMZs A or B; however, the same goal of no more than 50 percent of the unit burning over a 10-year period would apply. The remaining 5 percent of the Monument would include specific cultural resource, natural resource, and/or industrial infrastructure locations designated as FMZ B or FMZ A, under which fire management and mitigation strategies are more aggressive. Prescribed fires may be used as forest and vegetation management strategies in any FMZ. Prescribed fires are usually not as hot as uncontrolled wildfires; however, they may expose soils to erosive forces. After wildfires, some vegetation remains unaffected and/or vegetation sprouts/resprouts more rapidly.

Under this alternative, management of water resources would mainly consist of mitigation measures for disturbance to riparian/wetlands corridors. Soil erosion is more likely to occur once disturbance has occurred, in spite of mitigation measures, than it would if no disturbance had occurred. The primary sources of soil erosion occurring in riparian/wetlands areas are from vehicle or route crossings and livestock grazing. This alternative would require the protection of 2,415 acres of riparian/wetlands vegetation, which may reduce the potential for impacts to soil resources in this area.

Alternative V (Preferred Alternative)

Soil Resources Management

Under Alternative V, soil resource management actions would include requiring soil BMPs as COAs for all new oil and gas leases and permits; establishing NGD/NSO stipulations for areas with slopes greater than 30 percent (36,504 acres) and/or for soils with high-erosion potential; maintaining a zero-level accelerated erosion standard; prohibiting rangeland use to reduce the

protective attributes of vegetation; identifying areas for stabilization and rehabilitation; and restoring, stabilizing, and rehabilitating areas with severe human-caused soil erosion.

There is a high potential for soil erosion on oil and gas development sites, as well as in other areas where localized construction occurs, as the result of vegetation being removed and soils being exposed to wind and water. However, NGD/NSO stipulations for slopes steeper than 30 percent, and/or for other erosive soil, may help to protect the resource from erosion. In addition, soil erosion BMPs would be used during route construction, as well as during other ground-disturbing activities, which may, in turn, minimize impacts by minimizing ground disturbance. There may be localized beneficial impacts resulting from the stabilization and restoration of eroded areas. Soil resources may benefit from progress made toward achieving Public Land Health Standards.

Cultural Resources Management

Preservation of the Monument's cultural resources may serve to protect soil resources. Alternative V would protect cultural resource settlement clusters and sites from all activities, except for those related to scientific, archaeological, and/or historical investigations (where surface disturbance is required to be minimal). Impacts, including those resulting from trampling, soil compaction, and soil erosion, may occur as the result of the development of 13 to 25 cultural resource sites for visitation, as well as from excavation; however, the objective for protecting cultural resources within the Monument is to minimize ground disturbance. This objective may help to protect soil resources, as well as enhance stabilization efforts, at developed cultural resource sites.

Fluid Minerals Management

In addition to impacts from current fluid mineral leases as described in Alternative I, Under Alternative V, up to 880 acres would be available for leasing to protect against drainage. Up to 18 acres of new ground disturbance would be possible under this alternative and would occur on existing leased lands to access minerals associated with new leases. Even if additional lands were acquired, no more than 880 acres would be leased. New leases would have NSO/NGD stipulations that protect cultural, natural, and scenic resources, as well as all other Monument objects. Under this alternative, geophysical operations would be restricted to BLM-designated routes. Temporary access routes would require reclamation. If water is present in washes, alluvial valleys, and/or in perennial water features, geophysical vehicles would only be allowed to cross channels at BLM-designated routes. In addition, in areas where riparian/wetlands vegetation is present, geophysical vehicles could only travel on legally designated routes. Seismic operations requiring bulldozers, earthmoving equipment, and/or explosives would be prohibited. Soil resource NSO stipulations for slopes greater than 30 percent would apply. BMPs would be included in COAs for new leases.

Surface-disturbing activities associated with fluid minerals development expose soils to erosive forces; however, minimized development and the stipulations listed above may help to reduce potential impacts on new leases. Ground disturbance in existing leased areas may continue to pose the greatest threat to soil resource management.

Multi-year GADPs may help to minimize ground disturbance in currently leased areas (Appendix M). In addition, the use of existing disturbed areas for directional/horizontal drilling may minimize ground disturbance, as well as the associated loss of vegetative cover and soil (due to soil exposure and to wind/water erosion) (see Map 17). The loss of soil that would result from ground disturbance related to fluid minerals development is a primary concern.

Another concern associated with fluid minerals development is soil contamination that may result from spills and storage. Soil contamination can prevent vegetation from reestablishing,

can leech contaminants into the ground water, and can move into surface water systems through runoff. Incorporating BMPs, COAs, mitigation measures, and stipulations may provide opportunities for both minimizing ground disturbance and for reducing soil erosion and contamination.

Livestock Grazing Management

Under Alternative V, rangelands would be managed to meet Public Land Health Standards. Management actions proposed under this alternative include closing the East and West Sand Canyon, Rock Creek, Goodman Gulch, and Trail Canyon allotments to grazing (6,059 acres); reducing the numbers of active AUMs to 6,437; having ninety-four percent of Monument lands fall within grazing allotments; limiting spring livestock grazing; fencing streams and riparian/wetlands areas where other management actions do not result in achieving PFC and Public Land Health Standards; and considering “resting” allotments. Livestock grazing in the McElmo RNA (427 acres) would be limited to winter months.

Under Alternative V, as the result of reduced AUMs, the closure of 5 allotments, and intensive livestock management, soil conditions may improve. This would be due to increased vegetative cover, reduced soil compaction, and reduced impacts in riparian/wetlands areas. These improvements may occur more rapidly under this alternative than they would under the No Action Alternative (where reductions in livestock impacts are not proposed). In those areas where livestock congregate, especially during wet soil conditions, there may be soil compaction. In addition, livestock trails, and areas around water developments where livestock congregate may experience compacted soils. These are also areas where water flow may concentrate, thereby creating erosion. Implementing Public Land Health Standards may help to ensure the proper management of livestock, and may serve to minimize impacts to the soil resource.

Recreation and Transportation Management

Recreation activities that may impact soils include the construction of facilities, the development of travel routes, ground clearing for dispersed camping and campfires, and cross-country travel by hikers and horseback riders. Any time vegetation is removed and ground is cleared, soil erosion may occur. Exposed soils along linear features (such as paths/routes) may create channels for water flow during high intensity rain storms or during periods of snowmelt. Damage to biological crusts from overland travel may result in soil erosion. This alternative does not allow cross-country travel in the Sand Canyon/East Rock SRMA, which may, in turn, minimize damage to biological crusts, narrow the potential for soil erosion to designated routes, and focus soil stabilization efforts to routes of travel. Managing for a backcountry experience, except for in a few specific locations, would minimize soil disturbance, in that it would restrict the number of facilities and routes constructed.

Under this alternative, the transportation system would include up to 169 miles of routes. There would be designated bicycle and OHV routes. Up to 980 acres of ground may be disturbed as a result of routes. The management prescription for the transportation network would be to mitigate the impacts of erosion from past surface-disturbing activities, and to ensure that newly disturbed areas are stabilized and/or are successfully reclaimed. The transportation network would include motorized, non-motorized, and mechanized routes. All routes within the Monument have a gravel or natural surface, except County Roads 10 and N, which are chip-sealed. Native surface routes may result in soil erosion caused by water running down, or across, exposed soils during rain events. Travel during wet conditions may form ruts or gullies in native surface routes, which may, in turn, add to the channeling of water and to soil compaction.

Under Alternative V, the Monument would be closed to cross-country travel by motorized and mechanized vehicles to reduce inadvertent damage to cultural and natural resources.

Established routes, as shown on Map 5, would be open to designated uses and would be maintained to minimize soil erosion. No upgrades (such as route widening, the creation of passing lanes, etc.) designed to accommodate additional or different uses would be allowed; however, route maintenance would be scheduled. Limited-access routes would be maintained at a minimum level to meet the need of the use. In some cases, this may allow vegetation to occupy much of the route corridor, which may, in turn, stabilize soils and minimize soil erosion.

Under this alternative, most user-created routes would be closed. Closed routes would be reclaimed within 10 years. Reclamation of routes may disturb soils on a short-term basis, until vegetation becomes established.

Other Resources Management

Under Alternative V, the entire Monument would be designated as FMZ B, under which fire management and mitigation strategies are aggressive. Prescribed fires may be used as forest and vegetation management strategies; thereby exposing small areas of soil to wind and water erosion. However, prescribed fire would be used as a preventative measure designed to avoid wildfires, which are generally larger and pose a greater risk of large-scale soil erosion.

Under Alternative V, water resources management would consist of actively protecting 5,312 acres in canyon bottoms, riparian/wetlands areas, and floodplains through a policy of avoiding ground disturbance in these areas. Water/soil contact is constant in these areas, making them subject to erosion (water flow acts to scour soils). Maintaining vegetative cover to its maximum in these areas would serve to slow water flow, aid in sediment deposition, and reduce soil erosion.

Alternative VI (Proposed Plan)***Soil Resources Management***

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, there would be 36,607 acres with slopes greater than 30 percent.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, the transportation system would include up to 172 miles of routes, with a total of up to 997 acres of ground disturbance.

Other Resources Management

The impacts would be the same as those described under Alternative V. However, the Proposed Plan would actively protect 5,528 acres of canyon bottoms, riparian/wetlands areas, and floodplains.

Table 4-18 Comparison of Impacts to Soil Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Soil Resources	Not meeting Public Land Health Standards. Apply no accelerated erosion standard. Apply SSR/CSU to protect slopes greater than 40 percent (21,036 acres).	Take specific actions to meet Public Land Health Standards as rapidly as possible. Apply zero-level accelerated erosion standard. Apply NGD/NSO stipulation to protect slopes steeper than 30 percent (36,504 acres).	Take specific actions to meet Public Land Health Standards. Apply zero-level accelerated erosion standard. Apply NGD/NSO stipulation to protect slopes steeper than 30 percent (36,504 acres).	Same as Alt. III.	Same as Alt. II.	Take specific actions to meet Public Land Health Standards as rapidly as possible. Apply zero-level accelerated erosion standard. Apply NGD/NSO stipulation to protect slopes steeper than 30 percent (36,607 acres).
Cultural Resources	Protect cultural resource sites. Develop new sites for controlled visitation.	Protect cultural resource settlement clusters, sites, and isolated finds. Develop 13 sites.	Protect cultural resource settlement clusters and sites. Develop 13 to 25 sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Same as Alt. II.	Same as Alt. II.

Table 4-18 Comparison of Impacts to Soil Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
		lands to obtain minerals from new leased lands). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.				
	Continued development of existing leases (127,895 acres) with up to 1,985 acres new disturbance.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.
Recreation and Transportation	Manage 149 miles of routes; 864 acres of disturbance (per 1985 RMP decision). 1,235 acres of disturbance (per 2000-2002 inventory). Develop 7 facilities.	Manage 139 miles of routes; 806 acres of disturbance. Develop 7 facilities.	Manage 189 miles of routes; 1,096 acres of disturbance. Develop 13 facilities.	Manage 213 miles of routes; 235 acres of disturbance. Develop 20 facilities.	Manage 169 miles of routes; 980 acres of disturbance. Develop 9 facilities.	Manage 172 miles of routes; 997 acres of disturbance. Develop 9 facilities.

Table 4-18 Comparison of Impacts to Soil Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Other Resources: Fuels and Fire	Manage 155,800 acres (95%) with no specific fire suppression requirements.	Manage entire Monument as FMZ B, with specific fire suppression requirements.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.
Other Resources: Water Resources	Protect 2,415 acres of riparian.	Protect 5,312 acres of canyon bottoms, riparian and floodplain.	Same as Alt. II.	Protect 3,217 acres of riparian and floodplain.	Same as Alt. II.	Protect 5,528 acres of canyon bottoms, riparian and floodplain.

4.2.6.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-19 Past, Present, and Future Activities influencing Soil Resources
Past Activities
Unmanaged livestock grazing and associated loss in vegetative cover
Large scale vegetation treatments in the 1960s and 1970s
Spread of undesirable plant species such as cheatgrass
Ineffective reclamation efforts
Fluid mineral development
Encroachment of pinyon-juniper woodlands followed by chaining and other large-scale vegetation treatment
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Present Activities
Increased fluid mineral development
Firewood cutting restrictions
Increased popularity of OHVs
Prolonged drought and die-off of pinyon trees
Management to include meeting Public Land Health Standards
Implementation of Best Management Practices (BMP)
National Monument designation by Presidential Proclamation to protect the objects while managing valid existing rights so as not to create any new impacts to the objects
Future Activities (Proposed Plan)
Continued increase in fluid mineral development
Lease 880 new acres for drainage with restrictive stipulations

Table 4-19 Past, Present, and Future Activities influencing Soil Resources
GADPs required for long-range planning
Protection of cultural and natural resources on a landscape level to minimize cumulative impacts and manage for resource setting

An estimate of acres of known disturbance for past, present and future disturbance in the Monument shows the following:

Table 4-20 Cumulative Acres of Disturbance (Past, present and projected future acres)	
Development Type	Disturbance Area (acres) (Maximum, including what may be reclaimed)
Fluid Mineral Development	3,168 acres (1,165 past leased + 880 future leased + 18 future new leases + 1,102 seismic)
Routes	1,235 acres (213 miles is maximum number to exist)
1960s Chained/Harrowed Vegetation Treatments	15,000 acres
Total Acres	21,624 acres

There are three primary activities occurring off the Monument that may cumulatively impact soil resources within the Monument: 1) livestock grazing; 2) fluid minerals development; and 3) urban expansion. Livestock grazing on neighboring private lands may impact ground cover, plant diversity, and riparian/wetlands health on these lands often do not meet Public Land Health Standards. It can be predicted, however, that the more livestock graze within the Monument (either in animal numbers or time grazing), the greater the impact to soil resources resulting from trampling, rubbing, and associated erosion. In addition, closing routes (41 miles) and managing for Public Land Health standards within the Monument may increase ground cover over time, which may, in turn, reduce soil erosion.

Fluid minerals development (including federal surface/federal minerals; private surface/federal minerals; and private surface/private minerals) may result in considerable ground disturbance resulting from construction of well pads, pipelines, compressor stations, routes, and/or other facilities. Increased erosion and potential rockfall and/or landslide hazards may result especially if/when these activities are not subject to BMPs, COAs, stipulations, and/or mitigation measures. Reclamation of abandoned well pads on, and off of, the Monument has not been consistently successful. These areas continue to erode, which, in turn, provides conditions for the invasion of noxious weeds. Noxious weeds and other invasive species often prohibit the return of native vegetation, which is often better suited to hold soils in place.

Urban expansion, and the associated construction of buildings and routes, is occurring throughout Montezuma and Dolores Counties. This expansion is resulting in long-term ground disturbance. These activities may indirectly impact the Monument as a result of offsite soil erosion; erosion that can then move onsite or down drainages during high intensity rainstorms and/or during snowmelt. Sediment may enter perennial streams (including Yellow Jacket Canyon, McElmo Creek, and Cross Canyon), and may, eventually, be transported downstream from the Monument into the San Juan River (a major tributary of the Colorado River).

4.2.7. Terrestrial and Aquatic Wildlife

The primary goal for wildlife resources within the Monument is to optimize biological diversity by managing for a variety of healthy habitat types in support of native fish and wildlife populations. The management actions associated with this goal would aim to improve habitat conditions and reduce disturbance to terrestrial and aquatic resources (wildlife). The occurrence, abundance, and distribution of wildlife are most strongly affected by habitat type, quality, and accessibility. All of these habitat characteristics could be severely altered as a result of increased human activity and resource development, to the detriment of wildlife. The management objectives related to this goal include:

- contribute to the maintenance or recovery of Federally listed threatened, endangered, proposed, and candidate species; State listed species; and BLM sensitive species;
- contribute to the recovery of the Mexican spotted owl and to the southwestern willow flycatchers (SWWF);
- protect nesting sites and winter concentration areas for bald eagles and golden eagles;
- protect active nest sites for raptors;
- manage, conserve, and enhance habitat for neotropical migrant birds;
- manage, conserve, and enhance habitat for sensitive reptile species;
- protect breeding habitat for amphibians;
- reintroduce bighorn sheep;
- restore sagebrush grasslands to support populations of Gunnison sage-grouse on their historical range;
- maintain and restore stable populations of BLM sensitive fish species (flannelmouth sucker and bluehead sucker);
- improve tributaries that would contribute to restoring threatened and endangered fish populations within the San Juan River (Colorado pikeminnow and razorback sucker);
- improve forage and cover conditions for mule deer;
- manage and control wildlife species that have, or may have, detrimental impacts to other resources and/or land uses; and
- maintain and/or enhance habitats capable of sustaining existing or increasing wildlife and fish populations.

The six alternatives represent different combinations of management actions and land use or resource development scenarios, each with differing types and levels of impacts. Under the Proposed Plan, the general management goal is to ensure against actions that would jeopardize population viability, especially as they pertain to currently listed, proposed, or candidate threatened or endangered species, or as they may contribute to the listing of additional species.

Potential impacts to special status fish and wildlife fall into one or more of the categories described below, which include habitat loss, habitat fragmentation, disturbance, interference with movement patterns, and direct mortality. These impacts may reduce the numbers of one or more species through local extirpation or through changes in the distribution, relative abundance, and/or habitat use of various species. Reduced prey abundance may affect predator abundance, and may make populations and communities overly vulnerable to other impacts. For example, increases in the number of routes may result in habitat fragmentation. This, in turn, may result in habitat-specialists being more vulnerable to disturbance as a result of the reduction of patch size, an increase in the amount of edge, and an increase in accessibility to predators or nest parasitism. The gray vireo and the 6 species of bats listed in Table 3-14 are species that depend upon pinyon-juniper woodlands. As a result, they may suffer adverse impacts resulting from the fragmentation of this habitat caused by the addition of routes.

As described above for general wildlife, impacts associated with changes in management, human use, and/or in resource development may result in direct and indirect impacts to special status species. For wide-ranging or migratory species (such as migratory songbirds), onsite impacts may also impact community composition and function in the southern portion of the species' range (where they over-winter). In addition, project impacts may combine with non-project impacts and result in cumulative impacts.

In a general sense, these impact categories are applied to all special status species, including federally listed, proposed, or candidate threatened or endangered species. However, interagency consultation with the USFWS, pursuant to Section 7 of the Endangered Species Act (ESA) would address potential adverse impacts on these species during the preparation of a Biological Assessment (BA) and the issuance of a Biological Opinion (BO) for the selected alternative. The USFWS has concurred with BLM determinations in the BA (see Appendix O). For the purposes of expediency, the analysis below addresses generalized impacts for all special status species as a group. Occasionally, when particular potential impacts are noteworthy, specific mention is made of one or more species.

The following alternative analysis considers adverse and beneficial impacts, direct and indirect impacts, as well as short-term and long-term impacts, to wildlife resources. Terrestrial and aquatic wildlife may benefit from resource management actions, including protective measures for special status species, proactive implementation of a recovery plan, and public education. Other actions aimed at preserving and/or enhancing wildlife resources include TLs placed on disturbance activities during the breeding season, and/or on stipulations in buffer areas around certain wildlife species. Adverse impacts may include those resulting management actions, including fluid minerals development (as a result of ground disturbance, traffic, and human encroachment) or livestock management (as a result of vegetation being over-utilized and riparian/wetlands health being diminished).

Direct impacts to wildlife are often associated with direct mortality, including that which results from poaching or vehicle accidents. Broad-scale impacts, however, may occur indirectly, including those resulting from the loss or fragmentation of habitat, loss of habitat security, or disturbance to individuals.

For the purpose of this analysis, short-term or temporary impacts are those that are most often associated with a period of initial habitat loss or modification, and with intensive human activity. In the context of future management and development scenarios for the Monument, short-term impacts are mostly associated with oil and gas development, during which activity at a specific well site may last for several weeks or months. These impacts may be reduced in severity as that part of the field enters the production phase. This already occurs, to some extent, on existing fluid minerals leases.

Short-term impacts are those that last from 5 to 10 years, or less. Long-term impacts are those that last longer than 10 years, with most of these extending throughout, or potentially beyond, the period of the management action or development activity. Examples include impacts associated with the continued presence of elevated levels of human activity throughout the life of the oil and gas field (40 years or longer), as well as with the protracted period needed for final reclamation of disturbed areas. Permanent impacts are those with a likely duration of more than 50 years.

Major types of impacts on wildlife associated with humans are discussed below.

Direct Habitat Loss

Direct habitat loss occurs when life-sustaining conditions are lost (including through the removal of vegetation, the draining of a pond, etc.). In terms of future land use and management actions, vegetation impacts may be the most significant. Removal of vegetation may impact wildlife, as a result of the reduction in the extent and/or in the quality of habitat (food, cover, and structure) for nesting as well as for other uses. By comparing the amount of habitat lost to the amount preserved, these impacts are relatively simple to quantify. For example, removal of vegetation during the construction of a route or a well pad essentially strips the affected area of any wildlife value. The closure and reclamation of temporarily disturbed areas may eventually restore lost habitat values; however, the disturbance may have a long duration (20 or more years for a well) and/or may require years, or decades, for recovery of pre-disturbance structure and function.

Habitat Modification

Changes in habitat are generally less obvious, and less severe, than losses of habitat; however, they may be significant. This is especially true if small impacts accumulate across large areas. Examples include the removal of forage by domestic livestock; the trampling of soil by domestic livestock; the invasion of weeds in areas where native plant vigor, and/or cover, is reduced; the chaining of pinyon-juniper woodlands; the dewatering of streams, springs and seeps; and/or the removal of tree cover during timber harvesting.

Habitat modification may also be beneficial, and may serve as an important tool in wildlife management. Examples include the use of prescribed fires to stimulate new growth on senescent (older) woody vegetation, the thinning of overly dense shrubs to enhance forage production, the control of noxious weeds, the construction of protective fencing along riparian/wetlands areas, and/or the creation of alternative watering features designed to reduce the need for cattle to access streams.

Habitat Fragmentation

This type of impact on wildlife is increasingly recognized as related to human population growth and associated development. Impacts resulting from habitat fragmentation relate to the loss of large habitat blocks and to the increased percentage of "edge" on smaller blocks (when compared to larger blocks). Species adversely impacted by fragmentation consist of "habitat-interior" species and most "habitat-specialist" species. Habitat-interior species are those that breed in a particular habitat type, rather than at the transition area (ecotone) between two habitat types. Habitat-interior species are most often associated with dense forest vegetation types. Within the Monument, the concern for habitat-interior species may apply to wildlife tied specifically to pinyon-juniper woodlands or to sagebrush shrublands. These vegetation communities, however, are naturally fragmented, and have a diverse mix of trees, shrubs, forbs, and grasses. Most species occupying these vegetation types are not there for the monoculture of a certain vegetation type, but, rather, for the diversity of the mix of vegetation type.

Routes may result in habitat fragmentation. Many species exhibit a decline in use of areas adjacent to routes. Habitat-interior birds may avoid habitat within 483 feet (less than a mile) of routes (Forman and Alexander 1998, Forman 2000, Ingelfinger 2001). In one study, use by mule deer was reduced within 645 feet of a route. The “route-effect zone,” or the area over which a route exerts its ecological influence, is 645 feet (Knight et al. 2000). Impacts have also been described in terms of route density (length of routes per unit area). Research has demonstrated impacts resulting from routes and route density; however, the density of routes within the Monument is far less than the thresholds discussed in the literature. In addition, use of routes varies, which alters the type and/or the extent of impacts to wildlife. For example, a seldom-used two-track dirt route (considered a tertiary, or secondary route) may result in less impacts to wildlife than that caused by a heavily traveled paved route (considered a primary route). The degree of disturbance may vary according to the type of route, the level of use, the mode of travel, the season of travel, and/or to the wildlife species being impacted.

Small mammals in sagebrush-steppe landscapes, like that occurring within the Monument, have been studied. Their species richness has decreased with the increasing isolation of habitat patches, and these sagebrush-obligate species may be at risk of extirpation as sagebrush becomes even more fragmented (Hanser and Huntly 2006). The presence of cheatgrass may further add to the decrease in diversity. Due to the lack of protective cover, small mammals do not like to cross roadways. Roadways may sever populations of small mammals or may reduce movement to a small degree. Some of the small mammal species with relatively limited distributions in Colorado that inhabit semi-desert shrubland, pinyon-juniper woodland, and/or grassland include the canyon mouse, the pinyon mouse, the northern grasshopper mouse, and the white-throated woodrat.

The size of an undisturbed block of land may also affect the number of bird species present. Larger habitat blocks (325 acres or more) support a vastly larger number of birds, and have greater species diversity, than do small blocks of 8 acres or less (McIntyre 1995). These studies were not conducted in pinyon-juniper woodlands; however, it is not unreasonable to assume that the same concept applies. Similarly, small mammals are sensitive to fragmentation in sagebrush shrublands (Hanser and Huntly 2006).

Disturbance

Some species are more tolerant of human activity than others; however, virtually all species have some threshold of disturbance, above which they will abandon or avoid an area. The result is a de facto loss of habitat, because avoided areas cannot meet survival needs. The amount of habitat actually available to wildlife is called “effective habitat.” Reductions in the amount of effective habitat can greatly exceed any direct habitat loss. For example, Reed et al. (1996) estimated that the effective habitat loss of routes was 2.5 to 3.5 times as great as the actual habitat loss. Construction of a mile-long straight route 30 feet wide (the lower typical width for an oil and gas access route) would represent 3.6 acres of direct habitat loss. Multiplying this figure by 3.5, (the upper end of the range reported by Reed) yields an effective habitat loss of approximately 23 acres per mile of route.

Routes are not the only cause of disturbance impacts. Archaeological excavation and outdoor recreation may result in impacts to wildlife (Knight and Gutzwiller 1995). Many more species may be adversely impacted as the result of activities such as hiking, camping, wildlife viewing/photography, OHV use, and/or rock climbing (Boyle and Samson 1985). OHVs can result in flight, stress, and/or redistribution of wildlife. Humans hiking, backpacking, riding, and/or mountain biking may cause deer to move away at distances of over 650 feet (Freddy et al. 1986). Rock climbers may cause disturbance at preferred raptor perching and nesting sites.

Mountain biking and OHV use have increased in the past two decades (Knight and Gutzwiller 1995), and may result in disturbance impacts.

In terms of potential oil and gas development in currently undeveloped portions of the Monument, the degree of avoidance due to disturbance is difficult to predict. This is because it would depend upon the dispersion of disturbance areas, specific vehicular travel routes, and the number of trips. Wildlife would be expected to avoid areas up to 0.5 mile around human activity (such as well construction sites and access routes); however, they may continue to use the remaining available habitat. Construction disturbances may result in a greater impact, although they may be temporary. Well-operating disturbances may likely be a lower-level disturbance and of longer duration. Many species, including deer, can habituate to low levels of predictable human activity.

Interference with Movement Patterns

Habitat loss or modification, habitat fragmentation, and disturbance impacts may also impact wildlife, in that important daily or seasonal movement patterns may be altered. These patterns may be altered as a result of shifts designed to avoid human activity or to avoid crossing open areas that provide inadequate protective cover. Within the Monument, large open areas remain relatively intact, and there is likely little interference with wildlife movement patterns.

Direct Mortality

Direct mortality may result in areas experiencing increasing human use. This may be due to collisions with (or being run over by) vehicles, electrocution of raptors on utility lines, increased likelihood of illegal hunting, and/or inadvertent trampling of nests. The most likely cause of direct mortality within the Monument is routes. Amphibians and reptiles are particularly vulnerable to this because they cross routes between hibernation, breeding, and foraging sites; because they enjoy the warmth and stay on routes; and because they often do not move very quickly.

4.2.7.1. Evaluation Criteria and Assumptions

A number of methods can be used to measure adverse impacts to individual fish or wildlife species or populations; however, land management agencies generally focus on impacts to wildlife habitat. The number of acres of ground disturbance, livestock numbers, and road density can be used to compare impacts to wildlife habitat. Management actions that result in protective measures for wildlife and/or wildlife habitat are considered beneficial impacts. Another factor considered when determining impacts resulting from recreation on wildlife was visitation. Human presence is known to disturb wildlife, especially during sensitive times of the year (such as during nesting, breeding, and/or during preparation for winter). Recreation strategies that promote visitation may result in the greatest impacts to wildlife. In some instances, when impacts cannot be quantified, a descriptive analysis is used.

Assumptions used in analyzing impacts to wildlife resources include the following:

- Application of appropriate BMPs and standardized reclamation practices would be required as COAs for all new leases, permits, and surface disturbance areas (see Appendix E).
- For the impact analysis related to oil and gas development, the BLM would follow the stipulations from the San Juan/San Miguel RMP ROD (BLM 1985) and Amendment (BLM 1991b), including standard restrictions and limitations that also provide a measure of protection.
- The number of roads predicted for construction, based upon new acres leased for mineral development, would all be new roads.

- A variety of scenarios for bighorn sheep reintroduction are presented; however, details are not known at this time. The Colorado Division of Wildlife (CDOW) is responsible for managing wildlife and, ultimately, for making the decision regarding wildlife reintroductions. Given these circumstances, analysis at the PRMP/FEIS level can only focus on the Monument's willingness to coordinate with the CDOW throughout the process.
- Special status species are discussed below; however, potential impacts to general fish and wildlife can also be considered as potential impacts to special status species.
- Federal lands within the boundary of the Monument were used as the impacts analysis area.
- Watersheds associated with the Monument were used as the cumulative impacts analysis area.

4.2.7.2. Alternative Analysis

Impacts to wildlife resources within the Monument may differ depending upon specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed for wildlife resources, as well as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Wildlife Management

Under Alternative I, a number of existing protective measures would be in place, including protective measures (such as TLs and stipulations) for wildlife in general, which may benefit special status species. These are listed in the San Juan/San Miguel RMP ROD (BLM 1985), and include the prohibition of activities that may result in direct harm to threatened and endangered or sensitive species; the application of seasonal restrictions, where appropriate; the development of Habitat Management Plans (HMPs); the maintenance of riparian/wetlands habitat; the evaluation of potential native fish reintroductions; and the maintenance of deer and elk habitat and herd size management. Other actions target special status species and include:

- manage important habitat for special status species in ACECs;
- invest funds for habitat improvements in Cross, Cow, Cahone, Hovenweep, and Bridge Canyons riparian/wetlands areas;
- apply seasonal restrictions, where appropriate;
- develop HMPs, especially for special status species;
- maintain or improve riparian/wetlands habitat; and
- evaluate potential native fish reintroductions.

All of these actions may serve to protect wildlife and special status species by minimizing impacts, as listed above, to individual species and to their habitat (habitat loss, modification, and fragmentation; disturbance; interference with movement patterns; and direct mortality). This alternative calls for the modification of agreements with Wildlife Services (a section of the USDA Animal and Plant Health Inspection Service [APHIS]), to specify conditions for predator control. This may reduce indiscriminant predator killing. However, this alternative is not specific as to what those modifications may be; therefore, specific impacts cannot be determined.

Cultural Resources Management

The strategy for managing visitation to cultural resources is called the outdoor museum concept, in which visitors discover back country cultural sites on their own. Under this alternative, sites are assessed and developed for controlled visitation. This alternative allows for 240 sites to be stabilized. The additional access, and higher level of visitor use, may result from cultural resource development, which may, in turn, result in adverse impacts to individual species through disturbance (especially if songbirds are breeding and/or deer are wintering in the same areas). Impacts may be localized at developed sites where visitors are concentrated. The impacts to special status species may depend upon the location of their habitat, especially during times of occupancy, in relation to developed sites. The impacts to special status species as a result of scientific excavation may be minimal. This is because visitation is not heavy and because restrictions can be administered in a manner to avoid conflicts.

Fluid Minerals Management

Approximately 80 percent of Monument lands are currently leased for fluid minerals development. Under Alternative I, the remaining 20 percent would not be leased; therefore, no impacts would occur from new leases.

Fluid mineral development would result in both direct and indirect impacts to wildlife and wildlife habitat on currently leased lands. New fluid mineral development on 127,895 acres of currently leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of new disturbance.

The Proclamation allows for continued development on existing leases. Impacts to wildlife resulting from current fluid minerals leases would continue, and would be managed in accordance with the stipulations attached to existing leases. Stipulations set in place under the San Juan/San Miguel RMP/ROD Amendment (1991a), include NSO stipulations that protect scenic, natural, cultural, and/or archaeological values, and that protect rare flora and fauna; TLs on big-game crucial winter ranges (December 1 through April 30); and SSR/CSU stipulations on slopes equal to, or greater than, 40 percent and on riparian/wetlands vegetation. TLs may reduce impacts to big game while they occupy crucial winter habitat. Stipulations also apply to the McElmo RNA, for the habitat protection of rare species and reptiles.

For areas currently leased, the drainages and canyons may likely be protected from fluid minerals development. This is due to their lack of easy access, as well as to SSR/CSU stipulations on riparian/wetlands vegetation and steep slopes. It is anticipated that most of the extraction activity would occur on the mesa tops above the canyons, and that the species favoring riparian/wetlands areas and canyons may not be disturbed. However, the species favoring upland communities (such as pinyon-juniper woodlands, sagebrush and saltbush shrubland, and shrub-grasslands), may be impacted, since is where ground disturbance is expected to occur. The longnose leopard lizard, a BLM sensitive species, is an example of a species favoring these upland areas. These impacts are ongoing, based upon current management of fluid minerals in existing leases within the Monument.

Fluid minerals development has many aspects that are detrimental to wildlife populations; however, it is often the associated transportation infrastructure that results in disturbance, interference with movement, and/or in habitat fragmentation. (These are discussed below, under Recreation and Transportation Management.) In addition, the use of routes may bring more people to otherwise isolated areas. Examples include the increase in recreational shooting and motorized and mechanized use that occurs when routes open up in an otherwise inaccessible area (Reeve and Vosburgh 2006).

Alternative I would adhere to the San Juan/San Miguel RMP ROD (BLM 1985) and 1991 Amendment (BLM 1991a), which specify that no activities would be permitted in special status species' habitat that would jeopardize their continued existence. Alternative I also specifies that habitat management plans may be developed for winter raptor concentration areas and for threatened and endangered species' habitat, with a priority on the latter. Stipulations that are appended to fluid minerals leases would include those for the protection of natural resources (Stipulation Code SJ-1), and of rare fauna in the McElmo RNA (Stipulation Code: SJ-4).

Livestock Grazing Management

Under Alternative I, up to 28 allotments would be available for livestock grazing, with up to 8,492 active preference AUMs. Ninety-seven percent of Monument lands fall within grazing allotments under this alternative. Rangeland monitoring would continue to occur to determine whether or not livestock grazing goals and objectives were being obtained. During critical livestock grazing periods, less than 30 percent of active preference, and less than 50 percent utilization of current year growth of key species, would be allowed. Spring livestock grazing in all allotments would not occur on native ranges during the critical period of early forage growth, unless a system is implemented that would provide a critical rest period every 3 years. Meeting Public Land Health Standards and Livestock Grazing Guidelines is required under Alternative I; however, current conditions indicate that, to date, standards have not been met.

Under this alternative, livestock grazing impacts to wildlife may include loss of forage and/or impacts to riparian/wetland habitats favored by many species of wildlife. Livestock grazing may lead to conversion of native vegetation to invasive weeds (such as to cheatgrass). Noxious weed populations may be expected to increase in frequency, density, and diversity. This may have the potential to impact special status species, especially the longnose leopard lizard. Dense stands of cheatgrass under sagebrush and semi-desert shrublands may adversely impact longnose leopard lizards, because dense grass hinders their ability to find prey (Hammerson 1999).

Alternative I does not contain any active steps for the protection of riparian/wetland systems or biological soil crust communities. Minimum stubble height standards for herbaceous vegetation are also not part of this alternative. Livestock grazing impacts to special status species would continue to degrade and alter native sagebrush shrublands, which may, in turn, result in adverse impacts to the special status species that use these native habitats (such as the ferruginous hawk, the burrowing owl, and the longnose leopard lizard). Any impacts to riparian/wetlands vegetation resulting from weed infestations may damage the riparian/wetlands community (which supports a variety of neotropical migrant small birds, as well as raptors and other species). Of particular concern would be impacts to riparian/wetlands vegetation that may, in turn, impact instream habitat quality (including decreased bank stability, decreased vegetative cover, and/or increased sedimentation) in reaches that support flannelmouth suckers and bluehead suckers. Impacts to riparian/wetlands may also impact potential habitat for the western yellow-billed cuckoo and the SWWF (species that depend upon well-developed riparian/wetlands vegetation).

Recreation and Transportation Management

A primary factor to consider when determining impacts resulting from recreation on wildlife is visitation. Human presence is known to disturb wildlife, especially during sensitive times of the year (such as during nesting, fawning, calving, breeding, and/or during preparation for winter). Recreation strategies that promote visitation may likely result in greater impacts to wildlife; however, this alternative would offer no promotion strategy and would only develop facilities on an as-needed basis.

Based upon projected regional population growth, and the increasing popularity of outdoor recreation, recreation use continues to grow (Knight and Gutzwiller 1995). The resulting potential for damage to vegetation, as well as the potential for increased disturbance to wildlife, may likely increase impacts along commonly used routes. This may reduce effective or secure habitat for wildlife, increase habitat fragmentation, and, potentially, disrupt important movement patterns.

As discussed earlier, routes result in direct habitat loss, habitat fragmentation, spread of noxious weeds, disturbance, interference with movement patterns, and direct mortality. There are two measures of transportation that can be evaluated. These are: 1) route length and the associated area of ground disturbance; and 2) route density, involving the number of miles of routes per square mile. There are numerous variables to consider when determining impacts; however, the comparison of route length and density under the alternatives may be used and is presented in Table 4-1.

Under this alternative, the total length of routes would be 149 miles. Route density would be relatively low (0.58 miles per square mile). The 2000-2002 route inventory recorded 213 miles of routes and 1,235 acres of disturbance. The literature does not document reduced usage by elk and deer at these low route densities, other than the avoidance of routes in general. Many of these routes are likely used for OHV recreation and, although narrow, they represent potentially severe disturbance due to noise, dust, speed, and the potential for illegal use. Due to the short length of routes that would be added under this alternative, habitat fragmentation would remain low, and large blocks of undisturbed land, including designated WSAs, would be maintained. Under this alternative, direct habitat loss resulting from ground disturbance related to the proposed transportation system would be 864 acres.

Other Resources Management

Perhaps the most important resource for wildlife, especially in arid regions, is water. Riparian and wetlands areas show the greatest diversity in vegetation and wildlife species. Alternative I would protect 2,415 acres of riparian/wetlands system; however, there would be no restrictions on groundwater and/or on new water developments. Alternative I would be the least protective of water resources, when compared with the other alternatives.

This alternative would also protect large blocks of land, which may, in turn, benefit wildlife in that disturbance, habitat loss, and habitat fragmentation would be minimized. Under this alternative, 25,549 acres would be managed as WSAs, and 427 acres would be managed as the McElmo RNA.

Alternative V (Preferred Alternative)

Wildlife Management

Alternative V proposes the following wildlife protection actions:

- implementing TL for special status species that may benefit wildlife in general. Tree removal, fuel reduction, and ground-disturbing activity during the raptor breeding season would be prohibited, which may, in turn, benefit several bird species;
- prohibiting vegetation removal or treatment from mid-April to mid-July may protect nesting migratory birds and other wildlife;
- protecting or improving habitat for wildlife by:
 - maintaining or improving habitat;
 - establishing native grasses and forbs;

- prohibiting ground-disturbing activities within 150 feet of bodies of water that support native amphibian breeding;
- managing deer habitat;
- using prescribed fire as a management tool;
- changes in livestock grazing;
- implementing weed control; and
- implementing vegetation reclamation.

Predator-prey relationships are consistent with the objectives of this alternative. APHIS would be prohibited from culling or shooting individual animals or destroying their dens, except when individual animals pose a safety risk to humans or for other specific reasons, as agreed upon ahead of time.

Alternative V would follow the restrictions for wildlife outlined under Alternative I, and would add additional beneficial measures for special status species, including the prohibition of activities that would result in direct harm to threatened and endangered or sensitive species. These protective measures would include:

- the establishment of a TL within 0.5 mile of documented (occupied or historic) Mexican spotted owl nests to prohibit ground-disturbing activities within 0.5 mile from March 15 to September 1, with permitted activities within this area limited to mesa tops and rims;
- the implementation of the recovery plan (USFWS 1995) for the Mexican spotted owl.
- the establishment of a 0.5 mile restriction from active bald eagle or golden eagle nests from March 1 through July 15, and from winter roost or concentration areas from November 16 through April 15;
- the prohibition of ground-disturbing activities within 0.5 mile of bald eagle or golden eagle nest site, or bald eagle winter roost sites (active or historic) with a lease notice for oil and gas activities;
- the prohibition of tree removal and/or of ground-disturbing activity during the raptor nesting season (March 1 through July 15);
- the implementation of the recovery plan (USFWS 2002) for the SWWF;
- the preparation of a HMP for sensitive lizard species;
- the eradication of cheatgrass and other noxious weeds in vegetation communities that support sensitive reptiles, and the re-establishment of native vegetation;
- the fencing of suitable SWWF habitat to exclude livestock grazing; and
- the establishment of NGD stipulations within SWWF habitat and a 0.25-mile buffer of habitat patches.

This alternative would promote working with the CDOW to accomplish the reintroduction of bighorn sheep and Gunnison sagegrouse. Alternative V would provide measures that may protect habitat; lessen disturbance; and reduce habitat alteration and fragmentation for bats, peregrine falcons, bald eagles, ferruginous hawks, burrowing owls, SWWF, longnose leopard and desert spiny lizards, common kingsnakes, Mesa Verde nightsnakes, and special status fish species that occur within the Monument and in the San Juan River.

Cultural Resources Management

Alternative V would allow for the development of 13 to 25 sites for public visitation and interpretation. At the discretion of the Monument Manager, stabilization would be allowed, primarily to address human impacts. Development of each site, the required analyses, visitor presence, the additional access, and the greater level of overall visitor use may result in disturbance impacts to wildlife, especially to special status species, through human disturbance and possible habitat loss. However, the impacts may be minor, considering the relatively small surface area and the small number of sites involved. Under this alternative, scientific excavation would be timed to avoid special status species impacts. In addition, sites may be closed during critical periods of occupancy. This alternative would protect cultural resource settlement clusters and sites, preventing large areas of land from being disturbed, which may, in turn, benefit wildlife in that habitat would remain intact.

Fluid Minerals Management

In addition to impacts from current fluid mineral leases as described in Alternative I, under Alternative V, up to 880 acres would be available for leasing to protect against drainage. Up to 18 acres of new ground disturbance would be possible under this alternative and would occur on existing leased lands to access minerals associated with new leases. Under this alternative, new fluid minerals leases would be allowed on up to 880 acres for the protection of drainage. NSO stipulations would be included for areas of cultural and natural value. Geophysical operations would only be allowed to use BLM-designated routes. COAs would be applied to operational approvals, such as APDs. These actions may reduce impacts to wildlife overall, and may help to protect special status species, by minimizing ground disturbance and habitat loss or damage. Impacts will continue to occur from ongoing development of currently leased lands within the Monument. Impacts would include those related to ground disturbance and human encroachment. Such impacts would reduce the quality and quantity of wildlife habitat. Habitat loss, degradation, fragmentation, and species displacement would occur as the result of the construction of lineal features, such as powerlines, routes, and/or pipelines. Noise emissions from industrial facilities would impact wildlife behavior and movement patterns. Enhanced up-front planning, through the use of such tools as GADP surveys, would allow for proposals to be developed with consideration for protecting wildlife and other sensitive resources. Mitigation measures, COAs, BMPs, and stipulations would help to minimize impacts. In addition, the use of existing disturbed areas for directional/horizontal drilling would minimize ground disturbance, associated loss of vegetative cover and soils (due to soil exposure and to wind/water erosion) (see Map 17).

Livestock Grazing Management

Under Alternative V, the Monument would be stocked at 6,437 active AUMs with ninety-four percent of Monument lands falling within grazing allotments. This would be a substantial decrease from the current 8,492 AUMs. Five (5) livestock grazing allotments would be closed. Where Public Land Health Standards are being met, utilization levels would be limited to 50 percent of the current year's production of desired perennial grass species. A utilization level of 35 percent, on a by-pasture basis, would be implemented where Public Land Health Standards are not being met. Term livestock grazing permits would be modified to meet Public Land Health Standards.

Compliance with Public Land Health Standards may be achieved expeditiously as the result of reducing authorized use, adjusting spring livestock grazing duration and extent of use, and implementing a rest-rotation grazing system. Existing term livestock grazing permits would be reviewed on a regular schedule and adjusted, as necessary, to address current allotment conditions and permittee needs. Land health monitoring would continue. Steps taken to improve

Public Land Health Standards may help to maintain, or improve, wildlife habitat in that soil erosion would be minimized, water quality would be protected, vegetative cover would be improved, and forage would be provided. For example, when livestock are allowed to heavily browse shrubs, visual security for upland nesting birds is reduced, affording predators an unfair advantage for hunting success.

The relationship between livestock grazing and wildlife may be both beneficial and adverse. For example, the placement of pasture and allotment fences could act as travel barriers for wildlife that may otherwise get caught in the wire and get injured or die. On the other hand, the construction of livestock ponds would provide water for wildlife.

Recreation and Transportation Management

A primary factor to consider when determining impacts resulting from recreation on wildlife is visitation. Human presence is known to disturb wildlife, especially during sensitive times of the year (such as during nesting, breeding, calving/fawning, and/or during preparation for winter). Recreation strategies that promote visitation may result in greater impacts to wildlife, placing humans in wildlife habitat that was otherwise quiet and undisturbed. This alternative would propose a mix of promotion strategies. The BLM would manage in accordance with an undeveloped backcountry strategy, providing minimal facilities on 157,460 acres, and in accordance with a front country destination strategy, with additional facilities on 7,875 acres.

Under Alternative V, transportation management would include a total of up to 169 miles of routes, with up to 980 acres of ground disturbance. Route density would be 0.66 miles per square mile. These activities may have the potential to result in wildlife disturbance; however, restrictions on the location and the extent of recreation and transportation actions may help to minimize impacts.

Other Resources Management

Perhaps the most important resource for wildlife, especially in arid regions, is water. Riparian and wetlands areas show the greatest diversity in vegetation and wildlife species. Alternative V would protect 5,312 acres of riparian/wetlands system, including canyon bottoms, riparian/wetlands areas, and floodplains from ground disturbance, which may, in turn, help maintain the integrity of these areas. Under this alternative, groundwater and new water developments would be discouraged, which may, in turn, help maintain clean water sources for wildlife use.

This alternative would maximize the protection of large blocks of land for a variety of resource purposes. As a result, wildlife may benefit from these actions by having large quiet blocks of habitat where ground, vegetation, and noise disturbance is minimized. In particular, 25,549 acres would be managed as WSAs; 5,223 acres would be managed for wilderness character; and 7,826 acres would be managed as RNAs.

Alternative VI (Proposed Plan)

Wildlife Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, greater detail may be provided, or adjustments in restrictions for wildlife may occur. These would be analyzed on a project-specific basis (see Wildlife BMPs, Appendix E).

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, the BLM would manage for a backcountry experience on 158,515 acres, and transportation management would include a total of up to 172 miles of routes, which equates to up to 997 acres of ground disturbance. Under the Proposed Plan, route density would be 0.66 miles per square mile.

Other Resources Management

The impacts would be the same as those described under Alternative V. However, the Proposed Plan would protect 5,528 acres of riparian/wetlands systems (including canyon bottoms, and floodplains), and would manage 8,881 acres as RNAs.

Table 4-21 Comparison of Impacts to Terrestrial and Aquatic Wildlife Species

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Wildlife Resources	Continue existing protective measures. Control by APHIS targets individual animals anywhere on Monument.	Apply many strict protective measures. Control by APHIS targets individual animals when human safety is an issue.	Apply some strict protective measures. Designate some areas for animal control by APHIS, only when human safety is an issue.	Apply some strict protective measures. Control by APHIS targets individual animals anywhere in the Monument.	Apply many strict protective measures. Possible reintroduction of Gunnison sage-grouse and bighorn sheep. Control by APHIS targets individual animals only when human safety is an issue.	Same as Alt. V.
Cultural Resources	Protect cultural resource sites. Develop new sites for controlled visitation.	Protect cultural resource settlement clusters, sites, and isolated finds. Develop 13 sites.	Protect cultural resource settlement clusters and sites. Develop 13 to 25 sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Same as Alt. II.	Same as Alt. II.

Table 4-21 Comparison of Impacts to Terrestrial and Aquatic Wildlife Species

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
		leased lands). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.				
	Continued development of existing leases (127,895 acres) with up to 1,985 acres new disturbance.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments. Not meeting Public Land Health Standards.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments. Take specific actions to meet Public Land Health Standards as rapidly as possible.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments. Take specific actions to meet Public Land Health Standards as rapidly as possible. Apply zero-level accelerated erosion standard.
Recreation and Transportation	Manage 149 miles of routes; 864 acres of disturbance (per 1985 RMP decision). 1,235	Manage 139 miles of routes; 806 acres of disturbance. Develop 7 facilities.	Manage 189 miles of routes; 1,096 acres of disturbance. Develop 13	Manage 213 miles of routes; 235 acres of disturbance. Develop 20	Manage 169 miles of routes; 980 acres of disturbance. Develop 9 facilities.	Manage 172 miles of routes; 997 acres of disturbance. Develop 9

Table 4-21 Comparison of Impacts to Terrestrial and Aquatic Wildlife Species

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	acres of disturbance (per 2000-2002 inventory). Develop 7 facilities.		facilities.	facilities.		facilities.
Other Resources: Water Resources	Protect 2,415 acres of riparian. Apply no restrictions on groundwater and new water developments.	Protect 5,312 acres of canyon bottoms, riparian and floodplain. Discourage groundwater developments.	Protect 5,312 acres of canyon bottoms, riparian and floodplain. Allow groundwater developments.	Protect 3,217 acres of riparian and floodplain. Encourage groundwater developments.	Same as Alt. II.	Same as Alt. II.
Other Resources: Special Designations	Manage 25,549 acres as WSA. Designate no WSR. Manage 427 acres as RNA.	Managed 25,549 acres as WSA. Manage 5,223 acres for wilderness character. Designate no river segments suitable as WSR. Manage 7,826 acres as RNA.	Managed 25,549 acres as WSA. Designate no river segments suitable as WSR. Manage 427 acres as RNA.	Same as Alt. III.	Same as Alt. II.	Managed 25,549 acres as WSA. Manage 5,223 acres for wilderness character. Designate no river segments suitable as WSR. Manage 8,771 acres as RNA.

4.2.7.3. Cumulative Impacts

Activities impacting wildlife and fish resources include anything that changes their food, water, or shelter supply. The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-22 Past, Present, and Future Activities influencing Terrestrial and Aquatic Resources
Past Activities
Boom and bust cycle of natural resource extraction in the local area
80% of the Monument leased with standard stipulations
Unmanaged livestock grazing and associated loss in vegetative cover
Spread of undesirable plant species such as cheatgrass
Ineffective reclamation efforts
Unregulated hunting
Encroachment of pinyon-juniper woodlands followed by large-scale vegetation treatments
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Present Activities
Increased fluid mineral development
Firewood cutting restrictions
Increased popularity of OHVs
Management of 213 miles of routes
Prolonged drought and die-off of pinyon trees
Management of hunting by the Colorado Division of Wildlife
Management of 427 acres as a Research Natural Areas; 25,549 acres managed as Wilderness Study Area
National Monument designation by Presidential Proclamation to protect the objects while

Table 4-22 Past, Present, and Future Activities influencing Terrestrial and Aquatic Resources
managing valid existing rights so as not to create any new impacts to the objects
Future Activities (Proposed Plan)
Continued increase in fluid mineral development
Lease 880 new acres for drainage with restrictive stipulations, many of which are specific for wildlife
Management to include meeting Rangeland Health Standards
Manage 7,826 acres as Research Natural Areas; 25,549 acres as Wilderness Study Area with an additional 5,223 acres managed for wilderness character
Management of 172 miles of routes
GADPs required for long-range planning
Protection of cultural and natural resources on a landscape level to minimize cumulative impacts and manage for resource setting

Cumulative disturbance activities on the Monument are as follows:

Table 4-23 Cumulative Acres of Disturbance (Past, present and projected future acres)	
Development Type	Disturbance Area (acres) (Maximum, including what may be reclaimed)
Fluid Mineral Development	3,168 acres (1,165 past leased + 883 future leased + 18 future new leases + 1,102 seismic)
Routes	1,235 acres (213 miles is maximum number to exist)
1960s Chained/Harrowed Vegetation Treatments	15,000 acres
Total Acres	21,624 acres

The level of disturbance can vary depending upon the activity. Also, because of criss-crossing routes and scattered patches of clearings, the impacts from noise, traffic, and general human presence are spread out over larger areas than the acres reflect. On the other hand, some areas can be reclaimed to provide habitat for wildlife once wells and routes are abandoned

(keeping in mind that reclamation efforts have not been particularly successful, given soil and climate conditions within the Monument).

With each of these disturbances, there is an associated loss of wildlife habitat. In the case of historic large-scale vegetation treatments, habitat conditions have changed from woodland to grassland vegetation type and in some cases, have returned to woodlands. In addition to the above, livestock grazing presently occurs on 156,750 acres within the Monument. Under the Proposed Plan, grazing is planned for 151,636 acres (including newly acquired land). Historically, grazing has impacted wildlife, in that it results in changes to the vegetation type within the Monument, as well as in increased competition for resources.

Oil and gas development on private lands within, and adjacent to, the Monument would be expected to be similar in nature and extent to impacts to public lands within the Monument. The total surface area of private lands within the boundary of the Monument is nearly 16,600 acres. These areas in particular may experience cumulative impacts to wildlife as the result of changes in native vegetation, big-game winter range conditions, and/or changes to habitat. Impacts to private lands may be significantly greater than on BLM lands, especially if reclamation of disturbed areas, avoidance of riparian/wetlands areas, and/or maintenance of vegetation health is not performed to at least the same standards as that required by the BLM.

If development and recreational use increases on lands adjacent to the Monument, cumulative impacts may impact the Monument, as well as Native American tribal lands to the south and west of the Monument. Many of the adjacent farmlands are converting to subdivisions, which may, in turn, reduce their wildlife habitat potential. This development may also increase the potential for noise disturbance and for wildlife to be killed on routes. Such development may result in the Monument becoming a safe haven for wildlife.

Impacts to wildlife, and to special status species in particular, may result from increasing levels of human use and development throughout the region, regardless of management actions taken within the Monument. The anticipated increase in recreational use and/or in other vehicle-related disturbance offsite (as a consequence of continued human population growth) may further add to adverse impacts. For larger, more wide-ranging species (such as mountain lion or black bear), cumulative impacts may become disproportionately large and result in population declines. However, beneficial impacts, such as those resulting from route closures and reduced livestock grazing, may help to offset these impacts. The protection of large undisturbed blocks of land (such as in RNAs and WSAs, or avoidance of areas with high concentrations of cultural resource sites) may also help to provide undisturbed areas of wildlife habitat.

4.2.8. Vegetation Resources

The primary goal for vegetation resource management within the Monument is to sustain a biologically diverse landscape that supports a variety of habitats and native plant and animal species. Vegetation has specific purposes, in that it provides biomass as livestock forage, constitutes food and shelter for wildlife, and provides forest products (such as Christmas trees and firewood). In addition, vegetation provides intrinsic values (such as visual quality enhancement) and provides a setting in which to experience cultural resources. The management objectives related to this goal include:

- protect and/or enhance upland vegetation communities to ensure that the Public Land Health Standards for healthy, productive plant and animal communities are met, or that significant progress is being made toward achieving these standards;

- reclaim and rehabilitate disturbed areas impacted by wildland fire and other surface-disturbing activities (such as those resulting from well pad sites, pipeline routes, closed routes) to protect soil, water, and vegetation resources;
- protect and/or enhance aquatic, riparian/wetlands areas to ensure that the Public Land Health Standards for riparian/wetlands systems are met, or that significant progress is being made toward achieving these standards; and
- cooperate with other agencies and landowners in improving the health of the ecosystem.

Another goal for vegetation resource management is to control existing noxious weed populations and prevent new infestations. The management objectives related to this goal include:

- inventory and map existing noxious weed populations;
- develop and implement an integrated weed-management program, in cooperation with adjacent landowners and land managers (including Montezuma and Dolores Counties, private landowners, Hovenweep National Monument [NPS], the Navajo Nation, and the Ute Mountain Ute Tribe);
- develop and implement a program that emphasizes prevention, mechanical, biological, and chemical control techniques and includes inventory, detection and monitoring, and project actions; and
- prevent the establishment of new infestations of noxious weeds and the spread of existing populations.

Listed and proposed threatened or endangered plant species would be managed to comply with provisions of the ESA. Management plans would be implemented that conserve candidate species and their habitats to ensure that actions authorized, funded, or carried out by the BLM do not contribute to the need for the species to become listed. The management goal for special status plants and significant plant communities and their habitat is to reach a point where special status recognition is no longer warranted.

Native vegetation within the Monument is conceptually subdivided into the general community types described and quantified by area in Section 3.1.8. A distinction is made between upland vegetation and those areas classified as riparian/wetlands areas. In addition, noxious weeds are considered a separate vegetation management category, as are special status plant species and significant plant communities. These distinctions are carried through-out the following discussion.

A number of proposed management actions would have the potential to impact native vegetation. For this discussion, adverse direct impacts to upland vegetation may include disruption and/or removal of rooted vegetation resulting in a reduction in areas of native plant communities; a reduction of total numbers of plant species (species richness) within an area; and/or a reduction or loss of total area, diversity, structure, and/or function of wildlife habitat. Adverse direct impacts to riparian/wetlands areas may include those expressed for upland vegetation, as well as increased sedimentation due to local surface disturbance, soil and bank erosion, and changes to channel morphology. Beneficial direct impacts to vegetation resources may include an increase in areas of native plant communities, a decrease in the size of noxious weed populations, and an increase in species diversity and/or structure within these native plant communities.

A number of indirect impacts to vegetation resources may also be possible as the result of proposed management actions. Most indirect adverse impacts are assumed to result from direct impacts, in proportion to the relative amount of associated surface disturbance. Indirect adverse

impacts may include the disruption and/or reduction of pollinator populations; the loss of habitat suitable for colonization as the result of surface disturbance; the introduction of conditions that enhance the spread of weeds; and the general loss of habitat as the result of surface occupancy, surface compaction, and/or trampling. Physical disruption may result in sedimentation into occupied habitat and/or into potential habitat. Failed reclamation or mitigation measures may also result in indirect impacts to these resources. Indirect impacts to riparian/wetlands areas may also include disruption of hydrological processes, decreased ability to trap sediments and nutrients and to moderate surface flow, decreased infiltration for groundwater recharge, increased runoff, and focused livestock grazing pressure or wildlife use in less impacted riparian/wetlands areas. Additional indirect impacts resulting from increased erosion and sedimentation may occur to riparian/wetlands areas located near surface disturbances. This may occur even if the resource itself is purposely avoided to reduce direct impacts. Beneficial indirect impacts may result from minimizing or preventing surface disturbance (and, therefore, the associated disturbance to vegetation) as a result of the protection of other resources.

4.2.8.1. Evaluation Criteria and Assumptions

The most adverse direct impacts to vegetation result from surface disturbances; therefore, these areas are the focus of impact analysis for vegetation resources. Areas reclaimed, otherwise improved, and/or protected from ground disturbance are used to describe beneficial impacts. Estimates of surface disturbance areas associated with potential management actions were calculated using data from the AMS (BLM 2005b) and from the RFD (BLM 2005c), and are summarized in Table 4-1. When quantitative analysis is not possible, categories are based upon the potential physical impacts in relation to Public Land Health Standards.

Assumptions included in the analysis of impacts to vegetation resources include the following:

- Estimated disturbance areas are distributed among upland and riparian/wetlands communities in proportion to their relative area throughout the Monument, unless otherwise limited by applicable surface-use restrictions.
- Application of appropriate BMPs and standardized reclamation practices would be required as COAs for all new leases, permits, and surface-disturbance areas (see Appendix E).
- Federal lands within the Monument boundary are the subject of the impact analysis.
- The entire vicinity that comprises the Colorado Plateau Semi-desert Ecoregion (Bailey 1995) is the subject of the cumulative impacts analysis.

4.2.8.2. Alternative Analysis

Impacts to vegetation resources within the Monument may differ depending on specific management actions proposed under each alternative. The following sections describe the impacts from management actions proposed for vegetation resources, as well as those from the actions proposed for cultural resources, fluid minerals, rangelands, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Vegetation Resources Management

This analysis assumes that current vegetation resource conditions and trends described in Section 3.1.8 would continue into the future under this alternative. Therefore, under Alternative

I, the condition of the three dominant native upland communities may, generally, be expected to continue in a stable degraded state or in a downward trend.

Alternative I would contain several specific management actions intended to proactively manage riparian/wetlands areas (including springs). Nevertheless, based upon current conditions and trends, most of these vegetation communities would be expected to remain in Functional At-Risk (FAR) (53 percent) or Non-Functional (NF) (27 percent) categories. Over time, this trend may continue to result in adverse impacts to most of these communities, as well as in the failure to meet Public Land Health Standards.

Under Alternative I, noxious weed management would be implemented in a very general sense. No specific plan would be required and no specific actions for inventory or prioritized integrated management would be specified. Under this continuing management (Section 3.1.8), noxious weed populations may be expected to increase in frequency, density, and diversity over the time period of this analysis. This may result in an increase in the existing adverse impacts to vegetation resources as noxious weed populations continue to invade and expand into native plant communities, as well as in the continued failure to meet Public Land Health Standards.

Other than stipulations discussed under Fluid Minerals Management (see below), Alternative I does not include any specific management actions for special status plant species and/or for significant plant communities.

Cultural Resources Management

Under Alternative I, few of the cultural resources management actions would impact vegetation, either directly or indirectly; therefore, continuing management may be expected to result in few impacts to vegetation resources. However, to some degree, development and stabilization, testing, and/or other activities that result in surface clearance of vegetation may result in highly localized, adverse impacts. The degree to which these become long-term disturbance areas may depend on the actions taken to minimize vegetation disturbance, as well as on the degree to which appropriate reclamation techniques are implemented.

Fluid Minerals Management

Approximately 80 percent of Monument lands are currently leased for fluid minerals development. Under Alternative I, the remaining 20 percent would not be leased; therefore, no impacts would occur from new leases.

Fluid mineral development would result in both direct and indirect impacts to vegetation on currently leased lands. New fluid mineral development on 127,895 acres of currently leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance.

Impacts from surface disturbance related to fluid minerals activity would continue to contribute to the downward trend in upland plant communities. This is due to incomplete, or failed, reclamation of abandoned well pads, associated routes, and other infrastructure. Many of these sites support little vegetation and are often dominated by noxious weeds. These areas then serve as centers of disturbance from which weeds and other undesirable plants spread into native vegetation. These factors are expected to continue to result in adverse impacts to vegetation resources.

Alternative I would include CSU stipulations for riparian/wetlands vegetation zones. This may provide beneficial impacts, because these resources would be avoided during development activities. There are no stipulations under Alternative I for the specific protection of special status plant species, and/or for significant plant communities, from ground disturbance resulting

from oil and gas lease development activities. As a result, adverse impacts may result from disturbance to habitat and/or to the direct removal of these resources.

Livestock Grazing Management

Alternative I would include a total of up to 8,492 active AUMs and up to 28 allotments. Ninety-seven percent of Monument lands fall within grazing allotments under this alternative. The impact of livestock grazing on native plant species' community structure, cover, and diversity would be variable. This is due to initial conditions and to non-uniform grazing patterns that reflect differences in terrain, forage abundance and preference, and/or in soil attributes. Nonetheless, management of livestock grazing in many allotments may be considered part of the reason for such allotments not meeting the Public Land Health Standards for healthy, productive plant and animal communities, and for the downward trend observed in much of the native upland vegetation the Monument. Livestock grazing is considered part of the reason the majority of riparian/wetlands areas within the Monument are not currently achieving PFC. The current management of livestock grazing, including active AUMs and allotments, is an important factor in these trends and, over time, may contribute to adverse impacts to most of these vegetation communities, as well as in the continued failure to meet Public Land Health Standards.

Recreation and Transportation Management

Under this alternative, up to 149 miles of routes would be open to all forms of travel (including travel for limited access purposes and travel necessary to support existing oil and gas leases). This may result in up to 864 acres of surface disturbance, and to the second-lowest road density (0.58 miles per square mile) proposed under any of the alternatives. The 2000-2002 route inventory recorded 213 miles of routes and 1,235 acres of disturbance.

These factors may contribute to beneficial direct impacts to all native vegetation over the long-term, in that fragmentation of habitat and chances of disturbance to special status plant species and significant plant communities would be relatively limited, and because existing routes would be returned to native vegetation through reclamation. Indirectly, opportunities for noxious weed infestations occurring along roadsides may be reduced in proportion to the reduction in total miles of routes.

Other Resources Management

At present, 25,549 acres of the Monument surface are managed as 3 WSAs (using existing non-impairment standards and practices and in accordance with Interim Management Policy) and would remain under that status until the areas are designated as wilderness, or until they are released by Congress (BLM 1995). The continued restrictions on permanent structures, facilities, and/or on surface-disturbing activities may continue to result in indirect beneficial impacts to native vegetation in these areas, in that the areas would be protected from ground disturbance. This is especially the case for mature pinyon-juniper woodlands because the largest continuous stands in the Monument occur in this vegetation type (see Map 13). Several large areas of biological crust communities may also benefit from surface restrictions within the WSAs. Under the No Action Alternative, should these areas be released from WSA status, they would continue to be managed for wilderness characteristics.

Under this alternative, the McElmo RNA (427 acres) would be managed with special management prescriptions for herpetological research and habitat protection. This area would be protected from surface disturbance associated with oil and gas development by an NSO stipulation. This management may result in beneficial impacts to vegetation resources in this area, in that ground disturbance would be minimized and native vegetation communities would be encouraged.

Alternative V (Preferred Alternative)

Vegetation Resources Management

Under Alternative V, when compared with Alternative I, more specific and standard-driven actions (achieving PFC) would influence the management of riparian/wetlands areas. Alternative V would include a stated emphasis on systematic noxious weed inventory, mapping, detection, and monitoring. These management actions may allow for a far more focused and effective application of the current weed-management program, in that data and information upon which to base a number of important decisions would be provided (including incipient population locations, priority-to-control strategies, and the efficacy of different integrated methods for particular species and locations).

Alternative V would direct a number of focused management actions toward special status plant species and/or significant plant communities. These would include developing an inventory and monitoring plan; as well as specifying the avoidance of long-term ground-disturbing activities in the vicinity of known populations, community locations, and/or potential habitat. Route relocation or realignment would be called for, if monitoring results indicate that damage and/or disturbance is occurring. NGD/NSO stipulations may protect occupied and potential habitat for sensitive species. In terms of protective management of these resources, several of these actions would be strengthened, including requirements for specific protective TLs for livestock grazing in areas where biological soil crust communities occur; requirements for locating new routes away from biological crust communities with a 50-foot buffer; and requirements for the removal of the source of disturbance to these resources when detected during monitoring. The result may be beneficial impacts to special status plant species and/or to significant plant communities, and the achievement of Public Land Health Standards.

Cultural Resources Management

Under this alternative, few cultural resources management actions would impact vegetation, either directly or indirectly. The general focus for protecting the cultural resources within the Monument is avoidance; therefore, the associated lack of surface disturbance activities would, generally, benefit the vegetation resource. However, development, stabilization, testing, and/or other activities that result in surface clearance of vegetation, may result in highly localized adverse impacts. The degree to which these become long-term disturbance areas would be dependent upon the care that is originally taken to minimize vegetation disturbance, as well as on the degree to which appropriate reclamation techniques are implemented.

Under Alternative V, indirect beneficial impacts to vegetation may result from the restriction of any direct impacts to cultural resource settlement clusters and sites. Eventually, this restriction may result in more numerous, larger areas within the Monument where no direct impacts would be allowed. This may, in turn, result in the indirect protection of the vegetation resources within these areas.

Fluid Minerals Management

In addition to impacts from current fluid mineral leases as described in Alternative I, under Alternative V, up to 880 acres would be available for leasing to protect against drainage. This may result in the development of up to 2 well pads, with up to 18 acres of long-term disturbance. Given the stipulations attached to new leases, this disturbance would occur on existing leased lands to access minerals associated with new leases. Under Alternative V, the result of leasing these areas may be limited adverse impacts to vegetation resources. New leases would come with restrictive stipulations, appropriate BMPs, standardized reclamation practices, and COAs.

Alternative V would include stipulations that would protect vegetation resources, including NSOs for threatened, endangered, candidate, or other special status plant species, as well as for

riparian/wetlands habitat. Lease notices would be used to alert potential lessees to these stipulations. These protections may result in more beneficial impacts to listed species than those expected under Alternative I.

Impacts from ongoing development of currently leased lands within the Monument would continue. This would include ground disturbance that would continue to reduce the quality and quantity of native vegetation. Focused up-front planning, through the use of such tools as a GADP, would lead to proposals that reduce impacts, in that the ground disturbance footprint would be minimized and the loss of native vegetation and the influx in weedy species would be reduced. Mitigation measures, COAs, BMPs, and stipulations may help to minimize impacts. In addition, the use of existing disturbed areas for directional/horizontal drilling would minimize ground disturbance, as well as the associated loss of vegetative cover and soils (due to soil exposure and to wind/water erosion) and may reduce impacts to cultural and natural resources (see Map 17). The severity of impacts resulting from fluid minerals development on vegetation may depend upon the amount of activity, as well as upon the success of reclamation efforts.

Livestock Grazing Management

Alternative V would emphasize rangeland management actions with the stated purpose of improving rangeland conditions to achieve Public Land Health Standards for upland and riparian/wetlands vegetation communities, as well as for special status plant species and/or for significant plant communities. Under Alternative V, the number of active AUMs would be reduced by 24 percent (6,437), when compared with the No Action Alternative (8,492). Active allotments would be reduced from 28 to 23 with ninety-four percent of Monument lands falling within grazing allotments. The impacts resulting from livestock grazing on native plant species' community structure, cover, and diversity is variable (due to initial conditions, and to non-uniform grazing patterns that reflect differences in terrain, forage abundance and preference, and soil attributes); however, this reduction in AUMs may result in substantial beneficial impacts to vegetation communities in that pressure resulting from livestock grazing would be considerably reduced in proportion to the total AUMs. This may result in the most rapid movement toward achieving Public Land Health Standards for both upland and riparian/wetlands vegetation than would be achieved under any of the other alternatives.

Recreation and Transportation Management

Under this alternative, localized disturbance to vegetation would be expected in areas where camping, and the associated use of campfires, occurs. Disturbance occurs from trampling, especially where people continue to camp in the same location. Vegetation is removed for campfires, and is cleared for campsites. It is also disturbed when pack animals are tied to trees and/or allowed to graze freely. In addition, campsites are often selected along waterways where riparian/wetlands vegetation may be damaged as the result of trampling.

Under this alternative, up to 169 miles of routes would be open to a variety of forms of travel (including travel for limited access purposes). This may result in up to 980 acres of surface disturbance, which would include vegetation removal. Routes would also be a primary source of noxious weed infestation, in that weeds are often carried on vehicles. These factors may contribute to direct adverse impacts to special status plant species and/or to significant plant communities. On the other hand, under this alternative, 41 miles of existing routes would be returned to native vegetation through reclamation. Indirectly, opportunities for noxious weed infestations may decrease in proportion to the decreased numbers of routes (Harris and Silva-Lopez 1992, Zink et al. 1995).

Other Resources Management

Under Alternative V, the current management program associated with the 25,549 acres of the Monument surface designated as WSAs would continue (using existing non-impairment

standards and practices, and in accordance with Interim Management Policy), until they are designated as wilderness or until they are released by Congress (BLM 1995). The continued restrictions on permanent structures, facilities, and/or on surface-disturbing activities may continue to result in indirect beneficial impacts to native vegetation in these areas. This is especially the case for mature pinyon-juniper woodlands because the largest continuous stands in the Monument occur in these areas (see Map 13). Several large areas of biological crust communities may also benefit from surface restrictions within the WSAs. Under Alternative V, these areas would also contain NGD/NSO stipulations. Therefore, should these areas be released from WSA status, they would still be protected from surface-disturbing activities because they would still be managed for wilderness characteristics. This alternative would also include management actions intended to protect and enhance the wilderness characteristics of the WSA areas. Under Alternative V, an additional 5,223 acres of citizen-proposed areas would be managed for wilderness character. All of these actions may result in far greater beneficial impacts to vegetation resources than those expected under Alternative I, in that large blocks of land would be protected from ground disturbance.

Under this alternative, the existing McElmo RNA would be considerably expanded (from 427 to 7,826 acres), and would continue to be managed with special management prescriptions for herpetological research and habitat protection. These management requirements would maintain vegetation, in that ground disturbance would be reduced.

Alternative VI (Proposed Plan)

Vegetation Resources Management

The impacts would be the same as those described under Alternative V.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

Under this alternative, up to 172 miles of routes would be open to all forms of travel (including travel for administrative purposes and travel necessary to support new and existing oil and gas leases). This may result in up to 997 acres of surface disturbance, as well as in a route density of 0.66 miles per square mile.

Over the long term, these factors may contribute to adverse direct impacts to all native vegetation due to increased fragmentation of habitat and disturbance impacts to special status plant species and/or to significant plant communities. Under the Proposed Plan, 41 miles of existing routes would be returned to native vegetation through reclamation. Indirectly, noxious weed infestations may decrease in proportion to the decreased numbers of routes (Harris and Silva-Lopez 1992, Zink et al. 1995).

Other Resources Management

The impacts would be the same as those described under Alternative V. However, the existing McElmo RNA would be expanded from 427 to 8,881 acres and include the Cannonball and Sand Canyon units.

Table 4-24 Comparison of Impacts to Vegetation Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Upland Vegetation	Not meeting Public Land Health Standards. Restore native plant species.	Take specific actions to meet Public Land Health Standards as rapidly as possible. Restore native plant species. Proactively manage noxious weeds.	Take specific actions to meet Public Land Health Standards. Restore native plant species. Manage noxious weeds as encountered.	Take specific actions to meet Public Land Health Standards. Allow use of non-native plant species for revegetation. Manage noxious weeds as encountered.	Same as Alt. II.	Same as Alt. II.
Riparian and Wetland Vegetation	Not meeting Public Land Health Standards. Protect 2,415 acres of riparian. Apply no restrictions on groundwater and new water developments.	Take specific actions to meet Public Land Health Standards as rapidly as possible. Protect 5,312 acres of canyon bottoms, riparian and floodplain. Discourage groundwater developments.	Take specific actions to meet Public Land Health Standards. Protect 5,312 acres of canyon bottoms, riparian and floodplain. Allow groundwater developments.	Take specific actions to meet Public Land Health Standards. Protect 3,217 acres of riparian and floodplain. Encourage groundwater developments.	Same as Alt. II.	Same as Alt. II.
Cultural Resources	Protect cultural resource sites. Develop new sites for controlled visitation.	Protect cultural resource settlement clusters, sites, and isolated finds. Develop 13 sites.	Protect cultural resource settlement clusters and sites. Develop 13 to 25 sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.

Table 4-24 Comparison of Impacts to Vegetation Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new leased lands). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Same as Alt. II.	Same as Alt. II.
	Continued development of existing leases (127,895 acres) with up to 1,985 acres new disturbance.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments. Apply zero-level

Table 4-24 Comparison of Impacts to Vegetation Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
						accelerated erosion standard. Apply NGD/NSO stipulation to protect slopes steeper than 30 percent (36,607 acres).
Recreation and Transportation	Manage 149 miles of routes; 864 acres of disturbance (per 1985 RMP decision). 1,235 acres of disturbance (per 2000-2002 inventory). Develop 7 facilities.	Manage 139 miles of routes; 806 acres of disturbance. Develop 7 facilities.	Manage 189 miles of routes; 1,096 acres of disturbance. Develop 13 facilities.	Manage 213 miles of routes; 235 acres of disturbance. Develop 20 facilities.	Manage 169 miles of routes; 980 acres of disturbance. Develop 9 facilities.	Manage 172 miles of routes; 997 acres of disturbance. Develop 9 facilities.
Other Resources: Special Designations	Manage 25,549 acres as WSA. Designate no WSR. Manage 427 acres as RNA.	Manage 25,549 acres as WSA. Manage 5,223 acres for wilderness character. Designate no river segments suitable as WSR. Manage 7,826 acres as RNA.	Manage 25,549 acres as WSA. Designate no river segments suitable as WSR. Manage 427 acres as RNA.	Same as Alt. III.	Same as Alt. II.	Manage 25,549 acres as WSA. Manage 5,223 acres for wilderness character. Designate no river segments suitable as WSR. Manage 8,771 acres as RNA.

4.2.8.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future. For this discussion, the region is considered to include the areas immediately adjacent to the Monument, as well as the entire vicinity that comprises the Colorado Plateau Semi-desert Ecoregion (Bailey 1995). The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area.

Table 4-25 Past, Present, and Future Activities influencing Vegetation Resources
Past Activities
Unmanaged livestock grazing and associated loss in vegetative cover
Spread of undesirable plant species such as cheatgrass
Ineffective reclamation efforts
Encroachment of pinyon-juniper woodlands followed large-scale vegetation treatments
Fluid mineral development
Compliance with the Taylor Grazing Act, the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Present Activities
Increased fluid mineral development
Firewood cutting restrictions
Increased popularity of OHVs
Prolonged drought and die-off of pinyon trees
Implementation of Best Management Practices (BMP)
Manage 427 acres as Research Natural Areas; 25,549 acres as Wilderness Study Area
National Monument designation by Presidential Proclamation to protect the objects while managing valid existing rights so as not to create any new impacts to the objects
Future Activities (Proposed Plan)
Lease 880 new acres for drainage with restrictive stipulations

Table 4-25 Past, Present, and Future Activities influencing Vegetation Resources

Management to include meeting Public Land Health Standards
Manage 8,771 acres as Research Natural Areas; 25,549 acres as Wilderness Study Area with an additional 5,223 acres managed for wilderness character
GADPs required for long-range planning; larger block cultural resource inventories
Protection of cultural and natural resources on a landscape level to minimize cumulative impacts and manage for resource setting

Cumulative disturbance activities on the Monument are as follows:

Table 4-26 Cumulative Acres of Disturbance

(Past, present and projected future acres)

Development Type	Disturbance Area (acres) (Maximum, including what may be reclaimed)
Fluid Mineral Development	3,168 acres (1,165 past leased + 883 future leased + 18 future new leases + 1,102 seismic)
Routes	1,235 acres (213 miles is maximum number to exist)
1960s Chained/Harrowed Vegetation Treatments	15,000 acres
Total Acres	21,624 acres

In addition to the above, livestock grazing has occurred, and presently occurs, on 156,750 acres within the Monument and, under the Proposed Plan, is planned for 151,636 acres (with newly acquired land). Historically, this use has contributed to the change in vegetation types within the Monument.

Areas adjacent to the Monument are experiencing noxious weed conditions similar to the Monument. Sources of weeds at the Monument boundary include abandoned farmlands, access routes, and field edges. Without management actions that discourage weeds, all areas of disturbance are vulnerable. This is especially true where human traffic and/or wildlife movement transfers weed seeds into new sites.

All of the potential adverse impacts discussed for riparian/wetlands areas within the Monument are cumulative, with prior degradation of these areas resulting from livestock grazing, unregulated stream crossings, noxious weed proliferation, and/or drought impacts (Section 3.1.8). These adverse factors are also assumed to be present, and unmitigated, in many riparian/wetlands areas in the surrounding region. Therefore, adverse impacts that may result

from management actions proposed under this PRMP/FEIS would have the potential to be cumulatively greater than when assessed in isolation.

Regardless of management actions taken within the Monument, direct adverse impacts to native vegetation may result from ongoing human development throughout the general region. New development would result in new routes, new fluid minerals development, new housing, new commercial development, and new and increasing recreational use of wildlands. The same indirect impacts to native vegetation discussed above may also result. In many cases, the loss and/or fragmentation of native plant communities would be highly visible. These impacts may continue on a regional scale, and would be in addition to the impacts expected to result from land uses and resource management activities within the Monument. If adverse impacts to these resources continue to increase, as expected, their condition on public lands may become even more important due to their intrinsic value, the biodiversity they represent, and to the continuation of the ecological values they support.

Under the Proposed Plan, up to 880 acres of currently unleased area would be leased for fluid minerals development, for drainage purposes only. However, continued development of areas currently leased may result in up to 121 new well pads over the next 20 years, with up to 9 new associated treatment facilities, up to 53 miles of pipeline, and up to 67 miles of routes. The expected commensurate surface disturbance resulting from these developments is expected to total up to 883 acres of short-term disturbance, or up to 428 acres of long-term impacts to vegetation (after reclamation of abandoned and non-productive well pads).

Future development of fluid minerals on currently leased and private surface lands within the Monument, as well as on adjacent lands, may result in impacts similar to those expected to result from development on BLM lands. These cumulative impacts may be greater if reclamation of short- and long-term disturbances, and avoidance of riparian/wetlands areas, are not performed to standards. Fluid minerals development (including federal surface/federal minerals; private surface/federal minerals; and private surface/private minerals) may result in considerable ground disturbance resulting from construction of well pads, pipelines, compressor stations, routes, and/or other facilities. Increased erosion and potential rockfall and/or landslide hazards may result especially if/when these activities are not subject to BMPs, COAs, stipulations, and/or mitigation measures. Failure to perform adequate reclamation, or to avoid riparian/wetlands areas, may result in indirect impacts to BLM lands, in that a seed source for noxious weed infestations may be created, and in that sedimentation may be increased within riparian/wetlands areas. Degradation of these areas may also result in a decrease in the area occupied by native vegetation communities, and in the quality of wildlife habitat and human recreation experience throughout the area.

The degree of impact on vegetation communities may depend upon the amount of ground disturbed and on the success of the reclamation. The implementation of mitigation measures, BMPs, and other stipulations/restrictions on surface use may help to reduce overall impacts. However, given the timeframe for recovery of some native vegetation (sagebrush, for example, requires in excess of 20 years to reestablish to pre-disturbance conditions), surface disturbance may be considered long-term.

4.2.9. Visual Resources

The primary goal for visual resources management within the Monument is to manage all activities in a manner that conserves, protects, and enhances the Monument's scenic resources, including extraordinary cultural resources, topography, geology, and biology. The management objectives related to this goal include:

- designate Visual Resource Management (VRM) classes throughout the Monument, based upon an inventory of visual resources and management considerations for other uses; and
- manage activities within the Monument so that they adhere to the VRM Class objectives (see Appendix P).

Impacts to visual quality result from impacts to any one, or more, of four primary elements: form, line, color, and texture, as described below.

Form - Changes in form include those related to clearings in the vegetation and/or to structures that contrast with natural forms within the landscape.

Line - Changes in line include those related to roads and/or to ROWs that contrast with natural lines across the landscape.

Color - Changes in color include those related to exposing soil and/or to introducing structures that are of a color that contrasts with their surroundings.

Texture - Changes in texture include those related to introducing elements that are smooth in texture (such as roads, storage tanks, or buildings) against a coarse background of vegetation.

Direct beneficial impacts to visual resources may include those that enhance visual quality through actions that protect resources. Direct adverse impacts may include short- or long-term changes to current viewsheds.

4.2.9.1. Evaluation Criteria and Assumptions

Assessment of potential impacts to visual resources may be quantified by comparing acres of VRM classes and by describing impacts in qualitative terms.

Assumptions used in analyzing impacts to visual resources include the following:

- All WSAs are managed as VRM Class I.
- All areas managed as VRM Class II adjacent to units of Hovenweep National Monument are assigned a 0.5-mile buffer.
- The McElmo RNA is assigned VRM Class I.
- The Trail of the Ancients Scenic and Historic Byway is assigned VRM Class II, with a 0.5-mile buffer.
- Even though resource development activities may meet VRM Class II and Class IV objectives, the fact that projects are seen, attract attention (Class III), and/or may dominate the view of the casual observer (Class IV), means that they would impact visual resources.
- New development in areas that have current, ongoing development activities would result in additional visual impacts.
- Federal lands within the boundary of the Monument were used as the impacts analysis area for individual and cumulative impacts.

4.2.9.2. Alternative Analysis

Impacts to visual resources within the Monument may differ depending upon specific management actions proposed under each alternative, as well as upon the VRM Class assigned. The following sections describe the impacts from the management actions proposed for visual resources, as well as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Visual Resources Management

Under this alternative, VRM for the Monument would be determined on a project-activity basis through the development of Interim VRM Classes (in accordance with the San Juan/San Miguel RMP), consistent with the management emphasis. Outside of WSAs (which are managed in accordance with VRM Class I standards) no defined management objectives have been identified under this alternative. Instead of managing to meet specific objectives, the objectives are developed as management actions are taken. The “project-by-project” process proposed under this alternative does not provide the same level of Monument-wide comprehensive visual resource recognition and protection provided by the action alternatives.

Cultural Resources Management

Under Alternative I, there may be minor impacts to visual resources resulting from cultural resource management activities (such as from site testing, restoration, and/or interpretation activities). Signs and/or ground disturbance may be evident only at the immediate project site.

Fluid Minerals Management

Approximately 80 percent of Monument lands are currently leased for fluid minerals development. Under Alternative I, the remaining 20 percent would not be leased; therefore, no impacts would occur from new leases.

Fluid mineral development would result in both direct and indirect impacts to visual resources on currently leased lands. New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance.

The greatest impact to visual resources would occur from this development, and may include ground disturbance, construction of routes, pipelines, compressor stations, wells and well pads, and utility corridors. An assortment of stipulations, COAs, mitigation measures, and BMPs may help to minimize impacts. However, any disturbance may act to impact/disrupt the otherwise pristine scenery of the Monument, in that vegetation would be removed, thereby exposing bare soil; and in that human-made objects would be placed against a natural background.

Livestock Grazing Management

Under Alternative I, there would be up to 28 livestock grazing allotments, covering up to 159,676 acres of the Monument, with a stocking rate of up to 8,492 AUMs. Ninety-seven percent of Monument lands would fall within a grazing allotment under this alternative. No new grazing allotments would be authorized. Under this alternative, Public Land Health Standards for soil, water, and vegetation would continue to not be met. Exposed soils, reduced vegetative cover, and/or the presence of livestock trails and congregation areas may continue to result in adverse impacts to visual resources.

Recreation and Transportation Management

Alternative I would provide a broad range of recreation settings and activities; however, Class I visual objectives would remain in effect for WSAs. Cross, Cahone, and Squaw/Papoose Canyons would be closed to OHV use, which would minimize scenery impacts resulting from the creation of trails across the landscape. Under this alternative, grading and surfacing routes would be held to the minimum needed for user-safety. There would be up to 149 miles of routes open to mechanized, motorized, and/or non-motorized travel. The 2000-2002 route inventory recorded 213 miles of routes and 1,235 acres of disturbance. Under this alternative, there may

be beneficial impacts to visual resources, in that road closures and reclamation actions would restore native vegetation to the scenery.

Other Resources Management

Under Alternative I, the Monument would comply with State and Federal air quality standards; therefore, there would be no direct impacts to visual resources resulting from diminished air quality.

Under Alternative I, fire would be allowed to burn in specific areas, based upon desirability and feasibility of fire management strategies. Prescribed fire would be allowed in some instances to promote resource values, and to protect cultural resources. All burned areas would be evaluated to determine the need for fire rehabilitation. Under Alternative I, direct impacts to visual resources may be adverse on both the landscape and on the site-specific scale, depending upon the size of the fire. However, in most cases, these impacts may be considered short-term, with vegetation expected to return shortly after the burn.

Under Alternative I, native plant species would be emphasized during reclamation. Measures would be taken to improve vegetation in springs and riparian/wetlands areas, and efforts to control noxious weed species would continue. Maintaining a healthy ecosystem through the enhancement of native vegetation may benefit visual resources.

Under Alternative I, visual resources would not be a major evaluation factor for landownership adjustments. Major utility corridors would be allowed; however, operators would be encouraged to use existing corridors. Existing ROWs would be used as much as possible, and unused ROWs would be reclaimed. Blasting and/or cutting of canyon-rim edges (for the placement of pipelines and/or routes) would be avoided, when possible. Under this alternative, long-term adverse impacts may be expected to result from site disturbance associated with lands and realty management. These impacts may be centralized along development corridors where facilities and associated utilities are placed.

Alternative V (Preferred Alternative)

Visual Resources Management

Under Alternative V, WSAs and the McElmo RNA (38,598 acres) would be managed in accordance with VRM Class I objectives. All other areas would be designated as VRM Class II (126,643 acres), except for 94 acres assigned as VRM Class III. Objectives for specific areas within the Monument would promote maintaining visual quality objectives, and would be addressed up-front with project planning. COAs, mitigation measures, BMPs and stipulations would be put in place to help address visual quality concerns for most projects.

Cultural Resources Management

This alternative would manage for the protection of cultural resource settlement clusters and sites, and would protect large blocks of ground from disturbance. Under Alternative V, Cultural Resource Management Plans would be developed for cultural sites and would address visual resources. Alternative V would allocate 13 to 25 sites for public use. Potentially, this may offer increased opportunities for the appreciation of visual resources; however, it may also result in more ground disturbance as a result of the visitor facilities. These sites, however, would be small and unobtrusive; therefore, impacts may be minor.

Fluid Minerals Management

In addition to impacts from current fluid mineral leases as described in Alternative I, under Alternative V, up to 880 acres would be available for leasing to protect against drainage. Up to 18 acres of new ground disturbance would be possible under this alternative and would occur

on existing leased lands to access minerals associated with new leases. There would be no new leasing in WSAs. All temporary access routes for seismic exploration would be reclaimed. The use of bulldozers would be prohibited in seismic operations-related work. New leases would have NSO, CSU, TL, and lease notice (LN) stipulations designed to protect cultural, natural, and scenic resources, as well as all other Monument objects. Under this alternative, short-term adverse visual resource impacts associated with newly leased fluid minerals development may be mitigated by these stipulations/restrictions.

Under this alternative, operators within existing leases would be required to submit multi-year development plans and prepare GADPs. These up-front planning tools would help Monument management identify and apply appropriate BMPs, including placing development away from visually sensitive areas and limiting the amount of area being disturbed. Due to the need to avoid cultural resources, some facilities (such as wells and flow lines) may be located adjacent to existing roads and developed sites. This may concentrate development within the sensitive visual foreground of some travel routes (for example, Mockingbird Mesa and County Road N). These areas may be more visual to the Monument visitor; however, they may be used to minimize the footprint of disturbance on the ground. In addition, the use of existing disturbed areas for directional/horizontal drilling would minimize ground disturbance, as well as the associated loss of vegetative cover and soils (due to soil exposure and to wind/water erosion) and may reduce impacts to cultural and natural resources (see Map 17). The objective in most areas of the Monument is for development to occur at a frequency, and in such a way, that a predominantly natural appearing landscape may be maintained.

Livestock Grazing Management

Under this alternative, Public Land Health Standards for soil, water, and vegetation would be met. Alternative V may result in a direct beneficial impact to visual resources due to the restoration of land health resulting from reduced soil exposure, enhanced vegetation, and increased control of noxious weeds. Exposed soils, reduced vegetative cover, and the presence of livestock trails and congregation areas may persist in some areas, and may result in adverse impacts to visual resources. Ninety-four percent of Monument lands fall within an allotment under this alternative.

Recreation and Transportation Management

Under Alternative V, recreation management may, potentially, offer increased opportunities for appreciation of visual resources; however, it may also result in more ground disturbance as a result of increased visitor facilities. Ground disturbance and the placement of human-created structures may impact areas of otherwise relatively pristine scenery.

Under Alternative V, most user-created routes would be closed and restored within 10 years of the signing of the ROD. A strategy for enforcing the Travel Management Plan would be developed within 1 year of the signing of the ROD. New travel routes would be prohibited in Squaw and Cross Canyons, as well as within the McElmo RNA. Improved transportation management may benefit visual resources, in that the number of illegal user-created routes would be minimized (routes that would otherwise leave exposed soil scars across the Monument). The reclamation of routes would return natural vegetation to areas of ground disturbance.

Other Resources Management

Under Alternative V, the Four Corners Air Quality Task Force recommendations would be implemented. New or replaced wellhead engines and large compressor stations would be required to have emission controls. In addition, other measures would be implemented to

reduce small particulate matter pollution (dust) on construction projects. Impacts to visual resources resulting from Alternative V, in relation to air quality, may be beneficial.

Under Alternative V, the entire Monument would be designated as an area where wildfire is not desired, and where suppression is emphasized. Areas where prescribed fire is used as a management tool may result in adverse impacts to visual resources at the individual site scale; however, such actions would be designed to appear natural. Impacts, such as those resulting from scorching and fireline clearing, may be visible; however, they may be short-term, in that as vegetation resprouts, the visual quality of the area may be restored.

Under Alternative V, vegetation would be managed to promote the health of native plant communities. Native vegetation restoration projects would occur mainly on a project level. Weeds would be controlled. Seeding would be conducted in pinyon-juniper areas that were previously chained. Vegetation in riparian/wetlands areas may be improved. Livestock exclusions may be implemented, if necessary. Bark beetles would be treated in high-visibility administrative areas to prevent tree mortality. Under this alternative, impacts to visual resources, in terms of vegetation management, may be beneficial. This is because the objective of these actions would be to maintain/restore natural healthy vegetation communities.

Under Alternative V, only 1 route would be authorized to access each parcel of private property. Major new utility ROWs would be prohibited. Existing ROWs would be used during the construction of new facilities. Communication providers would be encouraged to share existing facilities. Under this alternative, impacts to visual resources, in terms of lands and realty management, may be beneficial, in that these actions may help to minimize ground disturbance and the disruption of natural scenery.

Alternative VI (Proposed Plan)

Visual Resources Management

Under Alternative VI, WSAs, as well as the McElmo, Expanded McElmo, Cannonball, and Sand Canyon RNAs, would be managed to meet VRM Class I objectives. Mockingbird Mesa, and the southwest portion of the Monument, would be managed for VRM Class IV, based upon the high level of development in these areas. Several road corridors, where moderate levels of energy development currently exist, and may increase, would be managed for VRM Class III to allow for moderate activity expansion. All other areas within the Monument would be managed for VRM Class II. The overall impact on the scenic setting would be a range of conditions, with selected areas being highly developed, while most Monument lands retain their natural appearance. This may help establish visual quality expectations for areas within the Monument, and would require up-front planning to adhere to these expectations.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V.

Other Resources Management

The impacts would be the same as those described under Alternative V.

Table 4-27 Comparison of Impacts to Visual Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Visual Resources	No VRM Classes identified.	Manage 38,598 acres as VRM Class I. Manage 126,643 acres as VRM Class II. Manage 94 acres as VRM Class III.	Manage 25,976 acres as VRM Class I. Manage 41,867 acres as VRM Class II. Manage 104,605 acres as VRM Class III.	Manage 25,976 acres as VRM Class I. Manage 27,535 acres as VRM Class II. Manage 94,327 acres as VRM Class III. Manage 17,497 acres as VRM Class IV.	Same as Alt. II.	Manage 41,724 acres as VRM Class I. Manage 100,394 acres as VRM Class II. Manage 14,190 acres as VRM Class III. Manage 9,972 acres as VRM Class IV.
Cultural Resources	Protect cultural resource sites. Develop new sites for controlled visitation.	Protect cultural resource settlement clusters, sites, and isolated finds. Develop 13 sites.	Protect cultural resource settlement clusters and sites. Develop 13 to 25 sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new leased lands). Apply NGD/NSO,	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Same as Alt. II.	Same as Alt. II.

Table 4-27 Comparison of Impacts to Visual Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
		CSU/SSR, TL, and COA restrictions.				
	Continued development of existing leases (127,895 acres) with up to 1,985 acres new disturbance.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.
Recreation and Transportation	Manage 149 miles of routes; 864 acres of disturbance (per 1985 RMP decision). 1,235 acres of disturbance (per 2000-2002 inventory). Develop 7 facilities.	Manage 139 miles of routes; 806 acres of disturbance. Develop 7 facilities.	Manage 189 miles of routes; 1,096 acres of disturbance. Develop 13 facilities.	Manage 213 miles of routes; 235 acres of disturbance. Develop 20 facilities.	Manage 169 miles of routes; 980 acres of disturbance. Develop 9 facilities.	Manage 172 miles of routes; 997 acres of disturbance. Develop 9 facilities.
Other Resources: Air Quality	Comply with State and Federal air	Comply with State and Federal air quality standards;	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.

Table 4-27 Comparison of Impacts to Visual Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	quality standards.	additional requirements and protective measures.				
Other Resources: Fuels and Fire	More likely to have large-scale fires.	Fires generally site-specific and short-term.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.
Other Resources: Vegetation Resources	Restore native plant species.	Restore native plant species. Proactively manage noxious weeds.	Restore native plant species. Manage noxious weeds as encountered.	Allow use of non-native plant species for revegetation. Manage noxious weeds as encountered.	Same as Alt. II.	Same as Alt. II.
Other Resources: Lands and Realty	Allow major utility corridors, with protective stipulations.	Prohibit major utility ROW corridors.	Allow major utility ROW corridors only within or adjacent to existing ROWs.	Same as Alt. I.	Same as Alt. II.	Same as Alt. II.

4.2.9.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-28 Past, Present, and Future Activities influencing Visual Resources
Past Activities
80% of the Monument leased for fluid mineral development, numerous active wells and associated facilities, numerous abandoned well-sites.
Designation of National Parks and air quality standards for visual management
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the Clean Air Act, the National Environmental Policy Act, and other legislation protecting natural resources and the quality of the human environment.
Present Activities
Growth in fluid mineral development and associated effects both inside and outside the Monument.
Reduced air quality resulting from increased development within and outside the Monument.
Moderate private land development within pastoral areas adjacent to the Monument, visible to Monument visitors.
National Monument designation by Presidential Proclamation to protect the objects while managing valid existing rights so as not to create any new impacts to the objects
Future Activities (Proposed Plan)
Regional proposal for coal-fired power plants.
Increased energy and residential development on pastoral lands in the vicinity of the Monument and visible to visitors accessing the Monument.
GADPs required for long-range planning
Protection of cultural and natural resources on a landscape level to minimize cumulative impacts and manage for resource setting.

The burning of fossil fuels, energy development, and the conversion of rural lands to urban lands are the three activities most likely to result in cumulative impacts to visual resources within the Monument. Increased fossil fuel burning within, and adjacent to, the Monument may degrade air quality and scenic vistas. The cumulative impact of past, present, and future energy development that is visible from travel routes within the Monument, as well as from access

routes through the Monument (such as the Trail of the Ancients Scenic and Historic Byway) includes those resulting from well pads, pipelines, compressor stations, routes, other facilities, and the substantial associated ground disturbance. The cumulative acreage of ground disturbance expected from fluid mineral development through the life of the Proposed Plan, in relation to leased and unleased lands within the Monument, is 3,168 acres, much of which is in linear features like routes and pipelines.

As ranches are subdivided and energy development increases, it is likely that scenic pastoral vistas currently surrounding the Monument will, over the next decade, convert substantially to more urban and industrial vistas. This, in combination with the increased development of private lands that are surrounded by Monument lands, will contribute to a more developed and less natural appearance as viewed from public travel routes.

The following summarizes cumulative disturbance activities on the Monument:

Table 4-29 Cumulative Acres of Disturbance (Past, present and projected future acres)	
Development Type	Disturbance Area (acres) (Maximum, including what may be reclaimed)
Fluid Mineral Development	3,168 acres (1,165 past leased + 883 future leased + 18 future new leases + 1,102 seismic)
Routes	1,235 acres (213 miles is maximum number to exist)
1960s Chained/Harrowed Vegetation Treatments	15,000 acres
Total Acres	21,624 acres

4.2.10. Water Resources

The primary goal for water resources management within the Monument is to ensure that an appropriate quality and quantity of water are available to support the proper functioning of ecological processes, consistent with applicable standards (such as water quality). The management objectives related to this goal include:

- protect and restore water resources from physical disturbances and adverse impacts associated with land management activities;
- ensure continued availability of water to adequately manage resources and multiple-uses (multiple-uses include both consumptive uses of water, such as livestock and wildlife watering, recreation, and fire suppression; as well as non-consumptive uses, such as maintaining flow in streams sufficient to support riparian/wetlands areas and fisheries values);
- protect water quality within, and downstream from, the Monument; and

- identify and quantify hydrologic processes and relationships; monitor changes in both water quality and quantity to ensure proper management of resources, as well as the multiple-uses that depend upon them.

Beneficial impacts that improve water quality may include actions that reduce and/or eliminate sedimentation and contamination factors. Beneficial indirect impacts may include increased vegetative cover, reduced soil compaction, and reduced disturbance to the soil's biological crust (which may, in turn, result in less soil erosion and surface runoff and, thereby, in greater water absorption and infiltration). Water quantity may be enhanced by irrigation inflow upstream. Beneficial impacts may also be described in terms of protective measures (such as the designation of WSRs). Adverse impacts to water quality may include sedimentation (which can be a result of ground disturbance and the associated runoff). Water contamination may result from direct deposition of fecal material and/or chemicals (such as from pesticides and/or herbicides). Water quantity may be reduced from stream diversions for irrigation, culinary, and/or other uses.

Direct impacts to water quality may involve the introduction of pollution directly into the water or at the water source. Indirect impacts may result from a loss of vegetation, which may, in turn, reduce water infiltration into the ground.

Potential impacts to surface water quality resulting from fluid minerals extraction may include soil disturbance that may, in turn, result in sediments washing and/or blowing into nearby streams; contaminated runoff from project wells entering streams and/or groundwater; and contaminants spilling, leaking, and/or being washed off of vehicles and equipment and into streams at route crossings. In addition, the depletion of surface water may result from drilling and cross-connection of water-bearing zones that may be tributary to surface water.

Potential impacts to groundwater quality resulting from the management of fluid minerals may include the cross-contamination of aquifers across geologic strata due to the improper sealing of aquifers encountered by the well bore; the contamination of shallow water aquifers due to surface spills and/or to accidental releases; and the leakage of fluids during the transfer, and/or transportation, of produced water.

The actual impacts on surface water and groundwater quality may depend upon the proximity of routes, pads, and/or of support facilities to water sources; the magnitude, duration, and intensity of precipitation events (which can, in turn, influence the volume of contaminated runoff reaching streams); well-completion techniques; and the BMPs used for stormwater pollution control. Wells sited away from actively flowing surface water may have a lower risk of impacting water resources. Potential impacts may be greatest during project construction. Long-term impacts, such as those resulting from surface-water depletion, may occur during well operations.

With appropriate mitigation measures put in place, the risk of contaminating surface water and/or groundwater during the management of fluid minerals may be low. When proper procedures are followed, accidental spills may be rare and may, usually, be contained. Implementing BMPs (such as frequently inspecting vehicles for leaks and lining reserve pits) may greatly reduce the risk of potential contaminants reaching water resources.

Livestock grazing may impact water quality, in that it grazing may increase sedimentation into streams, and may result in direct contamination at springs. Livestock grazing may increase the amount of sediment entering surface water, in that it may remove riparian/wetlands vegetation and may disturb streambanks. Sedimentation may alter the levels of dissolved oxygen, pH, and nitrite concentration in streams. The impact of continued livestock grazing on sedimentation may be localized and long-term. Water quality contamination resulting from direct contact of livestock with streams and springs may result in a short- to long-term impact, depending upon

the quantity and the nature of the contaminants. Primary contaminants obtained from direct contact may include bacteria and/or ammonia. Contaminated water resulting from livestock grazing may extend downstream into main-stem streams during peak flow events. Restricting the access of livestock to surface water may greatly reduce the risk of direct contamination.

Livestock grazing may indirectly impact water quality and stream channel conditions, in that it may remove upland vegetation, compact soil, and/or disturb biological soil crusts. The removal of vegetation and/or biological soil crust in upland areas may increase the potential for soil erosion. In addition, removing vegetation may increase the volume and/or the velocity of surface runoff due to the reduction of friction on the ground surface. Soil compaction may further reduce friction. An intact biological soil crust may help to reduce soil erosion (by covering the soil and binding soil particles together), and may aid in the infiltration and absorption of rainfall. Consequently, areas that are heavily grazed may quickly transport soil sediment downhill into adjacent streams. The potential for sedimentation resulting from upland livestock grazing may depend upon the frequency, magnitude, and/or on the timing of runoff events; watershed condition; number of livestock; proximity of livestock to surface water; season of use; and/or to the duration of grazing. Under this alternative, the indirect impacts of sedimentation on water resources may be moderate and long-term.

Livestock watering may reduce base flows at the watering source(s). The amount of water withdrawn would depend upon the number of cattle, the grazing season, and the method of extraction. A large amount of livestock receive water from small artificial ponds fed by storm-flow and snowmelt. Livestock grazing may also alter stream channel shape, in that it may increase the volume and rate of surface water reaching the stream (which can scour stream banks), and may increase the amount of sediment being deposited into the stream. It may also result in the collapse of stream banks as livestock access water, as well as in the removal of stabilizing riparian/wetlands vegetation adjacent to water sources. These processes tend to increase stream width, decrease its depth, and decrease its sinuosity (curvature). A straight, shallow stream is more likely to experience an increase in water temperature. Temperature increases may be compounded by the removal of riparian/wetlands vegetation (which shades the stream). Warmer streams may result in adverse habitat conditions for aquatic vegetation and/or wildlife. These physical changes are already occurring on some streams within the Monument. Continued livestock grazing would likely continue this trend, producing a long-term change in stream channel function and/or in habitat.

Different types of recreation may result in varying levels of impacts on water resources. Temporary, localized impacts to water quality may occur during visitor facility construction, in that it may increase impacts associated with soil disturbance and equipment traffic. Long-term impacts may result from the installation of some permanent features (such as parking lots). This may increase the amount of surface runoff reaching adjacent streams. Water usage for facilities (such as for drinking water pipelines, restrooms, and/or for kitchen use) may result in minor impacts to water quantity. The impacts of facilities on water resources may diminish with distance from the water source.

Dispersed foot traffic may result in minimal impacts to water resources (unless visitors wade directly into stream channels). The amount of expected foot traffic at any given time within the Monument would likely be too low to produce measurable impacts on stream channels. OHV use may result in greater impacts to water resources, especially if designated OHV routes cross stream valleys. OHVs may displace large amounts of soil and create soil ruts, which, in turn, may funnel runoff and sediment into nearby streams. Soil loss due to rainfall and/or to runoff is increased when cyanobacteria connections in the soil crust are broken. This may be especially problematic when the impact is in a continuous strip (such as in vehicle tracks). This is because channels for water flow are quickly formed, especially on slopes. Depending upon their

proximity and surfacing, high-traffic routes may contribute substantial amounts of sediment into streams. Traffic along natural surfaced routes may continue to displace sediment, both during times they are, and are not, being used. If the route surface is hardened (rocked or paved), then the risk of sedimentation may be greatly reduced; however, the risk of surface runoff may increase slightly. Route construction activities may displace topsoil that could then, potentially, enter nearby streams during runoff events. Depending upon their proximity to surface water, the construction of new routes may result in long-term impacts to water resources.

4.2.10.1. Evaluation Criteria and Assumptions

Due to a lack of long-term data for water resources within the Monument, quantifying impacts to water resources, specifically for water quality, is difficult. The number of acres of ground disturbance due to sedimentation may be used as a relative comparison, as an indication of potential for water quality deterioration. In the case of analyzing impacts resulting from livestock grazing, the number of AUMs and the potential for impacts associated with ground disturbance and direct water contamination may be used to compare alternatives. Impacts are sometimes described in qualitative terms, if appropriate.

Assumptions used in analyzing impacts to water resources include the following:

- Application of appropriate BMPs and standardized reclamation practices would be required as COAs for all new leases, permits, and surface disturbance areas (see Appendix E).
- The analysis assumed the implementation of all possible management actions (representing a “worst-case scenario”); therefore, the actual impacts of implementing each alternative are likely to be less, and within the scope of the analysis presented below.
- It is assumed that the number of routes predicted for construction, based upon new acres leased for fluid minerals development, would all be new routes.
- Erosion can be expected from the majority of soil types present within the Monument, most of which are characterized as having severe water erosion and high runoff properties.
- The spatial scales considered for direct and indirect impacts include the site of the proposed management actions, the general vicinity of the proposed management actions (including the nearest water bodies), and the catchment scale (the impacted stream valley or basin).
- Cumulative impacts are considered within the Monument at the fifth-field watershed scale. (The Monument makes up 56 percent of the Yellow Jacket Canyon fifth-field watershed, 30 percent of the Middle McElmo Creek watershed, 24 percent of the Cross Canyon watershed, 21 percent of the Lower McElmo Creek watershed, and only 3 percent of the Upper McElmo watershed. Consequently, the Yellow Jacket Canyon watershed would most likely be impacted by management direction within the Monument; whereas, the Upper McElmo watershed is more likely to be impacted by the activities of other landowners within the watershed. The temporal scale of impacts ranges from minutes to decades or longer.)

4.2.10.2. Alternative Analysis

Impacts to water resources within the Monument may differ depending upon specific management actions proposed under each alternative. The following sections describe the

impacts from the management actions proposed for water resources, as well as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, and recreation and transportation.

Alternative I (No Action Alternative)

Water Resources Management

Under Alternative I, the BLM would honor existing water rights within the Monument. New water rights may be secured to provide for recreation, livestock, and/or for the protection of riparian/wetlands zones or springs associated with cultural sites. The Dolores Water Conservancy District (DWCD), the Montezuma Valley Irrigation Company (MVIC), and other entities that import water to the watersheds in which the Monument is located are increasing the water flow in the Monument. If the current trend of returning irrigation flows continues, the surface water and near-surface water features within the Monument should continue to have larger flows, when compared with natural conditions. These augmented water features may continue to provide riparian/wetlands habitats and water for other uses, including for wildlife, livestock, and/or for recreation.

Alternative I would protect 2,415 acres of riparian/wetlands system and would implement projects designed to improve riparian/wetlands area and alluvial floodplain habitat. Active channel edges would be protected from non-restoration projects, unless appropriate mitigation measures were in place to reduce or eliminate impacts to streams. There are no restrictions on groundwater and/or on new water developments proposed under this alternative.

Under Alternative I, existing stream crossings would be assessed, and replaced or repaired, if necessary, to maintain water quality and stream function. Road crossings of intermittent or perennial streams would be reviewed on a case-by-case basis. Removing or improving stream crossings may result in long-term beneficial impacts to water resources, in that such actions may reduce potential sedimentation, and may help to maintain or restore channel condition and function.

Cultural Resources Management

The continued management of cultural resource sites for visitation, interpretation, and/or for research may result in negligible impacts to water resources. Sediment produced as a result of ground-disturbing activities (such as from facility construction or traffic) may be short-term, minor, and localized. The majority of known cultural sites are located on uplands, away from perennial streams, and visitation to these sites may result in minimal to no measurable impacts to streams or groundwater resources. A total of up to 240 sites is proposed for stabilization in Alternative I. Several of these sites would be developed for visitation, which may, in turn, increase the potential for disturbance.

In order to help protect existing spring riparian/wetlands areas that are associated with cultural sites, the BLM would obtain water rights for these areas. This may result in long-term beneficial impacts to these special habitats, in that these actions may help maintain flows sufficient for sustaining riparian/wetlands area-dependent species.

Fluid Minerals Management

Approximately 80 percent of Monument lands are currently leased for fluid minerals development. Under Alternative I, the remaining 20 percent would not be leased; therefore, no impacts would occur from new leases.

Fluid mineral development on currently leased lands would result in both direct and indirect impacts to water resources. New fluid mineral development on 127,895 acres of current leased

areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance. Impacts to water resources resulting from ongoing development of currently leased lands may include water depletion and water contamination.

Livestock Grazing Management

The continued management of up to 8,492 active livestock AUMs within the Monument may impact water quantity and quality. Ninety-seven percent of Monument lands fall within an allotment under this alternative. Under Alternative I, the BLM would secure sufficient water rights to provide for livestock management needs. Livestock watering may slightly reduce base flows at the watering sources. The amount of water withdrawn would depend upon the number of cattle, the grazing season, and/or the method of extraction. Therefore, the impacts of livestock to water quantity may be minor, in that flows within the Monument are currently augmented by irrigation returns.

Alternative I, the No Action Alternative, has failed to meet Public Land Health Standards to date. Livestock grazing is a key component of the failure. Not maintaining rangeland health would continue to impact water sources due to the lack of ground cover and healthy vegetation, and to the associated erosion and sedimentation into local streams. In addition, this alternative does not protect water sources to the same extent that they would be protected under the other alternatives; therefore, impacts to riparian/wetlands areas, floodplains, and/or canyon bottoms may continue, and may include trampling, soil compaction, erosion, and/or water contamination. Under this alternative, livestock management would have the greatest potential to adversely impact water resources.

Recreation and Transportation Management

This alternative does not implement a recreation promotion strategy. Facility development would be on an as-needed basis. The actual level of impact would depend upon the maintenance and construction of visitor facilities, the proximity of these facilities to water bodies, the types of recreation use, and the number of visitors. In addition, different types of recreation would result in varying levels of impacts to water resources. Dispersed foot and horseback traffic may result in minimal impacts to water resources (unless visitors wade directly into stream channels). The amount of expected foot and horseback traffic at any given time within the Monument may be too low to produce measurable impacts to channels. This would not be the case with dispersed motorized and mechanized traffic. However, since cross-country mechanized and OHV travel is prohibited within the Monument, little or no impact from these sources may occur.

Traffic along the 149 miles of routes (both motorized, non-motorized, and/or mechanized) may result in localized, long-term soil disturbance and displacement (with up to 864 acres of disturbance). The 2000-2002 route inventory recorded 213 miles of routes and 1,235 acres of disturbance. This alternative does not incorporate official travel management designations; therefore, it may not manage traffic in a manner that minimizes impacts to water resources to the same extent as the other alternatives. The low density of routes within the Monument, and the expected volume of visitor traffic, may result in minor impacts to water resources. However, every year new illegal user-created routes are developed. With the development of each new route, and the associated increased use, impacts from soil erosion may increase.

The closing of routes may result in long-term beneficial impacts to water resources, in that the volume of traffic may be reduced, and lands may be returned to a more natural surface. Residual route compaction may persist for decades. Routes that are reclaimed by vegetation

may regain some of their infiltration and runoff dispersal functions following a single growing season. Decompacting and/or recontouring routes may greatly accelerate their recovery.

Alternative V (Preferred Alternative)

Water Resources Management

Alternative V may result in long-term beneficial impacts to water quantity and quality within the Monument. Under Alternative V, the BLM would acquire water rights on point sources (such as reservoirs, wells, and springs) to support all water uses within the Monument. Existing water rights would be honored, and would contain the necessary terms and conditions relating to the authorization and maintenance of the facilities to meet aquatic, terrestrial, and other resource management objectives. New surface water and groundwater developments would only be implemented to mitigate environmental impacts, restore native habitats or populations, support visitor facilities, and/or to mitigate impacts to cultural resources. New developments would only be implemented following a NEPA analysis of potential impacts, and only when the development would not dewater springs or streams. Groundwater development would be discouraged, and would only be implemented following a full environmental impact analysis of the proposal on water resources.

Under Alternative V, the BLM would work with the owners of existing water infrastructure to reduce the facilities' impacts on riparian/wetlands habitat. In addition, new diversions through existing facilities would only be allowed where NEPA analysis demonstrates an overall benefit to Monument resources. The BLM would also work closely with the Colorado Water Conservation Board to establish instream flow rights for suitable perennial and seasonal streams within the Monument. On unprotected reaches, the BLM would only authorize new land uses that would ensure sufficient flows remained to support water-dependent values. In addition, the BLM would potentially increase water flows by developing a list of high priority water sources for noxious weed control, and by beginning treatment on these sites within 3 years of the signing of the ROD.

With these management actions in place, and assuming the current trend of returning irrigation flows continues, the surface water and near-surface water features within the Monument may continue to have larger flows over natural conditions. These augmented water features may continue to sustain riparian/wetlands habitats and may provide water for other uses, such as for wildlife, livestock, and/or for recreation.

When compared with Alternative I, Alternative V may result in greater long-term beneficial impacts to riparian/wetlands systems. Under this alternative, the BLM would protect 5,312 acres of riparian/wetlands area, canyon bottom, and floodplain systems by applying NGD/NSO stipulations. This restriction may help maintain and enhance riparian/wetlands areas, which, in turn, may help filter sediment, encourage the infiltration of surface runoff, help stabilize stream banks, and provide shade (which would help to regulate stream temperature, among other functions). This alternative would protect riparian/wetlands areas and floodplains, as well as canyon bottoms. (Additional information regarding impacts to riparian/wetlands areas is provided in Subsection 3.1.8, Vegetation Resources.)

Typically, water contamination at route and trail crossings is the result of sediment being dislodged from the route surface or from vehicles and equipment, and, to a lesser extent, from the leakage or spill of fluids and chemicals from vehicles and equipment. Under Alternative V, designated route crossings would only be permitted in the NGD/NSO riparian/wetlands areas if an environmental impact analysis demonstrated that the crossing would not contribute to a stream segment either not achieving, or not making progress toward achieving, PFC. This

management action may help minimize the risk of water quality contamination at stream crossings.

Cultural Resources Management

Alternative V identifies the development of 13 to 25 cultural sites for public use, with minimal stabilization, interpretive signage, infrastructure, and/or visitor services. This may result in negligible impacts to water resources. Sediment produced by ground-disturbing activities (related to facility construction, traffic, and/or to excavations) may be short-term, minor, and localized. The majority of known cultural sites are located on uplands, away from perennial streams, and visitation to these sites may result in little measurable impact on streams and/or on groundwater resources.

In order to help protect existing spring riparian/wetlands areas that are associated with cultural sites, the BLM would obtain water rights for these areas. This may result in long-term beneficial impacts to these special habitats, in that such actions may help maintain flows sufficient for sustaining riparian/wetlands area-dependent species.

Fluid Minerals Management

The management of fluid minerals may result in long-term impacts to water resources as the result of sedimentation, soil contamination, salt and nutrient loading, ground-water contamination, and augmented water flows. In addition to impacts from current fluid mineral leases as described in Alternative I, under Alternative V, up to 880 acres would be available for new leases, with up to 18 acres of potential ground disturbance. This disturbance may occur on existing leased lands to access minerals associated with new leases.

Impacts to water resources from ongoing development of currently leased lands would continue, and would be of greater concern than new development, given that 80 percent of the Monument is already leased. In addition to the impacts listed above, areas of concentrated development may result in changes to the nature of overland flows. Year-round drilling may impact watershed health and water quality, primarily as the result of runoff during the times that soils are saturated. When soils are saturated, roads and well pads are vulnerable to disturbance and rutting. Up-front planning, through the use of such tools as GADPs, may result in proposals that minimize impacts by reducing ground disturbance and the loss of native vegetation. Incorporating BMPs, COAs, stipulations, and mitigation measures may also help minimize impacts. In addition, the use of existing disturbed areas for directional/horizontal drilling may minimize new ground disturbance, as well as the associated loss of vegetative cover and soils (due to soil exposure and to wind/water erosion), and may reduce impacts to cultural and natural resources (see Map 17).

Livestock Grazing Management

Alternative V may result in long-term, beneficial impacts to water resources within the Monument. Emphasizing a reduction of authorized livestock use to up to 6,437 active AUMs, adjusting the duration and extent of spring grazing, and implementing rest-rotation grazing schedules may help improve water and riparian/wetlands resources throughout the Monument. Ninety-four percent of Monument lands fall within an allotment under this alternative. The benefits of these management actions may include increased vegetative cover and reduced soil compaction, which may, in turn, result in reduced soil erosion and surface runoff. As a result, less sediment may be deposited into streams, which may, in turn, result in additional benefits to water quality, including increased dissolved oxygen and decreased nitrite concentrations. If livestock are restricted from direct access to surface water, direct water contamination and the loss of riparian/wetlands vegetation (and associated channel changes) may be minimized.

Under Alternative V, direct sedimentation may be minor, in that riparian/wetlands areas would be excluded from livestock use where Public Land Health Standards are not being met. Given that livestock may have limited access to surface water under Alternative V, the impact of direct contamination may be possible at the site scale. Under Alternative V, the potential for sedimentation resulting from upland livestock grazing may be reduced as the result of the reduction in the number of authorized uses, the adjustment in the duration and extent of spring grazing, and the implementation of rest-rotation grazing schedules. Consequently, over the long term, the indirect impacts of sedimentation on water resources may be minor.

Under this alternative, implementing the management actions may also result in beneficial impacts to stream channel shape, in that such actions may eliminate or reduce the processes that are altering stream channels within the Monument. By protecting upland vegetation (and thereby decreasing surface runoff and sedimentation), excluding livestock from stream banks, and protecting essential riparian/wetlands vegetation, Alternative V may help to reverse adverse processes and may allow for the recovery of channels toward achieving PFC.

Recreation and Transportation Management

This alternative would designate RMZs and SRMAs, and would propose a mix of promotion strategies. Up to 157,460 acres within the Monument would be managed for the primitive, undeveloped recreation experience, with minimum facilities and infrastructure. These areas would be primarily used by local visitors. Approximately 7,875 acres would be managed under a destination strategy, with appropriate support facilities, designed to meet the needs of regional visitors. The amount of recreational development would vary among sites, with some having only minimal structures (signs), and others having more substantial structures (parking lots). The actual level of impact would depend upon the maintenance and construction of visitor facilities, the proximity of these facilities to water bodies, the types of recreation use, and/or the number of visitors. Temporary, localized impacts to water quality may occur during visitor facility construction, in that it may increase soil disturbance and equipment traffic. Long-term impacts may result from the installation of permanent features (such as parking lots), which may, in turn, increase surface runoff into adjacent streams. Water usage for a limited number of facilities may result in minor impacts to water quantity. The impacts of facilities on water resources may diminish with distance from the water source.

Different types of recreation would result in varying levels of impacts to water resources. Dispersed foot traffic may result in a negligible impact to water resources (unless visitors wade directly into stream channels). The amount of expected foot traffic at any given time within the Monument may be too low to produce measurable impacts to channels. Under this alternative, 8 miles of routes would be designated for OHV traffic; 74 miles would be open to all forms of traffic. If these routes are well maintained and sited away from water bodies (and OHV drivers remain on these routes), then adverse impacts to water resources may be minimized. Cross-country OHV use is prohibited within the Monument; consequently, there would be no impacts resulting from dispersed OHV travel.

Traffic along the up to 169 miles of routes (both motorized, non-motorized, and/or mechanized) may result in localized, long-term soil compaction and displacement (on up to 980 acres). Under Alternative V, most existing user-created routes would be closed and reclaimed, and fewer routes would be open to public use. A lower density of routes within the Monument, with the resulting lower volume of visitor traffic, may result in minor impacts to water resources. Under Alternative V, no new route construction and no reroutes are proposed; therefore, the impacts resulting from route construction on water resources may be negligible.

The closing of routes may result in long-term beneficial impacts to water resources, in that such actions may reduce the volume of traffic, and may help return the land to a more natural

surface. Residual route compaction may persist for decades. Former routes that are reclaimed by vegetation may regain some of their infiltration and runoff dispersal functions following a single growing season. Decompacting and/or recontouring routes may greatly accelerate their recovery.

Alternative VI (Proposed Plan)***Water Resources Management***

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, the BLM would protect 5,528 acres of riparian/wetlands area, canyon bottom, and floodplain systems by applying NGD/NSO stipulations.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, up to 158,515 acres within the Monument would be managed for a primitive, undeveloped recreation experience, with minimum facilities and infrastructure. Traffic along the up to 172 miles of routes (both motorized, non-motorized, and/or mechanized) may result in localized, long-term soil compaction and displacement (on up to 997 acres).

Table 4-30 Comparison of Impacts to Water Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Water Resources	Protect 2,415 acres of riparian. Apply no restrictions on groundwater and new water developments.	Protect 5,312 acres of canyon bottoms, riparian and floodplain. Discourage groundwater and new water developments.	Protect 5,312 acres of canyon bottoms, riparian and floodplain. Allow groundwater and new water developments.	Protect 3,217 acres of riparian and floodplain. Encourage groundwater and new water developments.	Same as Alt. II.	Protect 5,528 acres of canyon bottoms, riparian and floodplain. Discourage groundwater and new water developments.
Cultural Resources	Protect cultural resource sites. Develop new sites for controlled visitation.	Protect cultural resource settlement clusters, sites, and isolated finds. Develop 13 sites.	Protect cultural resource settlement clusters and sites. Develop 13 to 25 sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new leased lands). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Same as Alt. II.	Same as Alt. II.
	Continued development of	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.

Table 4-30 Comparison of Impacts to Water Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	existing leases (127,895 acres) with up to 1,985 acres new disturbance.					
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.
Recreation and Transportation	Manage 149 miles of routes; 864 acres of disturbance (per 1985 RMP decision). 1,235 acres of disturbance (per 2000-2002 inventory). Develop 7 facilities.	Manage 139 miles of routes; 806 acres of disturbance. Develop 7 facilities.	Manage 189 miles of routes; 1,096 acres of disturbance. Develop 13 facilities.	Manage 213 miles of routes; 235 acres of disturbance. Develop 20 facilities.	Manage 169 miles of routes; 980 acres of disturbance. Develop 9 facilities.	Manage 172 miles of routes; 997 acres of disturbance. Develop 9 facilities.

4.2.10.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-31 Past, Present, and Future Activities influencing Water Resources
Past Activities
Diversion of upstream waters for agricultural purposes
80% Monument leased for fluid mineral development
Construction of impoundments, primarily for livestock management
Livestock impacts on stream banks and riparian vegetation
Loss of ground cover from unmanaged livestock grazing
Management of 149 miles of routes
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Present Activities
Increased fluid mineral development
Prolonged drought
Subdivision of agricultural fields surrounding the Monument and urban expansion
Management of 213 miles of routes
Increased popularity of OHVs
National Monument designation by Presidential Proclamation to protect the objects while managing valid existing rights so as not to create any new impacts to the objects
Future Activities (Proposed Plan)
Continued increase in fluid mineral development
Lease 880 new acres for drainage with restrictive stipulations
Estimated development of 335 wells on existing leased lands within the Monument

Table 4-31 Past, Present, and Future Activities influencing Water Resources
Increased fluid mineral development outside the Monument
Management of 172 miles of routes
Increased development of neighboring lands including subdivisions
GADPs required for long-range planning
Protection of cultural and natural resources on a landscape level to minimize cumulative impacts and manage for resource setting

Water degradation can be a rapid process, whereas recovery is often much slower. The cumulative impacts to watersheds and water quality are primarily dependent upon the health of the vegetative community, the amount of surface disturbance, the amount of pollutants, and the degree to which ground water quality and quantity are degraded. Cumulative impacts to Monument water resources and watersheds may include flow augmentation and water contamination (including sedimentation). The cumulative impacts of extracting water for fluid minerals operations and for livestock watering may likely be compensated by offsite irrigation returns; therefore, they may be negligible. Irrigation upstream in the watersheds may continue to return a greater volume of water to Monument streams than under natural conditions. Due to these irrigation returns, otherwise intermittent and ephemeral streams now flow year-round. This change in flow regime may allow for the establishment and maintenance of riparian/wetlands zones along these reaches. Protecting existing spring riparian/wetlands areas associated with cultural sites by obtaining water rights for these areas may result in a long-term benefit to the local resource, as well as to other resources dependent upon that water (including downstream, offsite streams, and/or migrating wildlife).

There is a close correlation between soil, vegetation, and water resources. Impacts to any one of the three can directly affect the other two. The continued management of fluid minerals associated with existing leases within the Monument, as well as those occurring adjacent to the Monument, may result in cumulative impacts to water resources. Potential impacts to surface waters resulting from fluid minerals extraction may include soil and vegetation disturbance, which may, in turn, result in sediment washing and/or blowing into nearby streams; contaminated runoff from project wells entering streams and/or groundwater; and contaminants spilling, leaking, and/or being washed off of vehicles and equipment into streams at route crossings. In addition, the depletion of surface water may result from drilling and cross-connection of water-bearing zones that may be tributary to surface water. As the amount of surface disturbance increases, the ability of a watershed to buffer high flows and filter water and sediment decreases.

Potential impacts to groundwater resulting from the management of fluid minerals may include cross-contamination of aquifers across geologic strata due to the improper sealing of aquifers encountered by the well bore; possible contamination of shallow-water aquifers due to surface spills, accidental releases, and/or by the leakage of fluids during the transfer and/or transportation of produced water; and contaminated surfaces coming into contact with groundwater due to improperly sealed surface casing, well bore stimulation activities, mineral production, and/or abandonment. These impacts may occur on, or adjacent to, the Monument, and may result in widespread impacts. However, actual impacts may depend upon the proximity of routes, pads, and/or support facilities to water sources; the magnitude, duration, and intensity

of precipitation events (which can, in turn, influence the volume of contaminated runoff reaching streams); well completion techniques; and the BMPs used for stormwater-pollution control. Wells sited away from actively flowing surface waters may have a lower risk of impacting water resources.

With appropriate mitigation measures in place, the risk of contaminating surface water and/or groundwater during the development of fluid minerals is low. When proper procedures are followed, accidental spills are rare and are, usually, contained. Implementing BMPs (such as inspecting vehicles frequently for leaks and lining reserve pits) may greatly reduce the risk of potential contaminants reaching water resources. Fluid minerals development (including federal surface/federal minerals; private surface/federal minerals; and private surface/private minerals) may result in considerable ground disturbance resulting from construction of well pads, pipelines, compressor stations, routes, and/or other facilities. Increased erosion and potential rockfall and/or landslide hazards may result especially if/when these activities are not subject to BMPs, COAs, stipulations, and/or mitigation measures.

Contaminants in upstream offsite irrigation flows and, to a lesser extent, livestock in or near surface waters, may continue to impact water quality in Monument watersheds. Cumulative sources of excess sediment in streams may include erosion of channels and stream banks (due to peak flow events scouring the stream); livestock removing vegetation and collapsing stream banks and routes (especially at stream crossings); and soil-disturbing construction, recreation, and/or cultural activities. These impacts may occur within, and adjacent to, Monument lands and may cumulatively impact water resources within, and adjacent to, the Monument.

Under Alternatives V and VI, several management actions may reduce the amount of sediment reaching stream channels on, and adjacent to, the Monument. These activities include removing livestock from some stream channels, maintaining riparian/wetlands vegetation, reducing surface runoff resulting from upland livestock grazing, closing routes, restricting route crossings, and/or minimizing cultural and recreational facilities. Livestock accessing stream channels and riparian/wetlands areas may result in impairment to these resources, as well as in sedimentation moving into streams.

Recreation activities on public lands are on the increase, both regionally and nationally. As more and more people find themselves living in urban environments, the demand to recreate on public lands may become more intense. Limiting the number of developed recreation sites within the Monument could concentrate visitors at facilities or areas outside of the Monument that are not as intensively managed. Depending upon the type, intensity, and duration of this use, there may be adverse impacts to water resources within, and adjacent to, the Monument.

4.3. Resource Uses

4.3.1. Education and Interpretation

The primary goal for education and interpretation within the Monument is to increase appreciation of the objects identified in the Proclamation by creating opportunities for visitors, and other users, to learn about the Monument landscape and about its multiple-uses, as well as about the needs for protection and stewardship. Another goal is to ensure long-term benefits from research, education, and cultural heritage while, at the same time, balancing other uses and considering the impacts on the local economy. The management objectives related to these goals include:

- develop and implement a comprehensive Interpretation and Education Plan for the Monument;

- make available significant resources and areas for interpretation and education activities, including those identified within the Proclamation (including the overall cultural landscape, the geology of McElmo Dome, the various species of wildlife, and the unique herpetological resources).

Public education and interpretation, as well as heritage tourism, are critical for long-term protection of Monument resources. Current strategies include encouraging all visitors to first visit the Anasazi Heritage Center (AHC), which is where the Monument is headquartered; promoting the Leave No Trace concept; supporting education efforts with partners; incorporating strong preservation and advocacy messages in all exhibits, programs, and curriculum; and working with heritage tourism organizations in the Four Corners area to emphasize preservation messages during every visitor contact. It is also considered critical to incorporate information from current research into visitor programs so that the values of cultural and natural resources are understood.

Currently, visitors are directed to Lowry, Painted Hand, and Sand Canyon Pueblos, as well as to the Sand Canyon Trail. Maps, brochures, and/or on-site information are available for these locations. AHC staff endeavor to match each visitor with the type and quality of experience they are seeking, with an emphasis on visitor safety. The entire Monument is open to the public; however, no other sites within the Monument are currently prepared for visitation. The Monument is managed as an outdoor museum, where visitors are encouraged to experience the area through self-discovery. There are no services, restaurants, gas stations, ranger-guided tours, or developed campgrounds. Continued research, education, interpretation, and heritage tourism may raise the awareness of the values of the Monument's resources, as well as the sensitivities necessary to protect and preserve the resources. Developing these programs, in conjunction with specific site improvements, may increase visitors' sense of value and respect, enhance their experiences, and may increase site preservation and public support. Interpretation and education programs may also be used as part of an undeveloped backcountry visitor program.

Beneficial impacts to the education and interpretation program may include opportunities that enhance interpretive activities and access to facilities. Direct adverse impacts may include insufficient interpretive programs, facilities, and/or materials to meet public demand resulting in the resources being over-run. Indirect beneficial impacts may include increased public awareness and stewardship along with law enforcement efforts that may help deter vandalism of Monument resources.

4.3.1.1. Evaluation Criteria and Assumptions

Impacts to education and interpretation resources can be both quantitative and qualitative. Opportunities for information and education can be measured in terms of the number of sites interpreted and/or in terms of opportunities available to increase awareness of resource values and sensitivities.

Assumptions used in analyzing impacts to education and interpretation resources include the following:

- Federal lands within the boundary of the Monument, including the AHC, were used as the impacts analysis area for both individual and cumulative impacts.

4.3.1.2. Alternative Analysis

Impacts to education and interpretation may differ depending upon specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed for education and interpretation, as well as those from the

actions proposed for cultural resources, fluid minerals, livestock grazing, and recreation and transportation.

Alternative I (No Action Alternative)

Education and Interpretation Management

Under Alternative I, education and interpretation management would include organizing public involvement programs; interpreting Monument resources and values; providing environmental education to visitors on important topics; managing cultural resources for protection, preservation, investigation, and public use; maintaining developed recreation sites at Lowry, Painted Hand, and Sand Canyon Pueblos for interpretation and information; developing interpretive signing; developing new sites and areas for controlled visitation; managing the AHC as a focal point for education and interpretation; providing information to visitors on safety and resource protection; and organizing public interpretive programs.

The direct impacts of education and interpretation management may be beneficial, in that such actions may increase knowledge and enhance visitor participation and appreciation. The impact of education and interpretation management on the preservation of Monument resources may be beneficial, in that greater awareness and education may lead to a greater appreciation and care of the resources.

Cultural Resources Management

Under Alternative I, cultural resources management would include the development of new sites. The AHC would continue to serve as the focal point for interpretation. Visitors would be directed to Lowry, Painted Hand, and Sand Canyon Pueblos, as well as to the Sand Canyon Trail. Various levels of interpretation may enhance public awareness of resources, and may lead to the development and protection of suitable cultural resources for public enjoyment. Approximately 240 sites would potentially be stabilized. Protecting Monument cultural resources and developing interpretation for the public may enhance visitor participation and education, which may, in turn, increase awareness of, and appreciation for, Monument objects, which may be a beneficial impact.

Fluid Minerals Management

Under this alternative, there would be no fluid minerals management actions pertaining to education and interpretation.

Livestock Grazing Management

Under this alternative, there would be no livestock grazing management actions pertaining to education and interpretation.

Recreation and Transportation Management

Under Alternative I, the management of recreation resources would include maintaining developed recreation sites at Lowry, Painted Hand, and Sand Canyon Pueblos; preventing, or reducing, resource degradation; establishing site-specific visual quality and design guidelines for interpretation and for visitor management; and developing visitor management plans. Sand Canyon/Rock Creek, Mockingbird-Rincon, Cross, and Squaw Canyons would continue to be managed as undeveloped areas, with a focus on incidental and local visitors. Recreation management may result in direct beneficial impacts to education and interpretation by monitoring visitor use and needs.

Under this alternative, transportation management would include up to 149 miles of routes, of which 131 miles would be open to all forms of public travel. Under this alternative, 7 support

facilities would be maintained. This Plan would allow for continued education and interpretation of the Monument; however, it may not be proactive in terms of meeting future needs. If there is an increase in visitation to the Monument, this alternative may not be adequate in terms of meeting some visitor needs for more, or different, types of transportation. It may also not be adequate in terms of meeting visitor needs for clearer directions on the travel network.

Alternative V (Preferred Alternative)

Education and Interpretation Management

Under Alternative V, management of education and interpretation would include developing an Interpretation and Education Plan for the Monument; minimizing on-the-ground interpretive media; focusing interpretive media at staging areas and at the AHC; limiting interpretive media to developed sites; and encouraging research. Developing a plan would help to set a vision for the Monument and would help Monument management anticipate the steps necessary to meet that vision. It would set the BLM up to proactively manage for current and future visitation, rather than to continue to simply react to situations and problems. This alternative sets restrictions on organized group visits to cultural sites (see Education and Interpretation, Table 2-2).

Under Alternative V, education and interpretation activities would be directed from the AHC. In addition, interpretive information would be made available at specific sites within the Monument (see Appendix N). BLM guidance on developing interpretation and education plans would provide a framework for increased collaborative research, education and interpretation opportunities that would advance knowledge and preservation of the Monument resources. Enhancements called for under this alternative would include developing a plan that reflects Pueblo, Navajo, Ute, Spanish/Hispanic, and Anglo history within the Monument area; and developing differing approaches to public education for front country, middle country, and backcountry zones. These types of activities would interpret the Monument in a responsible well thought-out manner, which may, in turn, improve the experience of visitors, and allow management to be more effective and cost-efficient.

Cultural Resources Management

Under Alternative V, cultural resources management would include allocating 13 to 25 sites for public use. It would also require the preparation of CRMPs for these sites, the acquisition of Native American interpretive consultation, and training and education for SRPs for site visits. Monument staff, with peer review, would guide research proposals, from which new information could be incorporated into interpretation, education, and heritage tourism. In addition, an increase in Native American interpretive information could be disseminated, which may, in turn, increase the public's understanding of, and appreciation for, the resources. These management actions may be beneficial to education and interpretation, in that they would focus efforts on key areas for interpretation and on key messages for the public.

Fluid Minerals Management

Under this alternative, there would be no fluid minerals management actions pertaining to education and interpretation.

Livestock Grazing Management

Under this alternative, there would be no livestock grazing management actions pertaining to education and interpretation.

Recreation and Transportation Management

Under Alternative V, the management of recreation resources would include a mix of promotion strategies and would provide a variety of recreational experiences. Targeting specific audiences

for particular experiences would allow the BLM to focus on information and education needs, as well as on the associated materials required to aid in those experiences. Infrastructure development would target developed sites, while the majority of the Monument would provide an undeveloped backcountry experience. Defining front country areas and visitation sites may help focus education efforts and funding requests.

Transportation management routes proposed under Alternative V are shown on Map 5. This alternative would include up to 169 miles of routes, of which up to 74 miles would be open to all forms of public travel. In addition, 9 support facilities would be maintained. Establishing a Travel Management Plan may result in benefits to visitors, in that it would clarify access routes, destination points, and recreation opportunities within the Monument. A defined travel system may clarify realistic locations for education and interpretation opportunities.

Alternative VI (Proposed Plan)

Education and Interpretation Management

The impacts would be the same as those described under Alternative V.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

Under the Proposed Plan, there would be no fluid minerals management actions pertaining to education and interpretation.

Livestock Grazing Management

Under the Proposed Plan, there would be no livestock grazing management actions pertaining to education and interpretation.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V. However, the Proposed Plan would include up to 172 miles of routes, of which up to 68 miles would be open to all forms of public travel.

Table 4-32 Comparison of Impacts to Education and Interpretation

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Education and Interpretation	Maintain current development and distribution of interpretive material.	Develop an Education and Interpretation Plan. Limit interpretive site development. Manage group visitation to backcountry sites.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.
Cultural Resources	Protect cultural resource sites. Stabilize up to 240 sites. Develop new sites for controlled visitation. Allow scientific research. Identify no specific evaluation process.	Protect cultural resource settlement clusters, sites, and isolated finds. Standing walls documented and allowed to deteriorate. Develop 13 sites. Rely on broad-based standing committee of researchers to evaluate research proposals.	Protect cultural resource settlement clusters and sites. Standing walls documented and allowed to deteriorate. Develop 13 to 25 sites. Rely on an ad-hoc peer review committee of researchers to evaluate research proposals.	Protect cultural resource settlement clusters and sites. Stabilize standing walls. Develop 13 to 25 sites. Rely on Monument staff to evaluate research proposals, while seeking input from knowledgeable researchers.	Protect cultural resource settlement clusters and sites. Standing walls documented and allowed to deteriorate. Stabilization allowed under discretion of Monument Manager. Develop 13 to 25 sites. Rely on an ad-hoc peer review committee of researchers to evaluate research proposals.	Protect cultural resource settlement clusters and sites. Standing walls documented and allowed to deteriorate. Stabilization allowed under discretion of Monument Manager. Develop 13 to 25 sites. Rely on Monument Staff, with peer review, to evaluate research proposals.
Fluid Minerals	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.
	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.
Livestock	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.

Table 4-32 Comparison of Impacts to Education and Interpretation

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
grazing						
Recreation and Transportation	Manage 149 miles of routes. Promote no specific recreation strategy.	Manage 139 miles of routes. Market to local residents.	Manage 189 miles of routes. Market to regional visitors.	Manage 213 miles of routes. Market to national and international visitors.	Manage 169 miles of routes. Market to a mix of visitors.	Manage 172 miles of routes. Market to a mix of visitors.

4.3.1.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-33 Past, Present, and Future Activities Influencing Education and Interpretation
Past Activities
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Looting and vandalism of cultural resources
Cross country motorized transportation
Present Activities
Education regarding cultural resource values and the need to protect them
Increased Monument visitation and demand for interpretative materials
National Monument designation by Presidential Proclamation to protect the objects; managing valid existing rights so as not to create any new impacts to the objects
Future Activities (Proposed Plan)
Protection of cultural and natural resources on a landscape level to minimize cumulative impacts; management of resource setting
Increased population growth locally, regionally, nationally and internationally resulting in increased visitation to the Monument
Increased pressures on the protection of cultural resources requiring a greater need for education

Prior to the Antiquities Act, there was little expressed interest regarding the protection of cultural resources. Awareness of cultural resource values and visitation has increased, and so has the need to educate Monument visitors on how to respectfully visit sites. The primary outside influence on how education and interpretation is managed within the Monument today is how it is marketed by other entities. It is important to work with local Chambers of Commerce and travel councils to ensure that there is a common vision for the Monument. Population growth in the Four Corners area, and elsewhere, may also impact information and education efforts due to a general increase in visitors, as well as to an increase in local school enrollment, which may, in turn, increase the number of schools using the interpretive facilities at the AHC and visiting the Monument.

4.3.2. Facilities and Infrastructure

The primary goals for facilities and infrastructure within the Monument are to develop and maintain the smallest number of facilities and infrastructure necessary to provide for public safety, as well as to assist in meeting resource management objectives. Facilities and infrastructure include fences, troughs, routes, signs, visitor facilities, parking areas, boardwalks, railings, and other similar structures. The management objectives related to this goal include:

- coordinate the development and maintenance of facilities and infrastructure with Federal, State, Native American tribal, and private landowners (including the NPS at Hovenweep National Monument, the Ute Mountain Ute Tribe, the Navajo Nation, the Utah BLM Monticello Field Office, and private landowners); and
- ensure that all major BLM facilities are located outside of the Monument to protect Monument resources, and to provide economic opportunities in the local communities.

Direct impacts to facilities and infrastructure may include those resulting from vandalism, as well as those resulting from changes to facilities and infrastructure that impact the health and safety of visitors, staff, and Monument objects. The indirect impact of facilities and infrastructure may include increased or decreased protection of Monument objects.

4.3.2.1. Evaluation Criteria and Assumptions

Quantifying impacts to facilities and infrastructure for this analysis is infeasible due to the fact that the location and extent of potential impacts cannot be determined. Therefore, a descriptive analysis was conducted.

Assumptions used in analyzing impacts to facilities and infrastructure resource uses include the following:

- Facility and infrastructure BMPs would be implemented.
- Federal lands within the boundary of the Monument were used as the impacts analysis area.
- The number of routes predicted for construction, based upon new acres leased for mineral development, would all be new routes.

4.3.2.2. Alternative Analysis

Impacts to facilities and infrastructure may differ depending on specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed for facilities and infrastructure, as well as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Facilities and Infrastructure Management

Under Alternative I, facilities and infrastructure management would include maintaining and rehabilitating existing camping facilities; considering applications for new facilities; implementing non-structural alternatives, whenever possible; coordinating new facilities and existing facility improvements with the AHC; and constructing new livestock, watershed, and/or wildlife facilities where NEPA analysis demonstrates no adverse impacts. In addition, local communities would be allowed to provide facility-dependent settings and opportunities.

The direct impacts of these management actions may be beneficial, in that they would meet current visitation and development needs while, at the same time, requiring a minimal operational budget. New signs and parking areas at the Sand and East Rock Canyons and Painted Hand Pueblo may result in increased safety, in that this would remove non-designated parking along routes and increase safety awareness. If visitation increases, and fluid minerals development continues to increase, this alternative would not necessarily plan for, or meet the needs of, the Monument. Greater coordination and planning, as well as enhanced partnerships, may be needed.

Cultural Resources Management

Under Alternative I, cultural resources management would include developing new sites and areas, along with controlled visitation and various levels of interpretation; managing data and collected material to enhance public awareness of resources through interpretation by the AHC; and developing and protecting suitable cultural resources for public enjoyment. This type of management would require signs, paths, and other lands and realty infrastructure.

Fluid Minerals Management

Approximately 80 percent of Monument lands are currently leased for fluid minerals development. Under Alternative I, the remaining 20 percent would not be leased; therefore, no impacts would occur from new leases.

Fluid mineral development would result in both direct and indirect impacts to facilities and infrastructure on currently leased lands. New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance. Infrastructure is continually developed to meet this use. The increase in fluid minerals development on leased lands may result in an increase in demand for facilities, utility corridors, and associated features. It may also over-stretch existing facilities beyond their intended use.

Livestock Grazing Management

Under this alternative, rangeland resources would be managed to improve Public Land Health Standards, as well as to protect Monument objects. In order to manage livestock distribution, fences and water developments would be required. This infrastructure would need to be maintained to remain operational and effective, based upon specific management objectives outlined in AMPs. This alternative does not reduce AUMs to meet expected range allocation levels; therefore, more infrastructure (fences, troughs, etc.) may be needed to intensely manage livestock to meet Public Land Health Standards.

Recreation and Transportation Management

Under Alternative I, recreation management would include developing facilities on an as-needed basis, as well as maintaining developed sites at Lowry, Painted Hand, and Sand Canyon Pueblos. Under this alternative, there would be no special recreation promotion strategy; therefore, facility and infrastructure needs would target incidental visitors and local residents. As more visitors discover the area, facilities may be insufficient to meet visitation needs. The Monument travel system would include up to 149 miles (up to 864 acres) of routes for motorized, mechanized, and/or non-motorized use. Cross-country motorized and mechanized travel would be prohibited. These forms of travel would only be allowed on designated routes within the 126,737 acres open to OHV use. Without a Travel Management Plan defining the desired future for travel within the Monument, as well as enforcement requirements, illegal user-created routes would continue to develop. Many of the routes listed under this alternative would

need ROWs for people to legally access private land across public land and for people to legally access public land across private land. A greater number of signs may be required within the Monument to compensate for the fact that there is no official travel map available.

Other Resources Management

Under this alternative, soil SSR/CSU stipulations would be applied for slopes greater than 40 percent (21,036 acres). The SSR/CSU stipulations would require an engineering/reclamation plan that demonstrates how site productivity would be restored, how surface runoff would be controlled, and how offsite areas would be protected from accelerated erosion. In addition, surface-disturbing activities would not be allowed during extended wet periods. This restriction may result in beneficial impacts to infrastructure and facilities, in that facilities would not likely be built on unstable or erosive slopes, and in that timing constraints on construction would occur.

Alternative V (Preferred Alternative)

Facilities and Infrastructure Management

Under Alternative V, facilities and infrastructure management would include maintaining and rehabilitating existing facilities; implementing non-structural alternatives, whenever possible; coordinating between new facilities and existing facility improvements with the AHC; and constructing new livestock, watershed, and wildlife facilities where NEPA analysis demonstrates no adverse impacts. In addition, under Alternative V, the BLM would work with the National Park Service to determine the feasibility of a joint visitor center, and to develop visitor contact stations outside of the Monument to mitigate resource impacts and to ensure public safety. Local communities would provide facility-dependent settings and opportunities. The direct impacts of these management actions may be beneficial, in that signs may increase public safety, and in that there may be an increased awareness of private-land boundaries, which may, in turn, reduce conflicts over trespass. In addition, this alternative may keep costs to a minimum, and may encourage creative ways of developing partnerships designed to meet the financial needs for facilities within, and adjacent to, the Monument.

Cultural Resources Management

Under Alternative V, cultural resources management would include allocating 13 to 25 sites for public use, preparing CRMPs for these sites, and evaluating SRPs for site visits. These actions may result in direct impacts to facilities and infrastructure uses, in that it would direct visitors to specific sites, which would increase the need for, and the use of, signs, paths, and other infrastructure. This alternative would focus development efforts to specific sites, thereby minimizing costs.

Fluid Minerals Management

In addition to impacts from current fluid mineral leases as described in Alternative I, under Alternative V, up to 880 acres would be available for new fluids mineral leasing for the purpose of protecting conservation of oil and gas resources in any common reservoir now being produced under existing leases, or to protect against drainage. New wells would be drilled within existing lease areas and would result in up to 121 new well pads, up to 67 miles of routes, up to 8 treatment facilities, and up to 53 miles of pipeline. The management of fluid minerals, with regard to facilities and infrastructure, may include the development of support facilities for oil and gas development. Additional infrastructure, including routes and utilities, as well as offsite infrastructures, may be required for fluid minerals development. Currently, 80 percent of Monument lands are leased and would continue to be developed. Facility and infrastructure needs, whether they are related to new or existing facilities, would include ROWs, utility and travel corridors, signs, gates, and other associated structures.

Livestock Grazing Management

Under Alternative V, rangeland resources would be managed to improve Public Land Health Standards, and to protect Monument objects. Some infrastructure, such as fences, may be needed to implement more intensive grazing management.

Recreation and Transportation Management

Under Alternative V, recreation management would include a combination of strategies. Undeveloped areas with minimal facilities would be combined with more developed destination management strategies for Painted Hand and Sand Canyon Pueblos, as well as for the AHC and Lowry Pueblo RMZs. Approximately 7,875 acres would be managed as visitation areas, and 157,460 acres would be managed as backcountry areas. Additional infrastructure would be required in areas of front country management, as well as at specific sites where visitors are directed. Little or no infrastructure would be needed in backcountry areas.

Under this alternative, the Monument travel system would include up to 169 miles (up to 980 acres) of routes for motorized, mechanized, and/or non-motorized use. Routes would be maintained, however, upgrades to accommodate additional or different uses would not be allowed. In addition to routes designated as open to all forms of travel, there would be routes specifically designated for OHV, mountain bike, or OHM travel. Cross-country motorized and mechanized travel would be prohibited. These forms of travel would only be allowed on designated routes within the 126,737 acres open to OHV use. Infrastructure in the form of signs, parking areas, and ROWs would be needed to manage the planned transportation system.

Other Resources Management

Under this alternative, soil NGD/NSO stipulations for slopes greater than 30 percent (36,504 acres) would apply. BMPs would be required for all ground-disturbing activities. These restrictions may result in beneficial impacts to infrastructure and facilities, in that facilities would not likely be built on unstable or erosive slopes. Some constraints on the construction of facilities would occur to protect other resources (such as wildlife, soil, and water).

Alternative VI (Proposed Plan)**Facilities and Infrastructure Management**

The impacts would be the same as those described under Alternative V.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, 158,515 acres would be managed as backcountry areas. The Monument travel system would include up to 172 miles (up to 997 acres) of routes for motorized, mechanized, and/or non-motorized use.

Other Resources Management

The impacts would be the same as those described under Alternative V. However, soil NGD/NSO stipulations for slopes greater than 30 percent would include 36,607 acres.

Table 4-34 Comparison of Impacts to Facilities and Infrastructure

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Facilities and Infrastructure	Increase safety by closing non-designated parking and installing new signs.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Cultural Resources	Develop new sites for controlled visitation.	Develop 13 sites.	Develop 13 to 25 sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new leased lands). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Same as Alt. II.	Same as Alt. II.
	Continued development of existing leases (127,895 acres)	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.

Table 4-34 Comparison of Impacts to Facilities and Infrastructure

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	with up to 1,985 acres new disturbance.					
Livestock grazing	Maintain facilities (fences, troughs, etc.) to manage 8,492 AUMs. 97% of Monument lands within grazing allotments.	Maintain facilities (fences, troughs, etc.) to manage 6,437 AUMs. 94% of Monument lands within grazing allotments.	Maintain facilities (fences, troughs, etc.) to manage 8,368 AUMs. 94% of Monument lands within grazing allotments.	Same as Alt. I	Maintain facilities (fences, troughs, etc.) to manage 6,437 AUMs. 94% of Monument lands within grazing allotments.	Maintain facilities (fences, troughs, etc.) to manage 6,437 AUMs. 94% of Monument lands within grazing allotments.
Recreation and Transportation	Manage 149 miles of routes. Promote no specific recreation strategy.	Manage 139 miles of routes. Market to local residents.	Manage 189 miles of routes. Market to regional visitors.	Manage 213 miles of routes. Market to national and international visitors.	Manage 169 miles of routes. Market to a mix of visitors.	Manage 172 miles of routes. Market to a mix of visitors.
Other Resources: Soil resources	Apply SSR/CSU to protect slopes greater than 40 percent (21,036 acres).	Apply NGD/NSO stipulation for slopes steeper than 30 percent (36,504 acres).	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II except 36,607 acres.

4.3.2.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-35 Past, Present, and Future Activities influencing Facilities and Infrastructure
Past Activities
80% of the Monument leased with standard stipulations
Management of 149 miles of routes
Designation of the Trial of the Ancients Historic and Scenic Byway
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Present Activities
Increased fluid mineral development
Management of 213 miles of routes
Increased visitor pressure at front country recreation locations and some middle and backcountry sites
Subdivision of private lands in and around the Monument
National Monument designation by Presidential Proclamation to protect the objects while managing valid existing rights so as not to create any new impacts to the objects
Future Activities (Proposed Plan)
Continued increase in Monument visitation
Increased subdivision of private lands in and around the Monument
Management of 172 miles of routes
Lease 880 new acres for drainage with restrictive stipulations
Continued increase in fluid mineral development
GADPs required for long-range planning

New fluid minerals wells may be drilled within existing leased areas in the Monument, and may result in up to 121 new well pads, up to 67 miles of routes, up to 8 treatment facilities, and up to 53 miles of pipeline over the next 20 years (RFD, BLM 2005c). Additional infrastructure, including routes and utilities, may be required for fluid minerals development, both on, and adjacent to, the Monument. A cumulative summary of facilities associated with fluid minerals development on leased lands within the Monument is as follows:

Table 4-36 Past, Present, and Future Fluid Mineral Development on currently leased lands within the Monument		
Development Type	Number	Total Disturbance (acres)
Past and Present		
Well Pads	185	509
Pipelines	93	186
Access Routes (30' wide)	139	278
Access Routes (50' wide)	46	124
Facilities	16	68
TOTAL	N/A	1,165
Future (Proposed Plan)		
Well Pads	121	310
Pipelines	22	43
Access Route (30' wide)	30	61
Access Route (50' wide)	91	300
Facilities	16	170
3-D Seismic Survey	5	900
2-D Seismic Survey	10	202
TOTAL	N/A	1,985.00
Cumulative Total		
Well Pads	306	819

Table 4-36 Past, Present, and Future Fluid Mineral Development on currently leased lands within the Monument		
Development Type	Number	Total Disturbance (acres)
Pipelines	115	229
Access Route (30' wide)	169	339
Access Route (50' wide)	91	424
Facilities	32	238
3-D Seismic Survey	5	900
2-D Seismic Survey	10	202
TOTAL	N/A	3,150

The visitor center at Hovenweep National Monument may attract additional visitors to the area (as do other local attractions, including Mesa Verde National Park). The National Parks and National Monuments in the Four Corners region draws people from all over the world who are interested in learning more about the area’s archaeology and culture. This interest is bound to increase and, consequently, may require the construction of additional facilities to meet this increased visitation.

As a result of increased demand for infrastructure, visual impacts to the natural landscape may occur. Construction of facilities, along with the associated ground disturbance, may result in the loss of wildlife habitat, as well as the possibility of erosion due to increased sediment moving into stream systems. Noise levels from increased human presence (including voices, as well as noise associated with the movement of people and vehicles) around facilities and structures may reduce wildlife habitat security.

4.3.3. Special Forest Products

The primary goals for the management of special forest products within the Monument are to allow for the harvesting of forest products, the management of woodland stands, and the collection of other resources while, at the same time, protecting the objects (including cultural, biological, and geological resources) identified in the Proclamation. Special forest products traditionally harvested from within the Monument include fuelwood, fence posts, poles, and Christmas trees. More traditional forest products include bark materials, limb wood, foliar materials, seeds, and nuts. The management objectives related to this goal include harvesting forestry products and all woodland stands to help sustain a biologically diverse landscape that supports a variety of habitats and native plant and animal species.

A number of proposed management actions have the potential to impact special forest products, as a component of native vegetation. For this discussion, beneficial impacts to forest product resources may include an increase in areas of woodlands; an improvement in woodland health (in terms of increased diversity of stand species and/or of size class); and a decrease in the size

of noxious weed populations and insect and/or pathogen populations that have the potential to be detrimental to woodland stand health. Adverse direct impacts to forest products may include the disruption and/or the removal of rooted vegetation, which may, in turn, result in a reduction in areas of woodlands and/or a reduction in the total numbers of individual trees.

A number of indirect impacts to forest product resources may also be possible as a result of proposed management actions. Most indirect adverse impacts are assumed to result from direct impacts, in proportion to the relative amount of associated surface disturbance. Adverse indirect impacts may include the disruption in, and/or the reduction of, habitat suitable for colonization due to surface disturbance; the introduction of noxious weeds, insects, and/or pathogens by various vectors (or by conditions that enhance such organisms); and the general loss of habitat due to surface occupancy, surface compaction, and/or trampling. Failed reclamation or mitigation measures may also result in indirect impacts to these resources. Typically, beneficial indirect impacts result from minimizing or preventing surface disturbance. Direct beneficial impacts to special forest products may include sustaining a biologically diverse landscape that supports a variety of habitats, as well as native plant and animal species.

4.3.3.1. Evaluation Criteria and Assumptions

The most adverse direct impacts to woodlands may result from surface disturbances; therefore, these areas are the primary parameter for discussion and comparison of impacts for special forest products. Quantifying impacts in this way is difficult due to the fact that the location and extent of potential impacts cannot be determined at this point. In addition, the beneficial impacts of improving woodlands may not be realized during the next 20-year period. In general, areas reclaimed, otherwise improved, and/or protected from ground disturbance are used to describe beneficial impacts. Estimates of surface disturbance areas associated with potential management actions were calculated using data from the AMS (BLM 2005b) and the RFD (BLM 2005c), and are summarized in Table 4-1.

Assumptions included in the analysis of impacts to special forest products include the following:

- Estimated disturbance areas are distributed among all vegetation communities, including woodlands, in proportion to their relative area throughout the Monument, unless otherwise limited by applicable surface-use restrictions and/or other special management considerations.
- The application of appropriate BMPs and standardized reclamation practices would be required as COAs for all new leases, permits, and surface disturbance areas (see Appendix E).
- Federal lands within the Monument boundary are the subject of the impact analysis.
- Woodlands, as a component of the Colorado Plateau Semi-desert Ecoregion (Bailey 1995), are the subject of the cumulative impacts discussion.

4.3.3.2. Alternative Analysis

Impacts to special forest product resources may differ depending upon specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed for forest product resources, as well as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Special Forest Products Management

Under Alternative I, commercial forest product sales would not occur. However, private forest product sales would be allowed. Areas for private fuelwood and vegetative use permits would be identified, and would be limited to previously chained pinyon-juniper woodlands to reduce hazardous fuel loads. Timber and wood products from recreation, cultural, public land disposal, and ACEC emphasis areas would be managed to enhance their respective values, and to maintain healthy pinyon-juniper woodlands. Under this alternative, the management of special forest products is expected to result in a continuation of current conditions for these resources.

Cultural Resources Management

Under this alternative, few cultural resource management actions would impact woodlands either directly or indirectly; therefore, continuing management would be expected to result in few, if any, impacts on special forest products. This alternative would allow for the stabilization and, in some cases, the development of 240 cultural resource sites, which may, in turn, result in the surface clearance of vegetation at a localized level.

Fluid Minerals Management

Approximately 80 percent of Monument lands are currently leased for fluid minerals development. Under Alternative I, the remaining 20 percent would not be leased; therefore, no impacts would occur from new leases.

New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance which may involve the removal of pinyon and juniper trees. These areas would no longer be available for providing special forest products.

Livestock Grazing Management

In many allotments, livestock grazing management may be considered one of the reasons for such allotments not meeting the Public Land Health Standards for healthy, productive plant and animal communities, as well as for the downward trend observed in much of the native upland vegetation within the Monument. The current management of livestock grazing, including up to 8,492 active AUMs on up to 28 allotments, may continue to be a contributing factor in these trends and, over time, may contribute to adverse impacts to woodlands and forest products, insofar as they comprise the vegetation communities failing to meet Public Land Health Standards.

Recreation and Transportation Management

Under this alternative, up to 149 miles of routes would be open to travel by all means (including travel for limited access purposes). This may result in up to 864 acres of surface disturbance of total Monument surface. This affects forest products in two ways. First, the travel system indicates where forest products may be obtained since no cross-country travel is allowed. Second, the amount of disturbance resulting from route clearing may mean the loss of woodland vegetation. Since this alternative continues with existing management, no changes from current conditions are expected.

Other Resources Management

In general, it is assumed that vegetation resources management would result in the vegetation resource conditions and trends described in Section 3.1.8. Therefore, under Alternative I, the condition of woodlands, as one of the three dominant native upland communities, may be

expected to continue, generally, in a stable degraded state or downward trend. This may mean that over time, more dead and down fuelwood may be present in the Monument. This may be dependent on the frequency of fire, which may increase with greater fuel loads.

Alternative V (Preferred Alternative)

Special Forest Products Management

Under Alternative V, private harvesting of special forest products would not be authorized. Commercial fuelwood cutting of live trees and dead-and-down wood would be authorized by permit. All cutting areas would be designated under a permit system. Cutting areas would be considered open after the completion of a Class III cultural resource inventory.

Under Alternative V, the permit system for commercial special forest products would provide the BLM with administrative control of these actions. Despite oversight, having larger areas open to harvesting, as well as the use of live trees (as well as dead-and-down), may result in some adverse impacts through over-harvesting of woodlands, loss of wildlife habitat (including bird nests), and increased ground fuels. However, harvesting special forest products may result in the reduction of hazardous fuels, the removal of unwanted trees to achieve specific management goals, and an improvement in general woodland health and the health of ground cover.

Cultural Resources Management

Under this alternative, few cultural resources management actions would impact woodland vegetation, either directly or indirectly. However, to some degree, development and minimal stabilization of 13 to 25 sites, testing, and/or other activities that result in surface clearance of vegetation may, in turn, result in highly localized adverse impacts. The degree to which these become long-term disturbance areas may depend upon the care that is originally taken to minimize vegetation disturbance, as well as the degree to which appropriate reclamation techniques are implemented.

Under Alternative V, the requirement for a Class III cultural resources inventory may delay the commercial cutting of fuelwood in some areas. Indirect beneficial impacts to woodland vegetation may result, in that any direct impacts to cultural resource settlement clusters and sites would be restricted. Eventually, this restriction may be expected to result in areas within the Monument to which no direct surface-disturbing impacts would be allowed. This may result in the protection of forest product resources and woodlands within these areas.

The protection of cultural resources within the Monument may restrict forest management activities, such as personal firewood gathering. This practice often results in illegal cross-country motorized travel; therefore, this alternative does not allow for this use within the Monument. Commercial operations require prior clearances and environmental analyses and are mapped and monitored; therefore, it is easier to prevent impacts on cultural and natural resources relative to these operations.

Fluid Minerals Management

In addition to impacts from current fluid mineral leases as described in Alternative I, under Alternative V, up to 880 acres of lands could be leased. This may result in the development of up to 2 well pads, with up to 18 acres of long-term disturbance. This disturbance may occur on existing leased lands to access minerals associated with new leases. The result of leasing these areas may be limited adverse impacts to vegetation resources. Many of these impacts may be mitigated by the application of appropriate BMPs and standardized reclamation practices, such as COAs on the new leases. However, successful reclamation of woodlands, in terms of available special forest products, may require a much longer timeframe than would

either herbaceous or shrub-dominated plant communities, and may effectively result in adverse impacts over the next 20-year period. Impacts, as described, are resulting from the development of currently leased land.

Livestock Grazing Management

Alternative V would emphasize rangeland management actions, with the stated purpose of improving rangeland conditions to achieve Public Land Health Standards. Administering a reduction in AUMs (6,437) and closing 5 allotments (124 AUMs) may result in some beneficial impacts to forest products, in that such actions may improve overall woodland ecosystem health. However, if benefits occur, they may be minimal and probably not measurable.

Recreation and Transportation Management

Under Alternative V, up to 169 miles of routes would be open to travel by all means (including travel for limited access purposes). This may result in up to 980 acres of surface disturbance, as well as a route density of 0.66 miles per square mile.

These factors may result in the loss of potential woodland products; however, they may provide greater access for commercial wood gathering. Indirectly, opportunities for noxious weed infestations may increase in proportion to the increased numbers of routes.

Marketing the Monument to a variety of visitors may result in little, or no, impacts to woodland health. Overnight camping in some SRMAs may create adverse impacts, in that the associated campfires may increase the risk of wildfire ignitions. On the other hand, the removal of dead-and-down woody material for campfires may reduce fuels in localized areas and the potential for fires to ignite.

Other Resources Management

Woodland health may improve as opportunities to meet the goals and objectives of fuels and fire management are enhanced.

Alternative VI (Proposed Plan)

Special Forest Products Management

The impacts would be the same as those described under Alternative V.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

Under Alternative VI, 172 miles of routes would be open to travel by all means (including travel for administrative purposes and travel necessary to support new and existing oil and gas leases). This may result in up to 997 acres of surface disturbance, as well as in a route density of 0.66 miles per square mile. Otherwise, the impacts would be the same as those described under Alternative V.

Other Resources Management

The impacts are the same as those described under Alternative V.

Table 4-37 Comparison of Impacts to Special Forest Products

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Special Forest Products	Allow no commercial permits.	Allow no forest product removal.	Allow personal fuelwood harvesting, post cutting and Christmas tree removal. Authorize no commercial permits.	Allow personal fuelwood harvesting, post cutting and Christmas tree removal. Authorize commercial permits.	Allow no personal fuelwood harvesting. Authorize commercial permits.	Allow no personal fuelwood harvesting. Allow personal post cutting and Christmas tree removal. Authorize commercial permits.
Cultural Resources	Protect cultural resource sites. Develop new sites for controlled visitation (with localized clearing of woodlands).	Protect cultural resource settlement clusters, sites, and isolated finds. Develop 13 sites (with localized clearing of woodlands).	Protect cultural resource settlement clusters and sites. Develop 13 to 25 sites (with localized clearing of woodlands).	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new leased lands).	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance).	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance).	Same as Alt. II.	Same as Alt. II.

Table 4-37 Comparison of Impacts to Special Forest Products

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	Continued development of existing leases (127,895 acres) with up to 1,985 acres new disturbance.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments. Apply zero-level accelerated erosion standard. Apply NGD/NSO stipulation to protect slopes steeper than 30 percent (36,607 acres).
Recreation and Transportation	Manage 149 miles of routes; 864 acres of disturbance (per 1985 RMP decision). 1,235 acres of disturbance (per 2000-2002 inventory).	Manage 139 miles of routes; 806 acres of disturbance. Develop 7 facilities.	Manage 189 miles of routes; 1,096 acres of disturbance. Develop 13 facilities.	Manage 213 miles of routes; 235 acres of disturbance. Develop 20 facilities.	Manage 169 miles of routes; 980 acres of disturbance. Develop 9 facilities.	Manage 172 miles of routes; 997 acres of disturbance. Develop 9 facilities.

Table 4-37 Comparison of Impacts to Special Forest Products

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	Develop 7 facilities.					
Other Resources: Upland Vegetation	Not meeting Public Land Health Standards.	Take specific actions to meet Public Land Health Standards as rapidly as possible.	Take specific actions to meet Public Land Health Standards.	Same as Alt. III.	Same as Alt. II.	Same as Alt. II.
Other Resources: Fuels and Fire	More likely to have large-scale fires.	Fires generally site-specific and short-term.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.

4.3.3.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-38 Past, Present, and Future Activities influencing Special Forest Products
Past Activities
Unrestricted or minimally restricted gathering of firewood, Christmas trees or other forest products
Large scale vegetation treatments such as chaining
Management of 149 miles of routes
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Present Activities
Prolonged drought and the associated die-off of pinyon trees
Increased popularity of OHVs
Increased access through user-created routes (213 miles of routes)
National Monument designation by Presidential Proclamation to protect the objects. The designation of no off-road travel by motorized vehicles.
Future Activities (Proposed Plan)
Restrictions on harvesting fuelwood
Closure of many user-created routes
Protection of cultural and natural resources on a landscape level to minimize cumulative impacts and manage for resource setting

The prolonged drought, and the associated die-off of pinyon trees throughout the Southwest, has placed a large amount of firewood in the current market. Many people are meeting their current need for firewood from the resources available within their own lands. This has resulted in a decline in the need for commercial firewood. Future restrictions on harvesting fuelwood within the Monument may result in a greater demand for these products from other public lands. A greater demand for forest products off of the Monument may result in more routes and, therefore, adverse impacts resulting from cross-country travel (such as those related to erosion and sedimentation). However, it may also result in beneficial impacts, in that such actions may

reduce the risk of fire (from the removal of dead-and-down trees for fuel) on neighboring public lands. For people living near the Monument, this may also require more travel time and driving greater distances to obtain these products. As a result of not allowing non-commercial removal of fuelwood from the Monument, a greater reliance on mechanical fuels treatment may be required to reduce the risk of wildfire.

4.3.4. Lands and Realty

The primary goals for lands and realty within the Monument are to use land tenure adjustments to protect objects identified in the Proclamation, to improve management, and to reduce administrative costs. The management objectives related to these goals include:

- identify private land within, and adjacent to, the Monument boundary for possible acquisition from willing sellers, if the acquisition would contribute to achieving cultural and/or natural resource goals and objectives; and
- work with landowners to resolve encroachment issues.

Another goal for lands and realty within the Monument is to develop ROWs to accommodate facilities supporting multiple-use activities while, at the same time, protecting objects identified in the Proclamation. The management objectives related to this goal include:

- process ROW requests using evaluation criteria to protect Monument objects.

The final goal for the Lands and Realty program is to manage special uses to promote the protection of and education about Monument objects. To achieve this goal, the following objectives have been established:

- manage commercial filming to assist in achieving resource protection goals and objectives; and
- manage non-recreational, competitive, and special events to assist in achieving resource protection goals and objectives.

Approximately 16,620 acres within the Monument boundary are privately owned lands. These lands consist of approximately 42 parcels of relatively large, isolated tracts of land under approximately 30 different ownerships. These private-land parcels range in size from approximately 30 acres up to several thousand acres. The 313-mile Monument perimeter is adjacent to approximately 250 landowners within Montezuma County, and to an unknown number of landowners within Dolores County. There are 75 ROWs that encompass approximately 1,219 acres.

In accordance with the Proclamation, the BLM may not dispose of any Monument land; however, the BLM may acquire inholdings when they are offered from willing sellers. In accordance with the FLPMA, the BLM is authorized to convey or acquire partial interests (including water and/or mineral rights), acquire access easements for routes or trails, make certain improvements, and/or acquire conservation easements.

Direct adverse impacts to lands and realty may include the illegal encroachment of private land uses onto the Monument. Beneficial impacts may include acquiring inholdings or mitigating utility corridors to enhance the objects of the Monument.

4.3.4.1. Evaluation Criteria and Assumptions

Impacts cannot be predicted and measured across each alternative for lands and realty. This is because opportunities for acquiring inholdings are not known at this time, and the need for

future ROWs and other development cannot be predicted. However, some relative comparisons can be made.

Assumptions used in analyzing impacts to facilities and infrastructure resource uses include the following:

- New ROWs will be needed for oil and gas development and/or for fluid minerals development.
- Cutting of canyon rims includes allowing development, typically fluid minerals development, to occur along canyon rims, which often requires route cuts and/or pipeline cuts.
- The impacts analysis boundary for both individual and cumulative analyses is the Monument and the immediate adjoining lands.

4.3.4.2. Alternative Analysis

Impacts to lands and realty may differ depending upon specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed for land and realty, as well as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Lands and Realty Management

Under Alternative I, lands and realty management would include responding positively to private land sale offers (with willing sellers) on, and adjacent to, the Monument; pursuing easements; providing reasonable access to private parcels; identifying existing and potential ROW corridors; identifying terms and conditions for underground and/or aerial corridors; conducting a survey of the Monument boundary; and managing commercial filming and non-recreational special events to assist in achieving resource protection goals and objectives. Utility corridors would be allowed, with protective stipulations; however, existing ROWs would be used as much as possible. Blasting and/or cutting of canyon rims would be avoided.

Under Alternative I, there may be beneficial impacts resulting from management actions, in that existing ROWs would be used as much as possible, new ROWs would be subject to protective stipulations, and special events would be managed to achieve resource protection goals. These restrictions would provide for lands and realty needs while, at the same time, protecting the objects of the Monument. In addition, the acquisition of inholdings and adjacent lands may further protect Monument resources. Considerable effort to complete ROWs would be required to provide legal access across private land to reach public land, and to provide legal access across public land to reach private land.

Cultural Resources Management

Under Alternative I, cultural resources management would include developing new sites and areas, along with controlled visitation and various levels of interpretation; managing data and collected material to enhance public awareness of resources through interpretation by the AHC; and developing and protecting suitable cultural resources for public enjoyment. There may be no impacts resulting from cultural resources management, in relation to lands and realty uses, except for those associated with the need to acquire ROWs across private land to access public land and the need to acquire ROWs across federal land to access private land.

Fluid Minerals Management

Under this alternative, the management of fluid minerals on lands and realty would include authorizing facilities in support of oil and gas development. Fluid minerals development would require ROWs for pipelines and transmission corridors, and routes for transportation to and from exploration and production areas. Approximately 80 percent of Monument lands are currently leased for fluid minerals development. Under Alternative I, the remaining 20 percent would not be leased; therefore, no impacts would occur from new leases.

New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance.

Livestock Grazing Management

Under this alternative, livestock grazing would be managed to improve Public Land Health Standards, and to protect Monument objects. This management may not result in any impacts to lands and realty, except for those associated with the need to maintain access to range structures for management purposes. This may require the acquisition of ROWs.

Recreation and Transportation Management

Under Alternative I, recreation management would include developing facilities on an as-needed basis, as well as maintaining developed sites at Lowry, Painted Hand, and Sand Canyon Pueblos. Recreation management may not impact lands and realty, except for those associated with the need to maintain access to recreation sites or to public lands. This may require the acquisition of ROWs.

Under this alternative, the Monument travel system would include up to 149 miles (up to 864 acres) of routes for motorized, mechanized, and/or non-motorized use, and 7 supporting facilities. Cross-country motorized and mechanized travel would be prohibited. This alternative may result in adverse impacts to land and realty, in that existing ROWs may not accommodate anticipated routes and uses.

Other Resources Management

Under this alternative, soil SSR/CSU stipulations would be applied for slopes greater than 40 percent, (21,036 acres). Limiting the location and acreage available for routes and utilities may complicate lands and realty transactions; however, it may result in beneficial impacts to Monument resources, in that it may reduce associated surface disturbance.

Alternative V (Preferred Alternative)**Lands and Realty Management**

Under Alternative V, lands and realty management would include responding positively to private land sale offers (with willing sellers) on, and adjacent to, the Monument; pursuing easements; providing reasonable access to private parcels; identifying existing and potential ROW corridors; identifying terms and conditions for underground and/or aerial corridors; conducting a survey of the Monument boundary; and managing commercial filming and non-recreational competitive and special events to assist in achieving resource protection goals and objectives. Under Alternative V, the BLM would conduct the following:

- pursue acquisition or exchange of private holdings from willing sellers within, and adjacent to, the Monument;
- identify and prioritize a list of needed easements for public use or BLM administrative access, develop a boundary management plan, and pursue cost-sharing agreements with private landowners to survey boundaries;

- prohibit commercial filming and non-recreational competitive and special events, except for educational purposes relative to the Monument;
- prohibit new ROWs in RMZ 4 (Squaw-Cross Canyon);
- prohibit major utility ROW corridors, new renewable energy projects, construction of new communication sites, blasting and/or cutting near canyon rims, and the use of strobe lights on communication sites;
- require that route development be kept to an absolute minimum and that new ROWs comply with all NGD/NSO and SSR/CSU stipulation requirements;
- require that existing ROWs be used when constructing new facilities;
- require that new ROWs be aligned adjacent to existing ROWs; and
- require that reconstructed and future powerlines meet non-electrocution standards for raptors, and that new powerlines meet VRM objectives.

The impacts of this management may be beneficial, in that existing ROWs would be used as much as possible, and restrictions on new ROWs (construction and stipulations) may preserve Monument objects. The objective of this alternative is to minimize ground disturbance, which may, in turn, keep lands and realty transactions to a minimum. In addition, acquisition of inholdings and adjacent lands may further protect Monument resources and decrease administrative costs.

Cultural Resources Management

Under Alternative V, cultural resources management would include allocating 13 to 25 sites for public use, preparing CRMPs for these sites, and evaluating SRPs for site visits. The acquisition of land to be included within the Monument is most often the result of discovering the presence of sensitive cultural resource sites on that private land. In addition, the presence of cultural resources may require avoidance, as well as other mitigation measures, for land and realty actions (such as ROWs possibly requiring relocation or redesign). In order for some cultural resource sites to be available for visitation, ROWs may need to be obtained across private land.

Fluid Minerals Management

In addition to impacts from current fluid mineral leases as described in Alternative I, under Alternative V, up to 880 acres would be available for leasing to protect against drainage. A total of up to 18 acres of new ground disturbance would be possible and may occur on existing leased lands to access minerals from new leases. Additional infrastructure (including routes, utilities, and offsite infrastructure) may be required for fluid minerals development on both new and existing leases. The number of ROWs associated with fluid minerals development is likely to increase in proportion with the increased demand for such development.

Under this alternative, geophysical operations would be restricted to BLM-designated routes. Temporary access routes would require reclamation. Seismic operations requiring bulldozers, earthmoving equipment, and/or explosives would be prohibited. Soil resource NGD/NSO stipulations for slopes greater than 30 percent (36,504 acres) would apply. BMPs would be included in COAs for new leases. Under this alternative, protective measures would be in place; however, fluid minerals management may result in adverse impacts to land and realty, in that existing ROWs may not accommodate anticipated routes and pipelines. This may require additional ground disturbance to accommodate these needs.

Livestock Grazing Management

Livestock grazing may result in short-term impacts on reclamation efforts conducted under lands and realty management, since newly vegetated areas may be over-grazed.

Recreation and Transportation Management

Under Alternative V, recreation management would include a combination of strategies, including undeveloped areas with minimal facilities and destination management strategies for Painted Hand and Sand Canyon Pueblos, as well as for the AHC and Lowry Pueblo RMZs. Approximately 7,875 acres would be managed as visitation areas, and 157,460 acres would be managed as backcountry areas. Acquiring ROWs may be required to provide legal access to portions of the Monument for recreational purposes.

Under this alternative, the Monument travel system would include up to 169 miles (up to 980 acres) of routes for motorized, mechanized, and/or non-motorized use, and would include 9 support facilities. There would be routes specifically designated for OHV, mountain bike, or OHM travel. These forms of travel would be allowed on routes designated as open to all forms of travel. Cross-country motorized and mechanized travel would be prohibited. Under this alternative, transportation management may result in adverse impacts to lands and realty since additional ROWs may be needed to accommodate the travel system. Many of the routes listed under this alternative need ROWs to legally access private land across public land, and to legally access public land across private land.

Other Resources Management

Under this alternative, soil NGD/NSO stipulations for slopes greater than 30 percent (36,504 acres) would apply. BMPs would be required for all ground-disturbing activities. These restrictions may result in beneficial impacts to lands and realty, in that it may protect Monument objects.

Alternative VI (Proposed Plan)**Lands and Realty Management**

The impacts would be the same as those described under Alternative V.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, slopes greater than 30 percent include 36,607 acres.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, 158,515 acres would be managed as backcountry areas. The Monument travel system would include up to 172 miles (up to 997 acres) of routes for motorized, mechanized, and/or non-motorized use.

Other Resources Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, soil NGD/NSO stipulations for slopes greater than 30 percent (36,607 acres) would apply.

Table 4-39 Comparison of Impacts to Lands and Realty

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Lands and Realty	Allow major utility corridors, with protective stipulations.	Prohibit major utility ROW corridors.	Allow major utility ROW corridors only within or adjacent to existing ROWs.	Same as Alt. I.	Same as Alt. II.	Same as Alt. II.
Cultural Resources	Develop new sites for controlled visitation.	Develop 13 sites.	Develop 13 to 25 sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres.	Make up to 880 new acres available for lease. Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 3,021 new acres available for lease. Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 24,462 new acres available for lease. Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Same as Alt. II.	Same as Alt. II.
	Continued development of existing leases (127,895 acres).	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Livestock grazing	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.
Recreation and Transportation	Manage 149 miles of routes.	Manage 139 miles of routes.	Manage 189 miles of routes.	Manage 213 miles of routes.	Manage 169 miles of routes.	Manage 172 miles of routes.
Other Resources: Soil Resources	Apply SSR/CSU to protect slopes greater than 40 percent (21,036 acres).	Apply SSR/CSU to protect slopes greater than 30 percent (36,504 acres).	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II except 36,607 acres.

4.3.4.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-40 Past, Present, and Future Activities influencing Lands and Realty
Past Activities
80% of the Monument leased with standard stipulations
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Encroachment by neighboring private landowners
Present Activities
Increased fluid mineral development
Subdivision of private lands increasing the number of individual landowners adjacent to the Monument
National Monument designation by Presidential Proclamation to protect the objects while managing valid existing rights so as not to create any new impacts to the objects
Future Activities (Proposed Plan)
Continued increase in fluid mineral development
Lease 880 new acres for drainage with restrictive stipulations
Increased subdivision of private lands and it associated demand for routes and utilities
GADPs required for long-range planning
Completion of right-of-ways for access to public land across private land and to private land across public land on existing routes

Activities on private land within, and adjacent to, the Monument may result in cumulative impacts to lands and realty. As agriculture lands adjacent to the Monument become subdivided and more developed, there may be a greater risk of encroachment onto public lands. In addition, access needs and requests for ROWs may increase. Issues with boundary fencing and/or with water developments that deplete water from the Monument may increase. Currently, problems with user-created routes leading from adjoining private land onto the Monument exist, and will likely increase with the increase in local development. Oil and gas development, both on and adjacent to the Monument, may require more ROWs for utilities, pipelines, and/or for

routes. Specifically, the addition of up to 2 new wells on new leased lands, along with the estimated addition of up to 150 new wells on currently leased lands, would increase the need for routes and utility corridors within the Monument. Additional pressures for these land uses would occur from offsite development.

As development of lands adjacent to the Monument increases, visual impacts to the natural landscape may occur. The construction of buildings, routes, and associated structures would result in ground disturbance. It may also result in a loss of wildlife habitat, as well as the possibility of erosion and additional sediments moving into stream systems. Noise levels from increased human presence (including voices, as well as noise associated with the movement of people and vehicles) may reduce wildlife habitat security and impact the backcountry setting in portions of the Monument.

4.3.5. Minerals

Fluid Minerals

The primary goal for managing fluid minerals is to ensure the proper care and management of the objects protected under the Proclamation prior to authorizing continued exploration, development, production, and/or reclamation activity. The management objectives related to this goal include:

- determine if any of the 38,385 acres of unleased fluid minerals estate within the Monument should be leased to promote conservation of oil and gas resources in any common reservoir now being produced under existing leases or to protect against drainage;
- identify stipulations (see Appendix K) for new leases to ensure that impacts are not created that would interfere with the proper care and management of the objects protected by the Proclamation; and
- identify stipulations and BMPs (see Appendices E and K) for exploration, development, production, and reclamation to ensure that impacts are not created that would interfere with the proper care and management of the objects protected by the Proclamation.

Beneficial impacts, in terms of fluid minerals extraction, may include those actions that may enhance extraction efforts. Adverse impacts to fluid minerals resource extraction may include the inability to reach reserves and/or restrictions that make mineral extraction costly. Direct impacts may include the removal of ground from availability for exploration where restrictions, such as TLs or NSO stipulations that complicate the ability to extract fluid minerals, are in place.

The Monument is part of the National Landscape Conservation System (NLCS); therefore, a Strategic Plan for Oil and Gas development aligning NLCS goals with Monument management has been developed (see Appendix Q). Valid existing rights that predate the designation must be honored, while, at the same time, protecting the objects of the Monument.

The BLM prepared a RFD for the Monument (BLM 2005c), which estimated that 57 percent of all oil and natural gas wells, and 100 percent of CO₂ wells, would be successful. The RFD also estimated the total surface disturbance associated with oil and gas development. Drilling operations may result in surface disturbance for well pads and access routes, for both successful wells as well as for dry holes.

The RFD estimated 150 successful new wells, with 81 being conventional natural gas wells and 69 being CO₂ wells. Successful wells may require pipelines, treatment facilities, and ancillary infrastructure to support the increased production. If reservoirs, such as the Hovenweep Shale, result in production, and in more than 150 total APD submittals, a trigger point would be hit,

which would, in turn, initiate a separate systematic review, including new air quality modeling. Table 4-31 presents the total number of wells estimated to be drilled on currently unleased Federal fluid minerals estate over the next 20-year period, as well as the area of temporary and long-term surface disturbance associated with each alternative analyzed in the DRMP/DEIS.

	Alt. I No Action	Alt. II	Alt. III	Alt. IV	Alt. V Preferred	Alt. VI Proposed Plan
Total Area Effectively Available for New Fluid Mineral Surface Facilities (new leases)	0 acres	Up to 880 acres	Up to 3,021 acres	Up to 24,462 acres	Up to 880 acres	Up to 880 acres
Estimated Total New Fluid Mineral Well Pads in 20 years	0	2	8	59	2	2
Estimated New Routes on New Leased Lands	0	1 mile	3 miles	19 miles	1 mile	1 mile
20-yr Long Term Disturbance	0	18 acres	73 acres	447 acres	18 acres	18 acres

4.3.5.1. Evaluation Criteria and Assumptions

The criteria used to compare alternatives include the number of acres available for new leases and the estimated number of successful wells. Impacts may also be expressed in terms of costs and/or restrictions. Assumptions used in analyzing impacts to fluid minerals resource use include the following:

- **Alternative I:** Under this alternative, no new leases would be granted by the BLM (although existing leases would not be affected), in accordance with the 2002 Stipulated Settlement Agreement between the San Juan Citizens Alliance and the BLM (SJCA v. Gale Norton 2002). This settlement agreement, related to the Mail Trail Seismic Project, halted leasing until the Monument's RMP/EIS is complete. In order to provide a reasonable range of alternatives for oil and gas development, Alternative I was analyzed; however, it is not considered a viable option. The Proclamation specifically states that the Monument shall remain open to oil and gas leasing and by law, the BLM must, at a minimum, lease for drainage purposes.
- **Alternatives V and VI:** Under these alternatives, up to 880 acres of currently unleased acreage would be made available for new leases.

- The Monument contains the highest known density of archaeological sites in the United States, with approximately 5,157 previously recorded cultural sites. Portions of the Monument contain more than 100 cultural sites per square mile. It is estimated that the total number of sites within the Monument may range from 20,000 to 30,000.

4.3.5.2. Alternative Analysis

Impacts to fluid minerals management may differ depending upon specific management actions proposed under each alternative. The following sections describe the impacts from the actions proposed for fluid minerals, as well as those from the management actions proposed for cultural resources, livestock grazing, and recreation and transportation.

Alternative I (No Action Alternative)

Fluid Minerals Management

Under this alternative, fluid minerals leasing, as well as oil, natural gas, and CO₂ exploration and development, would be constrained by the existing 2002 Stipulated Settlement Agreement (SJCA vs. Gale Norton 2002). Under this settlement agreement, the parties agreed that “decisions pertaining to future oil and gas leasing in the Monument shall be deferred by BLM until completion of the RMP EIS.” Out of the current 24,462 acres of unleased Federal and split-mineral estate lands available, none would be leased, and no oil, gas, or CO₂ development would take place on these unleased lands. This includes lands that could be leased to promote conservation of oil and gas resources from common reservoirs now being produced to protect against drainage. The settlement agreement provides that the “RMP EIS shall present the known bounds of common reservoirs that produced under existing leases on the date of the Proclamation, and shall analyze alternative measures to protect against drainage.” The result of not leasing for drainage purposes is the loss of royalties from fluid minerals owned and managed by the BLM.

Seismic operation work by earth moving equipment would be limited to maintenance and/or repair of existing routes.

While this alternative would have no impact from new leasing, existing fluid mineral leases would continue to be developed with associated impacts. New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is expected to result in up to 1,985 acres of disturbance.

Cultural Resources Management

This alternative would not result in new fluid minerals leases or in any associated ground-disturbing activities from well pads, access routes, and/or facilities; therefore, cultural resources management would result in no impacts to new fluid minerals resource use. Existing leases would continue to be constrained by laws and regulations designed to protect cultural resources.

Livestock Grazing Management

Alternative I would not result in new fluid minerals leases or in any associated well pads, access routes, and/or facilities; therefore, livestock grazing management would result in no impacts to new fluid minerals leases. Little or no impacts resulting from livestock grazing occur on existing fluid minerals operations, except, perhaps, grazing impacts to reclamation efforts for surface disturbance.

Recreation and Transportation Management

This alternative would not result in new fluid minerals leases or in any construction of new routes requiring access control and/or maintenance associated with new leases; therefore, recreation and transportation management would result in no impacts to new fluid minerals leases. Recreation may impact existing mineral development in that access routes and well pads may be used for travel and parking by recreating publics.

Alternative V (Preferred Alternative)***Fluid Minerals Management***

In addition to impacts from current fluid mineral leases as described in Alternative I, Alternative V would limit new leasing of the currently unleased Federal fluid minerals estate to up to 880 acres, with the specific purpose of protecting against drainage. Even if additional lands are acquired, no more than up to 880 acres would be leased. This management action may result in up to 1 oil and gas well and 1 CO₂ well being drilled over the next 20 years. Construction of well pads and access routes necessary to service these wells may result in surface disturbance totaling up to 18 acres, with up to 1 mile of access routes. Given stipulations, the 18 acres of disturbance may occur on existing leased lands to access minerals associated with new leases. New fluid mineral development on existing leased lands would be the same as Alternative I.

Seismic operations involving earthmoving equipment would be prohibited.

Under both new and existing leases, the implementation of comprehensive planning, using multi-year development plans and GADPs, that analyze larger areas, may help to protect the objects of the Monument. In addition, the use of existing disturbed areas for directional/horizontal drilling would minimize ground disturbance, as well as the associated loss of vegetative cover and soils (due to soil exposure and to wind/water erosion), and may reduce impacts to cultural and natural resources (see Map 17). These planning strategies may result in greater up-front costs to operators; however, these costs may be balanced by the streamlining associated with analyzing larger projects and multiple wells, rather than individual APDs. (See Appendix M for details on analyzing fluid minerals development projects within the Monument.)

Cultural Resources Management

Under this alternative, the BLM would continue to require a Class III cultural resources inventory for lands subject to ground-disturbing activities. Monitoring of ground-disturbing activities would be required, and, at the discretion of the BLM, post-project monitoring may also be required. This alternative would emphasize the protection of cultural resource settlement clusters and individual sites, and would manage the objects of the Monument at the landscape level.

The impacts of cultural resources management on fluid minerals development may be increased cost and, potentially, significant time delays for project implementation. In addition, the time necessary to obtain a favorable determination for APD approval may be longer. However, the implementation of comprehensive planning to include multi-year development plans and GADPs that analyze larger areas may help to protect the objects of the Monument. These planning strategies may result in greater up-front costs; however, these costs may be balanced by the streamlining associated with analyzing larger projects and multiple wells, rather than individual APDs. This strategy for existing and new leases would go a long way in avoiding impacts to cultural and natural resources within the Monument.

In order to protect the high cultural resource site density, including settlement clusters, within the Monument, horizontal/directional drilling methods would need to be employed. These techniques would minimize surface disturbance, in that multiple wells would be drilled from a single well pad, rather than several wells and well pads being drilled. Horizontal/directional drilling may add increased drilling costs; however, these costs may be significantly less than those associated with cultural resource data recovery at multiple sites for new proposed wells

and their associated routes. (See Appendix M for details on analyzing fluid minerals development projects within the Monument.)

Livestock Grazing Management

Under this alternative, livestock grazing management does not include any management actions that would impact fluid minerals management, except, perhaps, grazing impacts to reclamation efforts for surface disturbance.

Recreation and Transportation Management

Under this alternative, up to 169 miles of routes would service fluid minerals development, as well as recreation users, within the Monument. Conflicts between mixed uses on some of these routes may occur. This may include recreation users parking on well pads, and large mineral trucks traveling with small passenger vehicles on Monument routes. Maintenance of routes, either for recreation or fluid minerals development purposes, may result in benefits to both types of users.

Alternative VI (Proposed Plan)

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

Under the Proposed Plan, up to 172 miles of routes would service fluid minerals development, as well as recreation users, within the Monument. Otherwise, the impacts would be the same as those described under Alternative V.

Solid Minerals

The goal for the solid minerals program is to protect the objects of the Monument by enforcing the minerals resources withdrawal, as specifically stated in the Proclamation.

Except for fluid minerals leasing, the Proclamation reserved and appropriated all Federal lands and interests in lands within the Monument, and withdrew them from all forms of entry, location, selection, sale, and leasing, and/or other disposition under the public land laws (including the mineral leasing and mining laws). For solid minerals, no new mining claims may be located, and no new prospecting and/or exploration activities may be undertaken to identify locatable minerals and/or to establish the discovery of valuable mineral deposits, except by existing claimants. Therefore, there would be no impacts to solid minerals management resulting from new leases.

Authorization for activities on existing mineral claims within the Monument would be managed by valid existing rights. The 2 unpatented claims considered active when the Monument was established continue to be active, meaning their maintenance fees have been paid. A notice for actual surface disturbing activities has not been filed, however. Since no information about current or past production is available for the H&H Quarry, future conditions are difficult to anticipate. If/when any of these operations expire, permits for these operations would not be reissued. If they remain active, they would require a validity examination before development. Development potential would be considered marginal for this resource, and would require a small area of disturbance. The rock quarry would be under permit for up to 10 years. Renewal of the permit is discretionary, and would include specific reclamation requirements.

Table 4-42 Comparison of Impacts to Minerals Management

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Fluid Minerals	No Impact from new leases.	Make up to 880 acre available for leasing (with up to 2 successful wells drilled). NSO stip. Applies to new leases. Up to 18 acres of disturbance may occur on neighboring leased lands to obtain minerals from new leased lands.	Make up to 3,021 acres available for leasing (with up to 8 successful well drilled). Up to 73 acres of disturbance may occur.	Make up to 24,462 acres available for leasing (with up to 59 successful wells drilled). Up to 447 acres of disturbance may occur.	Same as Alt. II.	Same as Alt. II.
	Continued development of existing leases (127,895 acres) with up to 1,985 acres new disturbance from 150 wells, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Sold Minerals	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.
Cultural Resources	No Impact.	Disturb no cultural resource settlement clusters, sites or	Disturb no settlement clusters or sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.

Table 4-42 Comparison of Impacts to Minerals Management

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
		isolated finds. Incorporate landscape analyses, including the GADP.	Incorporate landscape analyses, including the GADP.			
Livestock grazing	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.
Recreation and Transportation	No route development for new leases. Manage 67 miles of routes for new development on existing leases.	Manage access. Maintain an additional 1 mile of route for mineral development for new leases. Manage 67 miles for new development on existing leases.	Manage access. Maintain an additional 3 miles of routes for mineral development for new leases. Manage 67 miles for new development on existing leases.	Manage access. Maintain an additional 19 miles of routes for mineral development for new leases. Manage 67 miles for new development on existing leases.	Same as Alt. II.	Same as Alt. II.

4.3.5.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future. The analysis begins in the early 1940s. The cumulative impacts analysis tiers to the RFD and to the 1991 Oil and Gas Amendment to the San Juan/San Miguel RMP.

Table 4-43 Past, Present, and Future Activities influencing Mineral Extraction
Past Activities
The boom and bust cycle of natural resource extraction in the local area
80% of the Monument leased with standard stipulations
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the Clean Air Act, and other legislation protecting natural resources
Present Activities
Increased fluid mineral development
Greater national demand on domestic resources resulting in greater demand by local fluid mineral developers
Presidential Proclamation designating the area as a National Monument to protect the objects while managing valid existing rights so as not to create any new impacts to the objects
Mail Trail Seismic Settlement
Future Activities (Proposed Plan)
Lease 880 new acres for drainage with restrictive stipulations
GADPs required for long-range planning
Protection of cultural and natural resources on a landscape level to minimize cumulative impacts and manage for resource setting
Increased use of horizontal drilling and fracturing technologies possibly leading to the development of currently speculative reservoirs such as the Hovenweep Shale

Development levels in the RFD were determined by looking at past development and then averaging those levels over a 20-year period to determine the overall total impacts expected throughout the life of the Proposed Plan. The RFD looked at both leased and unleased lands to determine overall development levels (see the RFD for details).

Table 4-44 Past, Present, and Future Fluid Mineral Development on currently leased lands within the Monument		
Development Type	Number	Total Disturbance (acres)
Past and Present		
Well Pads	185	509
Pipelines	93	186
Access Routes (30' wide)	139	278
Access Routes (50' wide)	46	124
Facilities	16	68
TOTAL	N/A	1,165
Future (Proposed Plan)		
Well Pads	121	310
Pipelines	22	43
Access Route (30' wide)	30	61
Access Route (50' wide)	91	300
Facilities	16	170
3-D Seismic Survey	5	900
2-D Seismic Survey	10	202
TOTAL	N/A	1,985
Cumulative Total		
Well Pads	306	819
Pipelines	115	229
Access Route (30' wide)	169	339
Access Route (50' wide)	91	424

Table 4-44 Past, Present, and Future Fluid Mineral Development on currently leased lands within the Monument		
Development Type	Number	Total Disturbance (acres)
Facilities	32	238
3-D Seismic Survey	5	900
2-D Seismic Survey	10	202
TOTAL	N/A	3,150

Alternative I would not result in new fluid minerals leases on unleased lands; therefore, there would be no change in cumulative impacts resulting from the current management situation. The drilling of up to 2 new wells on unleased lands, as proposed under Alternatives V and VI, would result in up to 18 acres of disturbance and would occur on existing leased lands to access minerals associated with new leases. These totals would be added to those listed above for already leased lands.

For the Proposed Plan, the cumulative total (past, present and future) of up to 337 wells (335 leased + 2 unleased) on 306 well pads (some well pads would contain more than 1 well) would result in up to 3,168 acres of disturbance (3,150 leased + 18 unleased). The 18 acres of disturbance associated with new leases would likely occur on adjacent leased lands because NSO stipulations are attached to all new leases.

Under the Proposed Plan, the estimate of up to 150 wells on up to 121 new well pads on already leased lands, plus up to 2 new wells and pads on unleased lands, would present a yearly average for development over the next 20 years of up to 8 wells, up to 6 well pads, and up to 3.4 miles of new routes (.45 miles/well); as well as up to 2.7 miles of pipeline (.35 miles/well) and up to 13 acres of disturbance (13 acres/well, including seismic surveys). These are, however, yearly average figures.

In terms of air quality, the additional oil and natural gas wells may potentially contribute VOC emissions from wellheads and treatment facilities. In addition, particulate material may result from travel on new unpaved access routes. These additional emissions may impact air quality within, and adjacent to, the Monument, and may impact visibility. In terms of surface water quality, the cumulative impacts may impact offsite watersheds, in that increased sediments and other contaminants may enter the water system. Impacts may result from the same water pollutants impacting onsite surface water. Scenic values may diminish across the landscape. In addition, the feeling of being in remote, isolated, undiscovered lands may be reduced over portions of the Monument, as well as across Dolores and Montezuma Counties.

4.3.6. Livestock grazing

The primary goals for livestock grazing management within the Monument are to manage livestock grazing consistent with Public Land Health Standards, and to maintain a thriving natural ecological balance, multiple-use relationships, and productive forage resources. The management objectives related to these goals include:

- develop a rangeland monitoring strategy and plan to assess rangeland health conditions on a regular basis, as well as a process to implement necessary management revisions based upon monitoring results;
- manage livestock grazing to achieve Public Land Health Standards for upland and riparian/wetlands plant communities;
- manage livestock grazing to ensure the long-term sustainability of rangeland ecosystems and to promote the resistance and resilience of rangeland plants and soil to the impacts of recurring drought; and
- manage livestock grazing to meet vegetation, recreation, fish and wildlife, water quality, and cultural resource objectives, and to protect sensitive or high-quality resources from adverse impacts.

Another goal of livestock grazing management is to develop and encourage public and stakeholder understanding of livestock grazing management within the Monument. The management objective related to this goal is to improve communication, as well as the understanding of range management standards and expectations, between the BLM, grazing permittees, and the general public.

A number of proposed management actions have the potential to impact livestock grazing. Direct impacts are defined primarily in terms of forage production. These impacts may be adverse, resulting in disruption and/or in the removal of vegetation. These impacts may also be beneficial, resulting in increased forage quantity, quality, and/or availability. Indirect impacts associated with surface disturbance are assumed to occur in proportion to the relative amount of disturbance. These impacts may include a general loss of forage area and/or the availability of forage (due to surface occupancy for other uses), direct and indirect impacts to soils and vegetation, and the closure of specific areas to livestock to protect and/or enhance another resource. Vehicular traffic (including off-road vehicular traffic) and human visitors (and their dogs) may harass livestock. The introduction and/or expansion of noxious weeds through various vectors may poison livestock, in that it would replace palatable species with unpalatable species.

Impacts to soils and/or to vegetative cover may also result in the transport of eroded soils into streams and ponds, where the resulting sedimentation may reduce the availability and/or the quality of watering areas. A catastrophic release of a chemical pollutant into a watering source may result in direct harm to livestock, or may make watering areas unusable (such releases are infrequent; however, they may occur during oil and gas development and/or during chemical control of weeds).

This section discusses vegetation primarily as a resource that supports productivity requirements of livestock nutrition. However, the plants and plant communities within the Monument are also managed for their intrinsic values. Public Land Health Standard Number 2 and Number 3 acknowledge the multiple uses of the vegetation resource by discussing management along a continuum of characteristics. Managing vegetation for one aspect of the resource may result in conflicts with another aspect. For example, precluding livestock use of sensitive plant communities, such as riparian/wetlands corridors, may enhance the vegetation values (and the associated fish and wildlife values); however, this action may also reduce the amount and/or quality of forage and water available for livestock.

The opposite may also be true. Managing vegetation for maximum livestock productivity, palatability, and/or for nutrition often involves planting non-native forage species to supplement native species suppressed, or lost, due to prolonged grazing use. Maximizing livestock production generally means placing these large grazers into plant communities that are not

resilient to the impacts of trampling and selective plant removal. Stoddart et al. (1955) acknowledge that: "It is impossible to obtain the best use of a range without some disturbance, and the rancher cannot always have climax vegetation as his goal." These conflicts are addressed throughout this analysis. Additional impacts to vegetation are discussed in Section 4.2.8.

Vegetation is also a resource for wild herbivores, ranging in size from mice to elk. Wildlife species must compete directly with livestock for the forage, for the thermal cover this vegetation provides, as well as for space and water. Any changes in livestock and/or wild herbivore use of these resources would impact the other. The result of the direct competition is generally in favor of livestock, at the expense of wildlife.

Some management actions may favor one type of herbivore over another. For example, where focused livestock use of riparian/wetland areas are allowed, the quality of the plant community as an intrinsically valuable resource and important wildlife habitat may be reduced. Similarly, increased areas of human activity may result in wildlife avoiding an area with suitable forage, leaving more of the resource available to livestock than might otherwise occur.

Other land use and resource management considerations may result in the BLM applying various stipulations and other restrictions on use to protect specific resource values. (These protective stipulations/restrictions are listed and defined in Section 2.2.) Similarly, SSR/CSU stipulations and special mitigation designations (the latter would be applied as a COA for a permit) may require that a grazing permittee undertake supplemental ("non-standard") mitigation as part of a proposed action.

4.3.6.1. Evaluation Criteria and Assumptions

The most adverse direct impacts to livestock grazing results from surface disturbances; therefore, such areas are the primary parameter for discussion and comparison of impact analysis for livestock grazing. Areas reclaimed and/or protected from ground disturbance are used to describe beneficial impacts. Estimates of surface disturbance areas associated with potential management actions were calculated using data from the AMS (BLM 2005b) and from the RFD (BLM 2005c), and are summarized in Table 4-1.

When quantitative analysis is not possible, categories are based upon the potential physical impacts in relation to Public Land Health Standards. For riparian/wetlands vegetation, these categories are based upon the potential physical impacts in relation to Public Land Health Standard Number 2. For upland vegetation, these categories are based upon the potential physical impacts to this resource in relation to Public Land Health Standard Number 3.

Assumptions in the analysis of impacts to livestock grazing include the following:

- estimated disturbance areas are distributed among upland and riparian/wetlands plant communities in proportion to their relative area throughout the Monument, unless otherwise limited by applicable surface-use restrictions;
- application of appropriate BMPs and standardized reclamation practices would be required as COAs for all new leases, permits, and surface disturbance areas (see Appendix E);
- Federal lands within the Monument boundary are the subject of the impact analysis; and
- the entire vicinity that comprises the Colorado Plateau Semi-desert Ecoregion (Bailey 1995) is the subject of the cumulative impacts analysis

4.3.6.2. Alternative Analysis

Impacts to livestock grazing may differ depending upon the specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed for livestock grazing, as well as those from the actions proposed for cultural resources, fluid minerals, rangelands, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Livestock Grazing Management

Under Alternative I, 28 allotments would continue to be available for livestock grazing, with up to 8,492 active AUMs permitted. Ninety-seven percent of Monument lands fall within an allotment under this alternative. Some small land tracts outside of designated allotments would be available for authorized livestock grazing. A monitoring program would be established to determine whether or not livestock grazing goals and objectives are being achieved by the management system. Rangeland management would require the improvement of conditions on all allotments to meet Public Land Health Standards. Livestock grazing use during any portion of the critical period would be limited to no more than 30 percent of the active preference, and to no more than a 50 percent utilization of key forage species' current season growth. Spring use by domestic livestock in all allotments would not be permitted on native ranges during the critical period of early growth, unless a livestock grazing system is implemented that provides crucial rest periods once every 3 years, or unless a spring use pasture is developed to absorb livestock grazing use in meeting the rest requirements. Existing term grazing permits would be revised and new ones developed, as necessary. All livestock-use adjustments, including grazing systems, would be implemented through documented cooperation and consultation with permittee.

This analysis assumes that current rangeland resource conditions and trends described in Section 3.2.7 would continue into the future under these management actions. Current rangeland evaluation and monitoring data (BLM 2001i) show that in 18 of the 28 allotments, livestock grazing is considered a contributing factor in areas not achieving Public Land Health Standards. More intensive livestock management would be required to move allotments toward meeting Public Land Health Standards; however, the downward trend may likely continue under this alternative, ultimately requiring a reduction in AUMs.

Cultural Resources Management

Under this alternative, few cultural resource management actions would impact livestock grazing, either directly or indirectly; therefore, continuing management would be expected to result in negligible impacts to livestock grazing. To some degree, development and stabilization, testing, and/or other activities may result in surface clearance of vegetation. The degree to which these become long-term disturbance areas would depend upon the care that is originally taken to minimize vegetation disturbance, as well as the degree to which appropriate reclamation techniques are implemented.

Fluid Minerals Management

Under Alternative I, currently unleased acres would continue to be unavailable for new fluid minerals leases. However, development of currently leased areas would continue. Seventy-two of the 105 existing fluid minerals sites occur in 24 grazing allotments, with the majority of these in the Cross Canyon allotment. New fluid mineral development on 127,895 acres of currently leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67

miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance.

Generally, few impacts occur as the result of active fluid minerals exploration and construction activities, because livestock usually avoid these areas. However, avoidance may be considered an indirect impact that results in a reduction of available forage within these allotments. Well pads, supporting access routes, as well as utility and/or pipeline corridor, may also functionally remove rangelands from forage production.

In addition to the direct impacts of surface disturbance, other ongoing management actions associated with fluid minerals exploration and development have been noted as a factor in the observed downward trend in upland vegetation. This is due to incomplete or failed reclamation of closed and abandoned well pads, as well as to the associated routes and other infrastructure. Many of these sites support little vegetation, and are often dominated by noxious weeds. These areas then serve as centers of disturbance from which weeds and other undesirable plants spread into native vegetation. These factors are expected to continue to result in limited adverse impacts to livestock grazing.

Recreation and Transportation Management

Alternative I, due to the restriction on new oil and gas leases, may result in relatively few surface impacts resulting from route development. Under this alternative, up to 149 miles of routes would be open to travel by a variety of means (including travel for limited access purposes). This may result in up to 864 acres of surface disturbance, and in a road density of 0.58 miles/square mile. Under this alternative, route miles are based upon the 1985 San Juan/San Miguel RMP ROD. The number of miles currently present within the Monument is 213 (this includes illegal user-created routes). Less ground disturbance, resulting from fewer routes, may be beneficial to livestock grazing over the long-term, in that it may reduce loss of forage. Opportunities for noxious weed introduction and/or infestations occurring along roadsides may be reduced in proportion to the reduction in total miles of routes.

Other Resources Management

Currently, 25,549 acres of the Monument surface are managed as 3 WSAs (under existing non-impairment standards and practices, and in accordance with Interim Management Policy) and would remain under that status until the areas are designated as wilderness or until they are released by Congress (BLM 1995). Some grazing allotments coincide with these WSAs. In these areas, continued restrictions on the construction of permanent structures, facilities, and/or on surface-disturbing activities may continue to result in beneficial impacts, in that forage in these areas may not be disturbed. However, livestock operators often find it easier, and more effective, to manage their livestock through the construction of such facilities. Under the No Action Alternative, should these areas be released from WSA status, they would still be managed for wilderness characteristics; therefore, current impacts may likely continue.

Under this alternative, the McElmo RNA (427 acres) would continue to be managed with special management prescriptions for research and habitat protection. This area is protected from surface disturbance associated with oil and gas development by an NSO stipulation. This management may result in beneficial impacts to livestock grazing in this area, in that ground disturbance, and the associated loss in forage, may be reduced.

Alternative V (Preferred Alternative)

Livestock Grazing Management

The Preferred Alternative would include up to 6,437 active AUMs, which is considerably fewer than what is proposed under Alternative I (8,492 AUMs). Ninety-four percent of Monument lands

fall within an allotment under this alternative. Alternative V would suspend active preference of 2,055 AUMs, identified in all affected grazing permits. Suspended AUMs would be acknowledged in AMPs, but would be unavailable for livestock grazing. Twenty-three allotments (5 fewer than under Alternative I) would be available for livestock grazing. Sand Canyon East, Sand Canyon West, Rock Creek, Goodman Gulch, and Trail Canyon allotments would be made unavailable to livestock grazing (see Map 3). These allotments occur in the southeastern part of the Monument, and total 6,059 acres of primarily pinyon-juniper woodlands with low forage production. Closing these allotments may result in the avoidance of conflicts between cultural and natural resources and recreation, and may accelerate achievement of Public Land Health Standards in these areas. Reduction of AUMs throughout the remaining allotments may result in reduced pressure on existing vegetation, and in associated beneficial impacts to forage quality and quantity. This, in turn, may improve livestock weight, calving success, and survival.

Under this alternative, a number of specific management actions are included to hasten compliance with Public Land Health Standards. These would include the adjustment of spring livestock grazing duration and extent of use, and the implementation of a rotation-grazing system. A utilization guideline applied would be 35 percent of current year production for cool- and warm-season perennial grass species where Public Health Standards are not being met, and 50 percent where they are being met. The guideline applied for allowable utilization levels of current year growth would be no more than 30 percent of upland shrub and riparian/wetlands area woody species. In riparian/wetlands systems, minimum stubble height standards for perennial grasses and forbs would be 4 inches in spring use pasture and 6 inches in fall-and winter-use pastures. Livestock grazing within an allotment would be authorized during the critical spring growth period from March 1 through May 31 for no more than 2 years in any 3-year period. This would be accomplished by the implementation of a rotational livestock grazing system or by non-use for 2 of every 3 years. Spring use would not be allowed where Public Land Health Standards are not being met.

In the event that a grazing permit is relinquished or becomes vacant, a determination would be made to re-issue a term grazing permit, close the allotment, or create a reserve forage allotment. Permittees, and interested parties, would be invited to participate in monitoring. Existing term grazing permits would be reviewed on a regular schedule and revised, as necessary, to address current allotment conditions and permittee needs within the context of achieving Public Land Health Standards and other resource management objectives. Indirect impacts resulting from these actions may include accelerated achievement of Public Land Health Standards. This could lead to increased conception rates among livestock, higher weaning weight, lower animal veterinary costs, and reduced stress on livestock. More intensive livestock management practices may increase costs to the livestock operator, in that it may increase operator time and travel expenses.

Cultural Resources Management

Under this alternative, few cultural resources management actions would impact livestock grazing, either directly or indirectly. However, to some degree, development and stabilization, testing, and/or other activities that result in surface clearance of vegetation may result in highly localized adverse impacts. The degree to which these become long-term disturbance areas may depend upon the care that is originally taken to minimize vegetation disturbance, as well as in the degree to which appropriate reclamation techniques are implemented.

There is potential for conflict between visitors to cultural sites and livestock. Conflicts may include spooking animals, leaving gates open, and inadvertently allowing livestock to move into pastures where they are not supposed to go. The preparation of Cultural Resource Management Plans for cultural sites open to public use may reduce conflicts, in that livestock

grazing management issues would be considered in these plans, and efforts to separate uses may be incorporated.

Under Alternative V, some beneficial impact to livestock grazing may result from the restriction of any direct impacts to cultural resource settlement clusters and/or to sites. Eventually, this restriction may result in more numerous, larger areas within the Monument where no direct impacts would be allowed. This, in turn, may result in the indirect protection of the forage resources within these areas.

Fluid Minerals Management

In addition to impacts from current fluid mineral leases as described in Alternative I, under this alternative, up to 880 acres of lands currently unavailable for leasing could be leased. This may result in the development of up to 2 well pads, with associated routes equaling up to 18 acres of long-term disturbance (see Table 4-1). The 18 acres of disturbance may occur on existing leased lands to access minerals associated with new leases. Many of these impacts may be mitigated by the application of appropriate BMPs and COAs, including standardized reclamation practices on new leases. Rangelands disturbed as the result of route, utility corridor, and/or pad construction may be rehabilitated through the seeding of native plant species. The removal of livestock forage may be long-term in areas where the ground remains disturbed, and may be short-term where it is reclaimed soon after disturbance. Livestock often congregate on newly reclaimed areas, rendering reclamation efforts unsuccessful or too slow for full recovery. Temporary livestock adjustments may be necessary until vegetation becomes established. New leases and currently leased lands may remove considerable land from forage production when adding up all well pads and compressor stations, as well as all pipeline, utility line, and travel routes (1,985 acres of disturbance from future development). The risk of noxious weed introduction/expansion becomes higher in disturbed areas than in areas that are not disturbed. Generally, reclamation efforts within the Monument have not been successful, and have commonly resulted in noxious weed invasions.

Recreation and Transportation Management

Under Alternative V, up to 169 miles of routes would be open to all forms of travel (including travel for limited access purposes). This may result in up to 980 acres of surface disturbance, as well as in a route density of 0.66 mile/square mile.

These factors may result in adverse impacts to livestock grazing over the long-term due to the loss of forage, the increased fragmentation of rangelands, increased human disturbance to livestock, and injury or death to animals caused by vehicle collisions and shooting. Opportunities for noxious weed introduction and spread may increase in proportion to the increased numbers of routes (Harris and Silva-Lopez 1992, Zink et al. 1995).

Other Resources Management

Under Alternative V, 25,549 acres of the Monument surface would continue to be managed as 3 WSAs (under existing non-impairment standards and practices, and in accordance with Interim Management Policy) until they are designated as wilderness or until they are released by Congress (BLM 1995). Some grazing allotments coincide with these WSAs. In these areas, restrictions on the construction of permanent structures, facilities, and/or on surface-disturbing activities may result in beneficial impacts, in that forage in these areas may not be disturbed. However, livestock operators often find it easier, and more effective, to manage their livestock through the construction of such facilities.

Under this alternative, surface-disturbing activities would be minimized in WSAs through the use of NGD/NSO stipulations on some existing, and all new, leases. Management constraints would

promote these areas for their wilderness characteristics. Additional management actions intended to protect and enhance the wilderness characteristics of the WSA areas would be implemented. These actions may result in the protection of livestock forage and rangeland resources. An additional 5,223 acres would be managed for wilderness characteristics.

Under this alternative, the existing McElmo RNA would be considerably expanded, and there would be 2 new RNAs (with RNA acreage going from 427 to 7,826 acres). The McElmo RNA would continue to be managed with special management prescriptions for herpetological research and habitat protection. Portions of this area are protected from surface disturbance impacts resulting from oil and gas development by NSO stipulations. Prohibiting ground disturbance would help maintain forage resources, while, at the same time, allowing for intensive livestock management.

Alternative VI (Proposed Plan)

Livestock Grazing Management

The impacts would be the same as those described under Alternative V. However, the Proposed Plan would cancel all suspended AUMs.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

Under the Proposed Plan, up to 172 miles of routes would be open to a variety of forms of travel (including travel for administrative and private land purposes and travel). This may result in up to 997 acres of surface disturbance, as well as in a route density of 0.66 mile/square mile. Otherwise, the impacts would be the same as those described under Alternative V.

Other Resources Management

The impacts are the same as those described under Alternative V. However, under the Proposed Plan, the existing McElmo RNA would be considerably expanded, with 2 additional RNAs added (from 427 to 8,881 acres).

Table 4-45 Comparison of Impacts to Livestock grazing

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments. Apply zero-level accelerated erosion standard. Apply NGD/NSO stipulation to protect slopes steeper than 30 percent (36,607 acres).
Cultural Resources	Protect cultural resource sites.	Protect cultural resource settlement clusters, sites, and isolated finds.	Protect cultural resource settlement clusters and sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance).	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance).	Same as Alt. II.	Same as Alt. II.

Table 4-45 Comparison of Impacts to Livestock grazing

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
		minerals from new leased lands).				
	Continued development of existing leases (127,895 acres) with up to 1,985 acres new disturbance.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Recreation and Transportation	Manage 149 miles of routes; 864 acres of disturbance (per 1985 RMP decision). 1,235 acres of disturbance (per 2000-2002 inventory).	Manage 139 miles of routes; 806 acres of disturbance.	Manage 189 miles of routes; 1,096 acres of disturbance.	Manage 213 miles of routes; 235 acres of disturbance.	Manage 169 miles of routes; 980 acres of disturbance.	Manage 172 miles of routes; 997 acres of disturbance.
Other Resources: Special Designations	Manage 25,549 acres as WSA. Manage 427 acres as RNA. Manage 0 miles as WSR.	Manage 25,549 acres as WSA. Manage 5,223 acres for wilderness character. Manage 7,826 acres as RNA. Manage 25.3 miles as WSR (suitable).	Same as Alt. I.	Same as Alt. I.	Manage 25,549 acres as WSA. Manage 5,223 acres for wilderness character. Manage 7,826 acres as RNA. Manage 0 miles as WSR.	Manage 25,549 acres as WSA. Manage 5,223 acres for wilderness character. Manage 8,881 acres as RNA. Manage 0 miles as WSR.

4.3.6.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future. For this discussion, the area includes lands immediately adjacent to the Monument, as well as the entire vicinity that comprises Dolores and Montezuma Counties.

Table 4-46 Past, Present, and Future Activities influencing Livestock grazing
Past Activities
Unmanaged livestock grazing and associated loss in vegetative cover
Spread of undesirable plant species such as cheatgrass
Ineffective reclamation efforts
Encroachment of pinyon-juniper woodlands followed by large-scale vegetation treatments
Compliance with the Taylor Grazing Act, the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Present Activities
Increased fluid mineral development
Increased popularity of OHVs
Management of livestock grazing to meet Public land Health Standards
Prolonged drought
National Monument designation by Presidential Proclamation to protect the objects
Future Activities (Proposed Plan)
Continued increase in fluid mineral development
Lease 880 new acres for drainage with restrictive stipulations
Continued spread of noxious weeds and undesirable plant species
Expansion of the McElmo RNA and the addition of the Cannonball and Sand Canyon RNAs

In general, any disturbance that removes vegetation in the form of forage from the land may impact livestock grazing. These disturbances include route construction, ground disturbance from off-road vehicular use, mineral development, and/or wildfires. Other such disturbances are discussed in the soil and vegetation sections.

Livestock grazing has occurred within the Monument, as well as throughout the local vicinity, since the late 1800s. The general condition of the range throughout this area is poor. This is due to the general unsuitability of this ecoregion's plant community to support extensive and long-term unmanaged livestock grazing, as well as to regional drought.

Under the Proposed Plan, up to 880 acres would be available for new fluid minerals leases, with up to 2 new wells. The continued development of areas currently leased is expected to result in up to 121 new well pads over the next 20 years, with up to 8 new treatment facilities, up to 53 miles of pipeline, and up to 67 miles of routes. The cumulative total disturbed area within the Monument resulting from fluid minerals development through the life of the Proposed Plan is 3,267 acres. Areas are being reclaimed; however, success of reclamation efforts has, generally, been poor.

Future development of fluid minerals on private leased lands within the Monument boundary, as well as on adjacent areas, may result in impacts similar to those resulting from development on BLM lands. Fluid minerals development (including federal surface/federal minerals; private surface/federal minerals; and private surface/private minerals) may result in considerable ground disturbance resulting from construction of well pads, pipelines, compressor stations, routes, and/or other facilities. Increased erosion and potential rockfall and/or landslide hazards may result especially if/when these activities are not subject to BMPs, COAs, stipulations, and/or mitigation measures. These cumulative impacts may be greater if reclamation of short- and long-term disturbances and avoidance of riparian/wetlands areas are not performed to any standards, such as to the standards required on public lands. Failure to perform adequate reclamation and/or to avoid riparian/wetlands areas may result in indirect impacts to BLM lands, in that this may create a seed source for noxious weed infestations and/or may contribute to sedimentation in riparian/wetlands areas. Degradation of these areas may also result in a decrease in the extent of vegetative cover, and/or in the quality of wildlife habitat and the human recreation experience throughout the area.

4.3.7. Recreation

The primary goal for recreation within the Monument is to manage, and enable, access to the Monument for recreational activities while, at the same time, protecting cultural and natural resources, ensuring compatibility with other existing and permitted uses, and considering impacts on adjacent landowners and on the local community. The management goals include:

- produce Recreation Management Objectives for specific recreation opportunities, consisting of activities, experiences, and benefits;
- sustain Recreation Setting Prescriptions to produce targeted recreation opportunities, and to facilitate the attainment of experiences and benefits; and
- use Providers' Implementing Actions to conduct, yet constrain, all management, marketing, monitoring, and administrative support actions, as necessary, to produce targeted recreation opportunities, facilitate outcome attainment, and sustain prescribed recreation setting character.

Recreational activities offered throughout the Monument include wildlife viewing, scenic drives, hunting, camping, hiking, mountain biking, horseback riding, sports climbing, OHV use, accessing a number of Ancestral Puebloan culture sites, and experiencing the scenic vistas of Colorado Plateau geology and ecology. Determining adverse or beneficial impacts to recreational resources is often difficult. One person may perceive an action to be adverse; another person may perceive it to be beneficial. For example, certain management actions may

promote a backcountry recreation experience, while other management actions may promote a front country recreation experience.

Direct impacts to recreation may include route closures or openings, changes to methods of travel, and/or instituting entrance fees. Indirect impacts may include the presence of livestock in a recreation area, the sight of mineral wells, and/or water diversion.

4.3.7.1. Evaluation Criteria and Assumptions

Differences between alternatives, in terms of experiences being offered, can be evaluated. For example, one alternative may provide a more developed experience with numerous travel routes, facilities, and visitors, while another may provide greater opportunities for backcountry travel, thereby offering more solitude, fewer routes, and fewer facilities.

Assumptions used in analyzing impacts to recreation include the following:

- Application of appropriate BMPs and standardized reclamation practices would be required as COAs for all new leases, permits, and surface disturbance areas (see Appendix E).
- This impact analysis considers the spatial boundary as the existing limits of recreational lands and facilities within the Monument, and the temporal boundary as the next 20-year period.
- Cumulative impacts are considered at the regional scale and, more specifically, for Dolores and Montezuma Counties.

4.3.7.2. Alternative Analysis

Impacts to recreation may differ depending upon the specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed for recreation, as well as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, travel management, and other resources.

Alternative I (No Action Alternative)

Recreation Management

Under the No Action Alternative, impacts to recreation resources would not change from current conditions. This alternative would continue to ensure that recreation sites at Lowry, Painted Hand, and Sand Canyon Pueblos are maintained. A broad range of recreation settings and activities would be maintained, while, at the same time, preventing and/or reducing resource degradation resulting from recreation use, and while providing for visitor health and safety. Recreation opportunities would continue to be evaluated on a case-by-case basis as a part of project-level planning. The BLM would provide for a blend of settings and opportunities. Local communities would provide facility-dependent settings and opportunities. Visitor services and facility requirements would be managed to meet recreation goals.

This alternative would continue to manage recreation based on “emphasis areas” (under which one area may emphasize wildlife habitat, while another may emphasize livestock grazing, and while yet another may emphasize recreation). Existing limitations and closures would be retained. Based upon the requirements of the Proclamation, no motorized and no mechanized cross-country travel would be allowed. The result of managing recreation, as outlined under this alternative, is the loss of opportunities to define areas within the Monument where specific promotion strategies should be applied. Instead, recreation activity within the Monument is marketed and managed the same, whether under a backcountry or a front country setting,

whether the visitor is from Montezuma County or from a foreign country. Visitor needs are not targeted based upon the setting or upon the location within the Monument. Therefore, the opportunity to match the visitor with their desired setting and experience is lacking under this alternative.

Cultural Resources Management

Under Alternative I, cultural resources would continue to be developed for visitation and for interpretation. Areas would be made available for day use, where feasible, with the development of infrastructure designed to support visitors, where needed. As a result, there may be no change in the impacts to recreational use under this alternative.

Fluid Minerals Management

Approximately 80 percent of Monument lands are currently leased for fluid minerals development. Under Alternative I, the remaining 20 percent would not be leased; therefore, no impacts would occur from new leases.

New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance. Although site-specific visual quality objectives and design guidelines for infrastructure development would continue to be implemented, ongoing development on currently leased lands may appear industrial and impact the recreation experience.

Livestock Grazing Management

Under this alternative, livestock grazing management would be based on up to 8,492 active AUMs and up to 28 allotments. Ninety-seven percent of Monument lands fall within an allotment under this alternative.

There would be no new management actions. This may mean that poor public land health would likely continue, but without significant impacts on recreation management.

Transportation Management

This alternative would maintain the current 149 miles of routes within the Monument. The 2000-2002 route inventory recorded 213 miles of routes and 1,235 acres of disturbance. No designation of routes for bike, foot, and/or horse would occur; therefore, conflicts between recreation users may continue in the Sand Canyon/East Rock Creek area. All motorized and mechanized travel would be restricted to designated routes. A total of up to 131 miles of routes would be designated open to all forms of travel. Under this alternative, up to 7 transportation facilities would be developed. This management may result in beneficial impacts to recreation, in that visitors would then be able to access more recreational opportunities. However, without a Travel Management Plan, and associated travel map, confusion would continue as to what forms of transportation are allowed and where access to the Monument is available. Illegal user-created routes would continue to be developed, and law enforcement efforts to enforce a transportation system would be difficult.

Other Resources Management

Spectacular scenery is one of the primary reasons people come to the Monument to recreate. Therefore, to protect this resource, visual quality would be actively managed. Visual quality is measured on a scale from VRM Class I (most pristine) to VRM Class V (most altered). Based upon Interim Guidance, WSAs are to be managed as VRM Class I. However, under this alternative, no other VRM classification determinations were made; such determinations were expected to be determined on a project-by-project basis. This alternative would continue to

manage visual resources in accordance with Interim Management, which states that “permanent or long-term visual intrusions would be discouraged” and that management actions are to “preserve scenic values enhance viewing opportunities and increase variety where appropriate” (BLM 1985). Without specific VRM Class objectives identified throughout the Monument, visual quality management would become more difficult to include in management considerations and project planning.

Alternative V (Preferred Alternative)

Recreation Management

This alternative defines the Monument in terms of RMZs. Each zone would be managed in terms of its defined objectives and setting. Certain zones would be managed and marketed for regional, national, and international visitors, while the majority of the Monument would be managed for visitation by local residents. Construction of facilities and infrastructure would be kept to a minimum, but would be constructed, as needed, in the more developed recreation zones. This alternative would promote a destination management strategy for some areas and an undeveloped strategy for others, and would manage for a mix of backcountry and front country opportunities. This alternative would match visitors with the setting and their desired experience.

Under this alternative, when compared with Alternative I, there would be an overall increase in the total miles of routes available for travel within the Monument. The transportation system would consist of up to 169 miles of routes, which would allow for a combination of uses. Allowing OHV use on designated routes would enhance motorized recreational opportunities, in that it would facilitate dispersed use of recreational resources and access to areas inaccessible to ordinary street vehicles. However, OHV use, and its associated impacts to air quality, noise levels, soils, vegetation, wildlife, and general aesthetics, may diminish the recreational quality for recreation users seeking solitude and natural settings for non-motorized activities. Segregating uses on routes, as proposed under this alternative, may reduce user conflicts.

Under this alternative, recreational shooting and geocaching would be prohibited throughout the Monument. Restricting these uses may result in an increase in this activity on neighboring public lands. There would likely be little or no impacts to recreational shooters, in that there are no organized shooting groups in the local area, and given that there are many opportunities to shoot on other public lands, on numerous large private farms in the local area, and in several local developed facilities.

Under this alternative, camping and campfires would not be allowed in the more developed management zones (AHC, Sand Canyon/Rock Creek, and Pueblo Sites RMZs); however, these activities would be allowed within the majority of the Monument (in the less developed management zones). In summary, approximately 7,875 acres would be managed for public visitation, and 157,460 acres would be managed for backcountry use. Providing a variety of recreation settings may allow people to choose their desired experience, and to go to areas that meet their expectations.

Cultural Resource Management

Generally, cultural resource management actions enhance recreational experiences and provide benefits, in that such actions serve to protect resources and to educate the public about resource values. Under Alternative V, the Monument would be promoted as an outdoor museum, allowing visitors to experience cultural and natural resources through self-discovery. In addition, 13 to 25 cultural sites would be developed for visitation, directing visitors to more developed portions of the Monument. Under this alternative, cultural resources management

may be beneficial to the recreating public interested in exploring cultural resources, in that it would provide both developed and interpreted opportunities, as well as undeveloped options.

Fluid Minerals Management

In addition to impacts from current fluid mineral leases as described in Alternative I, under this alternative, up to 880 acres would become available for new mineral leases. Protective measures in leased areas would include the consolidation of maintenance activities designed to reduce human disturbance and to minimize the need for site visits to any existing lease areas. Leases would stipulate that access be limited to 1 route for energy developments. No increase in infrastructure development in new lease areas would occur along the Trail of the Ancients Scenic and Historic Byway. Up to 18 acres of ground would be disturbed as the result of the implementation of this alternative. The 18 acres of disturbance may occur on existing leased lands to access minerals associated with new leases.

The greater impact from oil and gas development on recreation opportunities within the Monument would come from existing leases. Currently, 80 percent of the Monument is already leased; therefore, current visual impacts resulting from this development would discourage many Monument visitors. Fluid minerals development, as well as the associated ROWs, power lines, roads, and facilities, may change a recreational setting from backcountry or middle country to front country. This impact may be long-term and, if it becomes wide-spread, it may result in displacing traditional recreation activities and may, in turn, result in a major loss of recreation benefits. This impact may affect both the individual Monument user as well as those holding SRPs for commercial operations. The protection of visual, cultural, and natural resources would help to prevent impacts from occurring throughout the Monument. Much of the Monument may remain pristine and undisturbed, providing a backcountry experience; however, areas are expected to be developed, which may, in turn, result in a more industrial appearance.

In the case of recreational hunting, there may be reduced satisfaction associated with the hunting experience in areas where there is fluid minerals development. In turn, the more development increases, the greater the risk to the safety of industry employees and property as a result of shooting. Increased fluid minerals development within the Monument may bring more traffic, noise, dust, air emissions, and construction of facilities. Impacts to recreation users would be considered when completing GADPs and during the development of multi-year plans.

Livestock Grazing Management

Under this alternative, livestock grazing would be managed to reduce conflicts between livestock grazing and recreation users, and in relation to the protection of cultural resources. There would be a reduction of 2,055 active AUMs (from 8,492 to 6,437). Ninety-four percent of Monument lands fall within allotments under this alternative. The closing of 5 livestock allotments may be of primary benefit to recreation users, in that these are located in an area popular to hikers, mountain bike riders, and horseback riders (including Sand/East Rock Canyons). The removal of livestock from these areas may further eliminate impacts to cultural resources, which may, in turn, benefit the recreational experience related to the exploration of cultural resources within this portion of the Monument.

Livestock in, and around, dispersed campsites may result in impacts to vegetation, and may compact soils. Livestock rub on signs, vehicles, and other property. They also tend to congregate in loafing areas, which are often near streams and ponds. Where livestock remain for extended periods of time, they defecate in, and around, campsites, which, in turn, draws flies. These conditions decrease the benefits associated with an aesthetically pleasing and healthy environment sought by recreation users. Some visitors may enjoy seeing livestock;

therefore, seeing them in open range conditions may contribute to an understanding of commodity production and western agricultural practices.

Transportation Management

This alternative would allow up to 169 miles of routes within the Monument. Some separation of routes for bike, foot, and/or horse travel would occur, which may, in turn, help to alleviate conflicts within the Sand Canyon/East Rock Creek area. Under this alternative, a total of up to 74 miles of routes would be designated open to all forms of travel. All motorized and mechanized travel would be restricted to designated routes. Foot travel, horseback riding and mechanized travel in Special Recreation Management Area (SRMA) 2 (Sand Canyon/Rock Creek) would be restricted to designated routes only. Motorized travel is prohibited in SRMA 2.

Alternative V would promote low-impact activity. It would add minimal facilities and infrastructure (up to 9 facilities), thereby not disturbing the pristine experience of the area. Several user-created routes would be closed, which may, in turn, improve visual quality.

Other Resources Management

Spectacular scenery is one of the primary reasons people come to the Monument to recreate. Therefore, to protect this resource, visual quality would be managed. Visual quality is measured on a scale from VRM Class I (most pristine) to VRM Class V (most altered). This alternative would manage 38,598 acres as VRM Class I; 126,643 as VRM Class II; and 94 acres as VRM Class III. Designating and maintaining scenic quality may help sustain the scenic beauty of the area; beauty that draws recreational users to the area and provides them with a quality experience. The presence of WSAs, especially if they are publicized, may attract recreational users seeking primitive recreational experiences.

Alternative VI (Proposed Plan)

Recreation Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, 158,515 acres would be managed for backcountry use. The transportation system would consist of up to 172 miles of routes, which would allow for a combination of uses.

Cultural Resource Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Transportation Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, up to 172 miles of routes would be managed within the Monument. Up to 68 miles of routes would be designated open to all forms of travel. In addition routes segregation would occur in the Sand Canyon/Rock Creek area, where a route would separate horse traffic from hiking use. This segregation would direct horse users away from an unsafe slickrock route.

Other Resources Management

The impacts would be the same as those described under Alternative V. However, the Proposed Plan would manage 41,834 acres as VRM Class I; 100,394 as VRM Class II; 14,190 acres as VRM Class III; and 9,972 acres as VRM Class IV.

Table 4-47 Comparison of Impacts to Recreation Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Recreation Resources	Maintain developed recreation sites at Lowry, Painted Hand, and Sand Canyon for interpretation. Allow no new commercial permits (Special Recreation Permits- SRPs). Allow dispersed camping. Retain existing limitations and closures. No restrictions on geocaching, climbing or recreational shooting.	Manage 8,211 acres for front country public visitation. Manage 157,124 acres for backcountry use. Allow no new SRPs, no renewal of existing SRPs. Do not allow camping, campfires, geocaching or recreational shooting anywhere in the Monument.	Manage 18,875 acres for front country public visitation. Manage 146,460 acres for backcountry use. Allow no new SRPs. Allow renewal of existing SRPs. Allow camping and campfires within Mockingbird Mesa-Rincon, Squaw-Cross Canyon, and Goodman Point SRMAs. Do not allow climbing, geocaching or recreational shooting anywhere in the Monument.	Manage 47,056 acres for front country public visitation. Manage 118,279 acres for backcountry use. Allow new SRPs on a case by case basis. Allow camping and campfires within Mockingbird Mesa-Rincon, Squaw-Cross Canyon, and Goodman Point SRMAs and in designated sites in other SRMAs. Do not allow climbing, geocaching or recreational shooting anywhere in the Monument.	Manage 7,875 acres for front country public visitation. Manage 157,460 acres for backcountry use. Allow 10 SRPs. Allow camping and campfires within Mockingbird Mesa-Rincon, Squaw-Cross Canyon, and Goodman Point SRMAs. Allow climbing in designated sites only. Do not allow geocaching or recreational shooting anywhere in the Monument.	Manage 7,875 acres for front country public visitation. Manage 158,515 acres for backcountry use. Allow 10 SRPs. Allow camping and campfires within Mockingbird Mesa-Rincon, Squaw-Cross Canyon, and Goodman Point SRMAs. Allow climbing in designated sites only. Do not allow geocaching or recreational shooting anywhere in the Monument.
Cultural Resources	Develop new sites for controlled visitation.	Develop 13 sites.	Develop 13 to 25 sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites	Make up to 880 new acres available for lease (NSO stip. applies to new	Make up to 3,021 new acres available for lease (with up to 73 acres of	Make up to 24,462 new acres available for lease (with up to 447 acres of	Same as Alt. II.	Same as Alt. II.

Table 4-47 Comparison of Impacts to Recreation Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	from new leases.	leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new leased lands). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.		
	Continued development of existing leases (127,895 acres) with up to 1,985 acres new disturbance.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.
Transportation	Manage 149 miles of routes; 864 acres of disturbance (per 1985 RMP decision). 1,235	Manage 139 miles of routes; 806 acres of disturbance. Develop 7 facilities.	Manage 189 miles of routes; 1,096 acres of disturbance. Develop 13 facilities.	Manage 213 miles of routes; 235 acres of disturbance. Develop 20 facilities.	Manage 169 miles of routes; 980 acres of disturbance. Develop 9 facilities.	Manage 172 miles of routes; 997 acres of disturbance. Develop 9 facilities.

Table 4-47 Comparison of Impacts to Recreation Resources

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	<p>acres of disturbance (per 2000-2002 inventory). Develop 7 facilities.</p>					
<p>Other Resources: Visual Resources</p>	<p>No VRM Classes identified.</p>	<p>Manage 38,598 acres as VRM Class I. Manage 126,643 acres as VRM Class II. Manage 94 acres as VRM Class III.</p>	<p>Manage 25,976 acres as VRM Class I. Manage 41,867 acres as VRM Class II. Manage 104,605 acres as VRM Class III.</p>	<p>Manage 25,976 acres as VRM Class I. Manage 27,535 acres as VRM Class II. Manage 94,327 acres as VRM Class III. Manage 17,497 acres as VRM Class IV.</p>	<p>Same as Alt. II.</p>	<p>Manage 41,724 acres as VRM Class I. Manage 100,394 acres as VRM Class II. Manage 14,190 acres as VRM Class III. Manage 9,972 acres as VRM Class IV.</p>

4.3.7.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-48 Past, Present, and Future Activities influencing Recreation
Past Activities
No authorized travel management plan or associated map developed or implemented
Limited access points established with private land intertwined with the Monument
80% of the Monument leased with standard stipulations
25,549 acres designated Wilderness Study Area
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, Clean Air Act, the National Environmental Protection Act, and other legislation protecting natural resources
Present Activities
Increased fluid mineral development
Increased use of OHVs
Increased use by mountain bikers and rock climbers
Unrestricted recreational shooting, climbing, geocaching, camping, and campfires
Designation of the Trail of the Ancients Historic and Scenic Byway
National Monument designation by Presidential Proclamation to protect the objects
Future Activities (Proposed Plan)
Lease 880 new acres for drainage with restrictive stipulations
Specific marketing strategies identified for Special Recreation Management Areas
Addition of 5,233 acres designated for management of wilderness characteristics
Closure of the Monument to recreational shooting and geocaching with restrictions placed on climbing, camping, and campfire use
Travel management plan with associated map developed and implemented

Recreation activity is on the increase, both regionally and nationally. As more and more people find themselves living in urban environments, the demand to recreate on public lands is becoming more intense. Depending upon the target audience, and on the marketing strategy, those visiting the Monument may be primarily local residents, regional visitors, or national and international tourists. Providing limited facilities, while, at the same time, offering a range of recreation opportunities, as described under the Proposed Plan, may provide for day-use activities and overnight opportunities for dispersed camping. The absence of developed campgrounds, with facilities for recreational vehicles, may result in visitors who are looking for these amenities to use other public land and/or private facilities. The concept of shifting uses, based upon what is or is not authorized within the Monument, may be applied to all uses, including recreational shooting, geocaching, and off-road vehicle users.

Marketing for national and international tourism may increase visitation to the region, and may boost the economic income of local counties, businesses, and residents. Depending upon the influx of people that may result, regional infrastructure may be insufficient to support the demand. Services, such as Search and Rescue (SAR) and/or law enforcement, may be strained.

Increased recreation opportunities may result in an increased demand for infrastructure, which may, in turn, result in increased visual impacts to the natural landscape. The construction of facilities, along with the associated ground disturbance, may result in the loss of wildlife habitat, as well as in the possibility for erosion with additional sediments moving into stream systems. Noise levels from increased human presence (including voices, as well as noise associated with the movement of people and vehicles) may reduce wildlife habitat security. Managing for the expansion of wilderness characteristics, and for the expanded/additional RNAs, as identified under the Proposed Plan, may help to offset some of these impacts.

Oil and gas development is, perhaps, the greatest threat to recreation opportunities, as well as to the draw of tourists to the Monument. The construction of facilities associated with fluid minerals development on, and adjacent to, the Monument may impact recreation users, altering their experience from backcountry to front country. This may result from increased noise, a larger system of routes, an influx of people and traffic, as well as impacts on visual landscapes.

4.3.8. Transportation

The primary goal for transportation management within the Monument is to define a travel management network (see Appendix R), with supporting facilities (such as parking areas), that would provide reasonable access to the public, private landowners, and authorized users (including fluid minerals operators and livestock grazing permittees) while, at the same time, protecting the objects identified in the Proclamation. [NOTE: For the general purpose of this PRMP/FEIS, the use of the word “road” in the DRMP/DEIS has been changed to “route.” As per BLM Instruction Memorandum No. 2008-014, the definition of a route is “a group or set of roads, trails and primitive roads that represent less than 100% (excludes non-designated routes) of the BLM transportation system.” In general, components of the transportation system are described as “routes.” All designated routes within the Monument are identified on the attached transportation map (Map 5). Travel off of a designated route is considered “cross-country” or “off-road”. County-improved routes are still referred to as roads.] The management objectives related to this goal include:

- designate limited access routes and their associated type of use. (A limited access route is a route restricted from general public use. Limited access routes include administrative access, which allows access for the purposes of maintenance or operation; private land access (see Appendix T); temporary access is used for a defined

period of time (such as during the operation of an oil and gas well), and then closed once the use is complete). The types of use include street legal motorized vehicle, OHV, OHM, foot, horse, and bicycle;

- designate existing and new routes for different types (such as street-legal motorized vehicle and OHV) of motorized and non-motorized public access, following the travel management network methodology in Appendix G. (In general, this methodology closes existing routes that do not access a destination [such as scenic overlooks, camping sites, and/or archaeological sites allocated for public use] and/or that pose a threat to Monument resources);
- designate closed and limited areas to protect Monument objects, and to prohibit all off-road motorized and mechanized vehicle use, except for emergency or authorized administrative purposes, as required under the Proclamation;
- identify the types and locations of facilities necessary to support the functions of the travel management network;
- identify maintenance activities required to protect the objects of the Monument;
- identify criteria that would assist in deciding if additional routes should be added or removed from the travel management network in the future;
- work in partnership with the CDOW to determine limitations (such as the season of use and/or the density level), if any, on new route construction to protect big game winter range and migration corridors within the Monument;
- identify guidelines and/or limitations to properly maintain, manage, and/or monitor the travel management network;
- work in partnership with affected interests to manage over-flights, and to achieve and maintain visitor experiences and benefits within RMZs;
- manage access to oil and gas leases issued prior to passage of the FLPMA in existing WSAs, and ensure that the BLM non-impairment standards are not violated; and
- work in partnership with affected interest groups to manage routes, and to protect resources and maintain visitor experiences and benefits.

Direct beneficial impacts to transportation may include increased access to authorized users, protection of Monument resources, and increased public safety. Indirect impacts may include changes in the type of traffic or level of use.

4.3.8.1. Evaluation Criteria and Assumptions

Quantifying impacts to transportation management requires anticipating the development of roads, as well as associated needs. The location and extent of some new routes and parking areas can be identified; however, the location and extent of routes associated with oil and gas development cannot be predicted. Quantitative estimates of route length and acreage are used, whenever possible (see Appendix R).

Assumptions used in analyzing impacts to transportation management include the following:

- Estimates of disturbance were compiled from the AMS (BLM 2005b) and the RFD (BLM 2005c).
- The number of routes predicted for construction, based upon new acres leased for fluid minerals development, would all be new routes.

- Federal lands within the boundary of the Monument were used as the impacts analysis area.
- Cumulative impacts include Dolores and Montezuma Counties.
- State laws apply to the Monument. (For example, if an alternative shows a State-managed route as being open to OHV travel, yet such activity is prohibited by State law, the State law would apply.)
- Cross-country travel (off-road travel) for the purposes of retrieving game during the hunting season may be authorized on other public lands; however, it is not authorized within the Monument.
- Transportation terms from 43 CFR 8340.0-5 are defined as follows:
 - **Off-road** -- cross-country travel between designated routes. All off-road travel is prohibited by motorized and mechanized vehicles.
 - **Open areas** -- areas where both cross-country and designated route travel is allowed by all types of vehicles, at all times, anywhere in the area, subject to the operating regulations and vehicle standards set forth in subparts 43 CFR 8341 and 8342. There are no “open areas” within the Monument.
 - **Limited areas** -- areas restricted at certain times, in certain areas, and/or to certain vehicular use. Generally, these are areas where mechanized and/or motorized travel is restricted to designated routes only. No cross-country travel is allowed within the Monument.
 - **Closed areas** -- areas where all types of mechanized and motorized travel are not permitted off routes and, in this case, where for the most part, routes do not exist and are not to be constructed, such as WSAs.
 - **Off-highway vehicle (OHV)** -- any motorized vehicle capable of, or designed for, travel on, or immediately over, land, water, or other natural terrain. Typically, this refers to All-Terrain-Vehicles (ATVs).
 - **Cross-Country travel** -- travel between designated routes.
 - **Limited Access Route** -- a route restricted from general public use. Limited routes include administrative access that allows access for purposes of maintenance or operation; private land access; and temporary access used for a defined period of time (such as during the operation of an oil and gas well), which is then closed once the use is complete.
 - **Public routes** -- these routes are open to the public; however, they may be restricted in terms of the type of travel allowed. (For example, there are motorized and non-motorized public routes.)
 - **Motorized travel** -- travel that uses some form of motorized vehicles, including OHMs (such as motorcycles), OHV (such as ATVs), and/or four-wheel and two-wheel drive full-size vehicles.
 - **Non-motorized travel** -- travel that does not use any form of machinery, such as hiking or horseback riding.

- **Mechanized travel** -- travel using self-propelled bicycles. This is sometimes included in the definition of “non-motorized” (making the distinction is often important).

4.3.8.2. Alternative Analysis

Impacts to transportation may differ depending upon specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed for transportation, as well as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, recreation, and other resources.

Alternative I (No Action Alternative)

Transportation Management

Under Alternative I, transportation management is based upon the San Juan/San Miguel RMP (BLM 1985). However, since that time, several user and development-created routes have been constructed. Therefore, the map offered under Alternative I does not reflect what is currently within the Monument. This is the No Action Alternative; therefore, it does not include the development of a comprehensive Travel Management Plan, which the Proclamation mandates.

Under Alternative I, the transportation system would consist of up to 149 miles of routes that would include the following:

- Limited Access + Public Foot, Horse = 7 miles;
- Limited Access + Public Foot, Horse, Bicycle = 3 miles;
- Public Foot = 2 miles;
- Public Foot, Horse = 0 miles;
- Public Foot, Horse, Bicycle = 6 miles;
- Public Foot, Horse, Bicycle, OHM, ATV = 0 miles;
- Public Open to All Travel Means = 131 miles; and
- Fluid mineral routes on new leased lands = 0 miles

Under this alternative, the Monument travel system would include up to 149 miles (up to 864 acres) of routes for motorized, mechanized, and/or non-motorized use. The 2000-2002 inventory recorded 213 miles of routes and 1,235 acres of disturbance. There would be no additional routes for new fluid minerals leasing. There would be no routes specifically designated for OHV, mountain bike, or OHM travel. These forms of travel would be allowed on routes designated as open to all forms of travel. All cross-country motorized and/or mechanized travel would be prohibited within the Monument. Under this alternative, 139,359 acres would be designated “limited,” and 25,976 acres would be designated “closed.” Under Alternative I, Monument routes would be maintained or upgraded to ensure public safety. Under this alternative, impacts to the transportation network would not change; therefore, there would be no definitive travel management system or associated travel map designed to direct the public. As a result, the public may continue to be confused, may continue to drive on routes that are not meant to be open for travel, and may create new routes by traveling cross-country. Without a Travel Management Plan that defines travel within the Monument, law enforcement efforts may be futile. Many of the routes listed under this alternative need ROWs, so that people may legally access private land across public land, and so that people may legally access public land across private land. A greater number of signs may be required on the Monument to compensate for the lack of an official travel map.

Cultural Resources Management

Under Alternative I, cultural resources management would include stabilizing and developing up to 240 sites, along with controlled visitation and various levels of interpretation; managing data and collected material to enhance public awareness of resources through interpretation by the AHC; and developing and protecting suitable cultural resources for public enjoyment. Routes would be closed, when necessary, to limit access, and to protect cultural resources. Greater maintenance would be required for routes that direct visitors to particular cultural sites. This is because traffic on these routes would increase, and would often include two-wheel drive, low-clearance vehicles.

Fluid Minerals Management

Approximately 80 percent of Monument lands are currently leased for fluid minerals development. Under Alternative I, the remaining 20 percent would not be leased; therefore, no impacts would occur from new leases.

New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 67 miles of routes. Many of these routes or portions of them may currently be in existence; however, many of these routes would be new construction.

Livestock Grazing Management

Under this alternative, livestock grazing would be managed to improve Public Land Health Standards, and to protect Monument objects. Use of the transportation system by livestock grazing permittees may be expected to continue, as under current management, with up to 8,492 AUMs and up to 28 allotments. Ninety-seven percent of Monument lands fall within an allotment under this alternative. This management may result in no impacts to the travel management system.

Recreation Management

Under Alternative I, recreation management would include developing facilities on an as-needed basis, and maintaining developed sites at Lowry, Painted Hand, and Sand Canyon Pueblos. No new SRPs would be issued. An off-road vehicle management program would be implemented, and some OHV-route designations would occur. This alternative contains no promotion strategy for the Monument; therefore, visitation may be expected to continue to grow at the same rate as in the local region. Increased visitation may result in a greater need for a clearly defined travel management system, with an official travel map and signage. This alternative may not meet that need, and would typically react to needs rather than plan ahead for them. This alternative may not be visitor-friendly, thus making it more difficult for visitors to navigate around the Monument which, in turn, may result in more user-created routes or in public use of non-public routes. Law enforcement, with regard to travel restrictions, may be difficult, in that travel restrictions would not be defined or displayed for the public.

Other Resources Management

Under this alternative, soil SSR/CSU stipulations would be applied for slopes greater than 40 percent, (21,036 acres). These SSR/CSU stipulations would require an engineering/reclamation plan that demonstrates how site productivity would be restored, how surface runoff would be controlled, and how offsite areas would be protected from accelerated erosion. In addition, surface-disturbing activities would not be allowed during extended wet periods. This may impact the transportation system in that construction, realignment, and reclamation efforts would be restricted.

Alternative V (Preferred Alternative)***Transportation Management***

The transportation system, under Alternative V, would consist of up to 169 miles of routes and summarized as follows:

- Limited Access + Public Foot, Horse = 59 miles;
- Limited Access + Public Foot, Horse, Bicycle = 0 miles;
- Public Foot = 3 miles;
- Public Foot, Horse = 1 mile;
- Public Foot, Horse, Bicycle = 23 miles;
- Public Foot, Horse, Bicycle, OHM, ATV = 8 miles;
- Public Open to All Travel Means = 74 miles; and
- Fluid mineral routes on new leased lands = 1 mile.

Under this alternative, routes would be maintained. Upgrades designed to accommodate additional or different uses would not be allowed. The total mileage of routes would be increased from up to 149 miles under Alternative I, to up to 169 miles under Alternative V. The total mileage of routes open to all travel means by the public would be reduced from 131 to 74 miles.

Under this alternative, there would be up to 19 miles of routes specifically designated for OHV, mountain bike, or OHM travel. These forms of travel would also be allowed on routes designated as open to all forms of travel. Under this alternative, 126,737 acres would be designated "limited," and 38,598 acres would be designated "closed." All cross-country motorized and mechanized travel would be prohibited. Foot travel, horseback riding and mechanized travel in Special Recreation Management Area (SRMA) 2 (Sand Canyon/Rock Creek) would be restricted to designated routes only. Motorized travel is prohibited in SRMA 2.

This alternative would meet the Proclamation requirement to establish a Travel Management Plan. As a result, an official travel map would be generated and distributed to the public, and signage would be placed throughout the Monument to help direct the public. These actions may help to alleviate confusion regarding travel within the Monument, thereby reducing user-created routes and misuse of routes. A clear and definitive travel system may be easier to administer and to enforce.

Cultural Resources Management

Under Alternative V, cultural resource management would include stabilizing and/or developing 13 to 25 sites for public use, preparing CRMPs for these sites, and evaluating SRPs for site visits. Route maintenance efforts would focus on areas where visitors are directed. The majority of the Monument, however, would be promoted as an outdoor museum, allowing visitors to experience the Monument through self-discovery. This alternative would protect cultural resource settlement clusters and/or sites at the landscape level. Protecting large blocks of land may prevent future route development from weaving between individual cultural sites. Mitigating for potential impacts to cultural sites and to settlement clusters may result in the relocation or redesign of site-specific segments of routes. Increased traffic may occur on certain routes, leading to sites that are interpreted for the public, or to sites that are being stabilized.

Fluid Minerals Management

In addition to impacts from current fluid mineral leases as described in Alternative I, under Alternative V, up to 880 acres would be available for leasing to protect against drainage. A total of up to 18 acres of new ground disturbance would be possible, and up to 1 mile of additional routes would be required. This disturbance may occur on existing leased lands to access minerals associated with new leases. Geophysical operations would be restricted to BLM-designated routes. Seismic operations requiring bulldozers, earthmoving equipment, and/or explosives would be prohibited. Soil resource NGD/NSO stipulations for slopes greater than 30 percent (up 36,504 acres) would apply. BMPs would be included in COAs for new leases. Impacts to the travel management system may include increased traffic, with large vehicles possibly impacting public safety at locations where new development occurs.

Development of current leases may continue to impact travel management systems. Protective measures in leased areas may include the consolidation of maintenance activities to reduce human disturbance, and to minimize the need for site visits to any existing lease areas. With fluid minerals development possible over 80 percent of the Monument, impacts to the transportation system may include the need for additional routes. It may also result in increased traffic, increases in large vehicles (which may, in turn, possibly impact public safety), and increased garbage and litter. Signs and gates may be required on certain routes where public travel would not be allowed.

Livestock Grazing Management

Under this alternative, livestock grazing would be managed to improve Public Land Health Standards, and to protect Monument objects. A reduction in AUMs would occur; however, use of the travel management system by livestock grazing permittees would be expected to continue at about the current level. This management may result in little or no impacts to transportation.

Recreation Management

Alternative V would promote low-impact activity; however, it would provide for motorized vehicle access throughout the Monument. Approximately 7,875 acres would be managed for public visitation, and 157,460 acres would be managed for backcountry use. Alternative V would identify and manage RMZs and SRMAs. It would add minimal facilities and infrastructure, thereby not disturbing the pristine experience of the area. A large portion of the Monument is planned for management for a backcountry experience; therefore, an increased need for motorized access may not occur. Routes leading to areas where the public is directed (such as to interpreted cultural resource sites) would receive increased traffic. Providing a travel map and signage would direct recreation users to legal access routes, and would help them identify authorized methods of transportation.

Other Resources Management

Under this alternative, soil NGD/NSO stipulations for slopes greater than 30 percent (36,504 acres) would apply. BMPs would be required for all ground-disturbing activities. This may result in restrictions for route development.

Alternative VI (Proposed Plan)

Transportation Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, the transportation system would consist of up to 172 miles of routes and summarized as follows:

- Limited Access + Public Foot, Horse = 52 miles;
- Limited + Public Foot, Horse, Bicycle = 12 miles;
- Public Foot = 3 miles;
- Public Foot, Horse = 3 mile;
- Public Foot, Bike = 1 mile;
- Public Foot, Horse, Bicycle = 24 miles;
- Public Foot, Horse, Bicycle, OHM, ATV = 8 miles;
- Public Open to All Travel Means = 68 miles; and
- Fluid mineral routes on new leased lands = 1 mile.

Under this alternative, routes would be maintained. Upgrades to accommodate additional or different uses would not be allowed. The total mileage of routes would be increased from up to 149 miles under Alternative I, to up to 172 miles. The total mileage of routes open to all travel means by the public would be reduced from 131 to 68 miles.

Under this alternative, there would be up to 8 miles of routes specifically designated for OHV. This form of travel would also be allowed on routes designated as open to all forms of travel. Under this alternative, 126,737 acres would be designated "limited," and 39,653 acres would be designated "closed." All cross-country motorized and mechanized travel would be prohibited. Foot travel, horseback riding and mechanized travel in Special Recreation Management Area (SRMA) 2 (Sand Canyon/Rock Creek) would be restricted to designated routes only. Motorized travel is prohibited in SRMA 2.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, 158,515 acres would be managed for backcountry use.

Other Resources Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, soil NGD/NSO stipulations for slopes greater than 30 percent would apply to 36,607 acres.

Table 4-49 Comparison of Impacts to Transportation Management

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Transportation (includes new fluid mineral routes)	Manage 149 miles of routes; 864 acres of disturbance (per 1985 RMP decision). 1,235 acres of disturbance (per 2000-2002 inventory). Develop 7 facilities.	Manage 139 miles of routes; 806 acres of disturbance. Develop 7 facilities.	Manage 189 miles of routes; 1,096 acres of disturbance. Develop 13 facilities.	Manage 213 miles of routes; 235 acres of disturbance. Develop 20 facilities.	Manage 169 miles of routes; 980 acres of disturbance. Develop 9 facilities.	Manage 172 miles of routes; 997 acres of disturbance. Develop 9 facilities.
Cultural Resources	Develop new sites for controlled visitation.	Develop 13 sites.	Develop 13 to 25 sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Develop 0 new miles of routes.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance on neighboring leased lands to obtain minerals from new leased lands). Develop 1 new mile of route. Apply NGD/NSO, CSU/SSR, TL, and	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance). Develop 3 new miles of routes. Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance). Develop 19 new miles of routes. Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Same as Alt. II.	Same as Alt. II.

Table 4-49 Comparison of Impacts to Transportation Management

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
		COA restrictions.				
	Continued development of existing leases (127,895 acres) with up to 1,985 acres new disturbance.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.
Recreation	Maintain developed recreation sites at Lowry, Painted Hand, and Sand Canyon for interpretation. Allow no new commercial permits (Special Recreation Permits- SRPs). Allow dispersed camping. Retain existing limitations and closures. No	Manage 8,211 acres for front country public visitation. Manage 157,124 acres for backcountry use. Allow no new SRPs, no renewal of existing SRPs. Do not allow camping, campfires, geocaching or recreational shooting anywhere in the Monument.	Manage 18,875 acres for front country public visitation. Manage 146,460 acres for backcountry use. Allow no new SRPs. Allow renewal of existing SRPs. Allow camping and campfires within Mockingbird mesa-Rincon, squaw-Cross Canyon, and Goodman Point SRMAs. Do not	Manage 47,056 acres for front country public visitation. Manage 118,279 acres for backcountry use. Allow new SRPs on a case by case basis. Allow camping and campfires within Mockingbird mesa-Rincon, squaw-Cross Canyon, and Goodman Point SRMAs and in designated sites in	Manage 7,875 acres for front country public visitation. Manage 157,460 acres for backcountry use. Allow 10 SRPs. Allow camping and campfires within Mockingbird mesa-Rincon, squaw-Cross Canyon, and Goodman Point SRMAs. Allow climbing in designated sites only. Do not allow	Manage 7,875 acres for front country public visitation. Manage 158,515 acres for backcountry use. Allow 10 SRPs. Allow camping and campfires within Mockingbird mesa-Rincon, squaw-Cross Canyon, and Goodman Point SRMAs. Allow climbing in designated sites

Table 4-49 Comparison of Impacts to Transportation Management

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	restrictions on geocaching, climbing or recreational shooting.		allow climbing, geocaching or recreational shooting anywhere in the Monument.	other SRMAs. Do not allow climbing, geocaching or recreational shooting anywhere in the Monument.	geocaching or recreational shooting anywhere in the Monument.	only. Do not allow geocaching or recreational shooting anywhere in the Monument.
Other Resources: Soil Resources	Apply no accelerated erosion standard. Apply SSR/CSU to protect slopes greater than 40 percent (21,036 acres).	Apply zero-level accelerated erosion standard. Apply NGD/NSO stipulation to protect slopes steeper than 30 percent (36,504 acres).	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Apply zero-level accelerated erosion standard. Apply NGD/NSO stipulation to protect slopes steeper than 30 percent (36,607 acres).

4.3.8.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-50 Past, Present, and Future Activities influencing Transportation
Past Activities
No authorized travel management plan or associated map developed
Limited access points identified with private land intertwined with the Monument
Manage 149 miles of routes
80% of the Monument leased with standard stipulations
25,549 acres Wilderness Study Area designated
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, Clean Air Act, National Environmental Protection Act, and other legislation protecting natural resources
Present Activities
Increased fluid mineral development and greater demand for route numbers and improved condition
Increased use of OHVs
Manage 213 miles of routes
Subdivision of private lands in and around the Monument
Increased use by hikers, mountain bikers and horseback riders particularly in the Sand Canyon/Rock Creek Special Recreation Management Area
Trail of the Ancients Historic and Scenic Byway designated
National Monument designation by Presidential Proclamation to protect the objects
Future Activities (Proposed Plan)
Continued increase in fluid mineral development
Lease 880 new acres for drainage with restrictive stipulations in addition to development on currently leased lands

Table 4-50 Past, Present, and Future Activities influencing Transportation
Continued subdivision of private lands in and around the Monument
Manage 172 miles of routes
Specific marketing strategies identified for Special Recreation Management Areas
An addition of 5,233 acres managed for wilderness characteristics
Travel management plan with associated map developed and implemented

The primary contributors to route development within the Monument are user-created for recreation purposes and those associated with fluid minerals development. The cumulative disturbance activities on the Monument are as follows:

Table 4-51 Cumulative Acres of Disturbance (Past, present and projected future acres)	
Development Type	Disturbance Area (acres) (Maximum, including what may be reclaimed)
Fluid Mineral Development	3,168 acres (1,165 past leased + 883 future leased + 18 future new leases + 1,102 seismic)
Routes	1,235 acres (213 miles is maximum number to exist)
1960s Chained/Harrowed Vegetation Treatments	15,000 acres
Total Acres	21,624 acres

Impacts to the local route systems within, and adjacent to, the Monument would likely include the need for expansion and maintenance, depending upon area population growth. This may result from nearby agriculture fields being subdivided and developed primarily for residences, as well as from an influx of recreation users and/or an increase in fluid minerals development. Private, county, and State route maintenance costs may continue to reflect the increased level of need; however, funds may be focused more on developed and primary access routes. In terms of maintenance, less developed, natural surface routes (as occur within the Monument) would depend upon Federal funding. This funding may not increase at the rate in which maintenance is needed. As use of the public lands increases, these impacts may increase.

The increase in route mileage within the Monument resulting from fluid minerals exploration and development on existing leases over the next 20 years is estimated to be up to 67 miles. These new routes may result in up to 360 acres of surface disturbance. Generally, fluid minerals development routes are constructed and maintained by the operator.

Depending upon residential and tourist growth in the region, additional parking areas and developed site facilities may be required. In terms of protecting the objects of the Monument, additional law enforcement may be needed. This is due to increased user-created routes and illegal cross-country travel.

As a result of increased demand for infrastructure, visual impacts to the natural landscape may occur. Construction of facilities, with their associated ground disturbance, may result in the loss of wildlife habitat, as well as in the possibility of erosion with additional sediment moving into stream systems. Noise levels from increased human presence (including voices, as well as noise associated with the movement of people and vehicles) may reduce wildlife habitat security.

4.4. Special Designations

4.4.1. Areas of Critical Environmental Concern

The primary goal for ACECs within the Monument is to provide consistent protection and management of important cultural and natural resources. The management objective related to this goal is to manage to maintain and/or to enhance the special resource values within the Monument (see Appendix S).

Beneficial impacts may include actions that further enhance and/or protect the qualities for which the ACECs were designated. Adverse impacts may include actions that might diminish the value of the area being protected.

4.4.1.1. Evaluation Criteria and Assumptions

Evaluation criteria for comparing impacts under the various alternatives in relation to ACECs depend upon the purpose of the designation. In the case of the Monument itself, the designation was for the purpose of protecting cultural and natural resources.

Assumptions used in analyzing impacts to special designation areas include the following:

- This impact analysis considers the spatial boundary as the existing limits of the ACECs, and the temporal boundary as the next 20-year period. This would apply to both individual and cumulative impacts analyses.

4.4.1.2. Alternative Analysis

Impacts to ACECs may differ depending upon the specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed for ACECs, as well as those from the management actions proposed for cultural resources, fluid minerals, livestock grazing, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Areas of Critical Environmental Concern Management

Alternative I would maintain the current designation of the Anasazi Cultural Multiple-Use Area ACEC (Anasazi ACEC) on 165,335 acres of BLM-administered lands. In addition, management actions would provide multiple-use opportunities, along with closer monitoring of surface-disturbing activities. Alternative I would propose no change to the current management of the ACEC since protection is provided through the designation of the area as a National Monument; therefore, there would be no new impacts to the ACEC.

Cultural Resources Management

Alternative I would manage cultural resources to preserve and protect them throughout the ACEC. This alternative may result in beneficial impacts to the ACEC by furthering the goals for which the ACEC was designated, and by continuing to provide a multiple-use area while, at the same time, protecting the area's natural, biological, and cultural resources.

Fluid Minerals Management

This alternative would allow no new fluid minerals leases, therefore, no impacts to the ACECs would occur as a result of new leasing. Fluid mineral development on existing leases would result in both direct and indirect impacts to cultural resources. New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance which could impact up to 347 cultural resource sites. Ongoing development within existing leases would continue to impact scenery and the cultural resource setting which would, in turn, impact the values planned for protection by the ACEC designation.

Livestock Grazing Management

Under this alternative, livestock grazing would permit up to 8,492 active AUMS. There would be no new management actions pertaining to livestock grazing. Vegetation and soil resources within the ACEC may continue to decline, which would prevent Public Land Health Standards from being met.

Recreation and Transportation Management

In general, the fewer the number of routes, the less the amount of ground disturbance and associated resource damage, including less impacts to vegetation, water, soil, and/or to scenic values. Under this alternative, there would be up to 149 miles of routes within the ACEC. This may result in a route density of 0.58 miles per square mile, and a ground disturbance of up to 864 acres. Visitation to the area may impact the character and the quality of pristine areas. Maintaining large areas for a backcountry experience may help to direct the majority of visiting publics to a few specific developed locations (such as Lowry, Painted Hand, and Sand Canyon Pueblos). These actions may help maintain ACEC values within the Monument.

Other Resources Management

Alternative I would protect 2,415 acres of riparian/wetlands system. Under this alternative, there would be no restrictions placed on groundwater or on new water developments. This alternative may be the least protective of water resources, which is another value promoted by the ACEC designation.

Alternative V (Preferred Alternative)

Areas of Critical Environmental Concern Management

Under Alternative V, the ACEC designation would be removed, except for RNAs (7,826 acres), which are unique types of ACEC (see Appendix S). The ACEC designation would be dropped because the Presidential designation of the Anasazi ACEC as a National Monument supersedes the administrative ACEC designation. Management actions would continue to provide multiple-use opportunities within the Monument; however, primary emphasis would be placed on cultural and natural resource values. Protection of cultural resource sites and settlement clusters, as proposed under this alternative, may result in large undisturbed areas, which would, in turn, allow for a greater potential for recovering information from cultural and natural resource landscapes. This would help Monument management achieve the goals set

forth under the original ACEC designation and goals carried forward by the Monument designation.

Cultural Resources Management

Under Alternative V, the Monument would be managed as an outdoor museum, allowing backcountry exploration and self-discovery of cultural resource sites. In addition, 13 to 25 cultural sites would be developed for public visitation. This may result in beneficial impacts, in that it may facilitate visitation through routes, interpretive signs, and education. The development of these cultural resource sites may enhance visitor experiences and prevent impairment of these resources, which may, in turn, help Monument management achieve the goals set forth under the original ACEC designation and goals carried forward by the Monument designation.

Fluid Minerals Management

This alternative would require that all fluid minerals exploration and development activities be conducted in manner that protects cultural resource settlement clusters and sites, and that isolated finds are fully documented. This may help to protect large blocks of land from ground disturbance. In addition to impacts from current fluid mineral leases as described in Alternative I, up to 880 acres would be available for new leases, but only to protect against drainage. This may result in up to 18 acres of ground disturbance. The 18 acres of disturbance may occur on existing leased lands to access minerals associated with new leases. The greater threat to maintaining ACEC values, when compared to new leases for drainage purposes, is from the ongoing development of existing fluid minerals leases within the Monument as described in Alternative I. The implementation of multi-year development plans and GADPs may help to protect ACEC values, in that up-front efforts may improve planning related to fluid minerals development.

Livestock Grazing Management

Alternative V would decrease livestock grazing to up to 6,437 permitted AUMs, and would close 5 allotments to grazing. The reduction in AUMs, as well as the addition of intense management, may expedite land health improvement. Cultural resources may sustain fewer impacts resulting from livestock rubbing and trampling. In addition, there may be a reduction in erosion, in that increased vegetative cover may help to hold cultural resource artifacts on site, may improve wildlife habitat, and may promote the existence of native vegetation.

Recreation and Transportation Management

In general, the fewer the number of routes, the less the amount of ground disturbance and associated resource damage, including less impacts to vegetation, water, soil, and/or to scenic values. Under this alternative, there would be up to 169 miles of routes. This may result in a route density of 0.66 miles per square mile, and a ground disturbance of up to 980 acres. However, this alternative would maintain large areas for a backcountry experience. This alternative would manage up to 7,875 acres for public visitation, and up to 157,460 acres for backcountry experiences. This alternative would designate the largest number of acres within the Monument to backcountry experiences. Protection of soil, water, and vegetation resulting from the lack of development proposed under this alternative may help Monument management achieve the goals set forth under the original ACEC designation and goals carried forward by the Monument designation.

Other Resources Management

Alternative V would protect 5,312 acres of riparian/wetlands system, including canyon bottoms, riparian/wetlands areas, and floodplains. Groundwater and new water developments would be

discouraged. This alternative would protect water resources, maintaining the integrity of the original ACEC.

Alternative VI (Proposed Plan)

Areas of Critical Environmental Concern Management

The impacts would be the same as those described under Alternative V except 8,881 acres would be designated as an ACEC.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V. However, under the Proposed Plan, there would be up 172 miles of routes. This may result in a route density of 0.64 miles per square mile, and a ground disturbance of up to 963 acres. In addition, 158,515 acres would be managed for backcountry experiences.

Other Resources Management

Alternative VI would protect 5,528 acres of riparian/wetlands system, including canyon bottoms, riparian/wetlands areas, and floodplains. Groundwater and new water developments would be discouraged. Some areas within RNAs (which are ACECs) contain riparian/wetlands vegetation.

Table 4-52 Comparison of Impacts to Areas of Critical Environmental Concern (ACEC)

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
ACEC	Maintain ACEC designation on 165,335 acres.	Drop ACEC designation, except for RNAs. Manage 7,826 acres as ACEC.	Drop ACEC designation, except for RNAs. Manage 427 acres as ACEC.	Same as Alt. III.	Same as Alt. II.	Drop ACEC designation, except for RNAs. Manage 8,771 acres as ACEC.
Cultural Resources	Protect cultural resource sites.	Protect cultural resource settlement clusters, sites, and isolated finds.	Protect cultural resource settlement clusters and sites.	Protect cultural resource settlement clusters and sites.	Protect cultural resource settlement clusters and sites.	Protect cultural resource settlement clusters and sites.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new leased lands).	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance with an NSO stip. that applies to new leases).	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance with an NSO stip. that applies to new leases).	Same as Alt. II.	Same as Alt. II.
	Continue development of existing leases (127,895 acres) with up to 1,985 acres new disturbance. Some ACEC	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.

Table 4-52 Comparison of Impacts to Areas of Critical Environmental Concern (ACEC)

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	areas fall within existing leases.					
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.
Recreation and Transportation	149 miles of routes and 864 acres of disturbance (per 1985 RMP decision). 1,235 acres of disturbance (per 2000-2002 inventory).	139 miles of routes and 806 acres of disturbance.	189 miles of routes and 1,096 acres of disturbance.	213 miles of routes and 1,235 acres of disturbance.	169 miles of routes and 980 acres of disturbance.	172 miles of routes and 997 acres of disturbance.
Other Resources: Water Resources	Protect 2,415 acres of riparian. Apply no restrictions on groundwater and new water developments.	Protect 5,312 acres of canyon bottoms, riparian and floodplain. Discourage groundwater developments.	Protect 5,312 acres of canyon bottoms, riparian and floodplain. Allow groundwater developments.	Protect 3,217 acres of riparian and floodplain. Encourage groundwater developments.	Same as Alt. II.	Same as Alt. II.

4.4.1.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future. The analysis begins with the original designation of the area as an ACEC in 1985.

Table 4-53 Past, Present, and Future Activities influencing ACECs
Past Activities
Historic vandalism and looting
Historic unmanaged livestock grazing
Chaining and other ground disturbing vegetation treatments
Unmanaged transportation and recreation
80% of the Monument leased with standard stipulations
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Designation of the area as an ACEC in 1985
Present Activities
National Monument designation by Presidential Proclamation
Future Activities (Proposed Plan)
Designation of ACEC dropped except where it overlaps with RNA designation
8,771 acres managed as RNA/ACEC

There would be no cumulative impacts as a result of removing the ACEC designation from the overall Monument. The Presidential Proclamation designating the ACEC as a National Monument would fulfill the original purpose for setting aside the area for protection. Impacts may occur that would, however, diminish the purpose for declaring the area as a National Monument (originally, as an ACEC). (Please refer to the analysis of cultural resources, wildlife, and vegetation in this chapter). These may include potential impacts to RNAs, especially those resulting from fluid minerals development where NSO stipulations have not been applied.

4.4.2. Scenic and Historic Byways

The primary goal for Scenic and Historic Byways within the Monument is to implement the Corridor Management Plan for the Trail of the Ancients Scenic and Historic Byway (the Byway), in cooperation with management partners. The Byway provides access to examples of Ancestral Puebloan culture, as well as to scenic vistas of Colorado Plateau geology and ecology. The management objective related to this goal is to preserve resource values while, at the same time, implementing site-specific actions in the Corridor Management Plan.

Beneficial impacts to the Byway may include those resulting from management actions that enhance the pristine, natural conditions that are viewed from the roadway, and/or the historic values for which the roadway was designated. Adverse impacts may include those resulting from actions that reduce these values.

Direct impacts to the Byway may include the implementation of an unnatural-appearing vegetation treatment that diminishes its scenic quality, especially if these treatments can be seen from the Byway. On the other hand, managing livestock grazing in a manner that results in healthy native vegetation along the roadway may indirectly benefit the Byway designation, in that scenic quality may be maintained. Impacts may also include potential fluid minerals development, and/or visitor services development, adjacent to the Byway.

4.4.2.1. Evaluation Criteria and Assumptions

In order to quantify impacts, acres of disturbance, miles of routes, and numbers of livestock can be measured. However, quantifying these impacts within the viewshed of the Byway may be more difficult. Special considerations and restrictions exist for the placement of structures adjacent to Scenic Byways. The number of structures may increase under a particular alternative; however, the placement of structures adjacent to the Byway may not occur. For example, although fluid minerals development may occur, the infrastructure associated with that development must be placed outside of the viewshed of the Byway.

Assumptions used in analyzing impacts to Scenic and Historic Byways include the following:

- The impacts analysis boundary for the Byway would include the area seen in the foreground of County Road 10.
- The San Juan Skyway does not enter the Monument (it does, however, reference the AHC as a point of interest); therefore, this analysis pertains only to the Byway.

4.4.2.2. Alternative Analysis

Impacts to the Byway may differ depending upon the specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed for Scenic and Historic Byways, as well as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Scenic and Historic Byways Management

The Trail of the Ancients Scenic and Historic Byway was established because of the unique cultural and natural resources in the area. Therefore, protection of these resources is important in maintaining the intent of the Byway. Alternative I would continue to ensure that significant cultural resources are identified, and that they are given proper consideration as part of advance planning for project-level decisions. A comprehensive Monument-wide program for the

inventory, protection, and interpretation of cultural resources is not explicitly addressed in the management actions of existing plans, or those proposed to be used under Alternative I. Current management of public lands is required to comply with all applicable laws and regulations that provide for the protection of cultural and historical resources; however, this alternative may result in indirect impacts to cultural resources. Adverse impacts to the Byway may include increased visitor usage of the Byway, and other public routes, by a combination of motorized and/or non-motorized travel. This may increase the need for route maintenance, including trash pickup, infrastructure (such as signage), and law enforcement for traffic control and public safety.

Cultural Resources Management

Under Alternative I, cultural resources would continue to be developed for visitation and interpretation. As a result, there would be no change in the impacts to the Byway.

Fluid Minerals Management

Under this alternative, no new fluid minerals leases would be available. Existing leases would continue to be developed, and analyzed, on a project-specific basis. New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. New development on existing leases is estimated to cause 1,985 acres of disturbance. Activities related to fluid minerals management on existing leases may degrade visual resources viewed from the Byway and increase traffic on the Byway.

Livestock Grazing Management

Under this alternative, management of livestock grazing would be based upon permitting up to 8,492 AUMs. No new impacts would occur under this alternative. However, current impacts would continue, including continued poor rangeland health.

Recreation and Transportation Management

Under this alternative, recreation management would promote visitation to Lowry, Painted Hand, and Sand Canyon Pueblos. Currently, there are 149 miles of routes, representing 864 acres of ground disturbance. Under this alternative, impacts to the Byways may not change, however, concerns or issues with the Byway would not be incorporated into a comprehensive Travel Management Plan.

Other Resources Management

Under this alternative, VRM objectives would discourage permanent or long-term visual intrusions, and would strive to preserve scenic values, thereby enhancing viewing opportunities and increasing variety, where appropriate. No specific VRM objective is assigned to the Byway. In accordance with the San Juan/San Miguel RMP, VRM decisions for the Byway viewshed would occur on a project-specific basis. This would not allow for a proactive approach toward maintaining the viewshed along the Byway, or incorporate concerns for its protection into project planning.

Alternative V (Preferred Alternative)***Scenic and Historic Byways Management***

This alternative would emphasize the protection of cultural resource settlement clusters and sites, as well as of natural resources which are key attractions for the Scenic and Historic Byway. Under this landscape-scale management approach, potential direct visual impacts along the Byway may be reduced. The designation, clarification, and implementation of a Travel

Management Plan may assist in preventing unwanted off-road travel. Managed access would concentrate visitors in areas of developed cultural resource sites and maintain the majority of the Monument in a backcountry setting. This may reduce visual impacts along the Byway, while, at the same time, requiring the maintenance and infrastructure to support visiting publics.

Cultural Resources Management

Under Alternative V, the Monument would be managed as an outdoor museum, allowing visitors to experience the Monument through self-discovery. Under this alternative, 13 to 25 sites would be developed for visitation and interpretation. This may direct visitors to sites accessed off of the Byway, which may, in turn, increase the use of the Byway.

Fluid Minerals Management

Under this alternative, protective measures in leased areas would include the consolidation of maintenance activities to reduce human disturbance and to minimize the need for site visits to any existing lease areas. No increase in infrastructure development in new lease areas would occur along the Byway. There would be no impacts to Byway usage resulting from the leasing of up to an additional 880 acres. The majority of impact to the Byway would occur on lands already leased for fluid minerals development. Currently, eighty percent of the Monument is leased (and the BLM is required to honor valid existing rights); therefore, impacts resulting from development within areas already leased are going to continue to occur. The use of multi-year development plans and GAPDs may help to minimize impacts, in that up-front efforts may improve planning related to fluid minerals development. Implementing mitigation measures, COAs, BMPs, and stipulations may also help to minimize impacts.

Livestock Grazing Management

Under Alternative V, rangeland resources would be managed to reduce conflicts between livestock grazing and recreation users, and to protect cultural resources. There would be a reduction of 2,055 active AUMs available (from 8,492 active AUMs under Alternative I to up to 6,437 under Alternative V). Reducing these AUMs may result in beneficial impacts, in that it may improve vegetative cover and land health, may restore natural conditions, and may enhance the scenic quality along the Byway.

Recreation and Transportation Management

Alternative V would identify and manage RMZs and SRMAs. It would promote low-impact activity with minimal facilities and infrastructure, thereby not disturbing the pristine experience of the area. This alternative would promote visitation by a mix of local residents, as well as by regional, national, and international visitors. Alternative V would maintain up to 169 miles of routes, representing up to 980 acres of ground disturbance, with most existing user-created routes closed and reclaimed. Approximately 7,875 acres would be managed for public visitation, with 157,460 acres managed for backcountry use. Most user-created routes would be closed and reclaimed. However, the overall increase in available route access may encourage the public to explore more of the Monument, and to use the Byway as a means of accessing the Monument. Under this alternative, concerns or issues with the Byway would be incorporated into a comprehensive Travel Management Plan. The Travel Management Plan, along with its associated travel map, would provide clear direction on legal access, which may, in turn, keep illegal user-created routes from developing. A Travel Management Plan may also provide law enforcement with the support necessary to enforce travel restrictions.

Other Resources Management

This alternative would manage 38,598 acres as VRM Class I; 126,643 acres as VRM Class II; and 94 acres as VRM Class III. The Byway, along with a 0.5-mile buffer, would be managed as

VRM Class II. This would help to maintain the viewshed of the Byway, adding restrictions that would not necessarily apply elsewhere.

Alternative VI (Proposed Plan)***Scenic and Historic Byways Management***

The impacts would be the same as those described under Alternative V.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V. However, the Proposed Plan would maintain up to 172 miles of routes, representing up to 997 acres of ground disturbance, with most existing user-created routes closed and reclaimed. In addition, 158,515 acres would be managed for backcountry use.

Other Resources

This alternative would manage 41,834 acres as VRM Class I; 100,394 acres as VRM Class II; 14,190 acres as VRM Class III; and 9,972 acres as VRM Class IV. The Byway, along with a 0.5-mile buffer, would be managed as VRM Class II.

Table 4-54 Comparison of Impacts to Scenic and Historic Byways

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Scenic and Historic Byways	Take no actions specific to Scenic and Historic Byways.	Implement site specific actions that enhance Scenic and Historic Byways.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.
Cultural Resources	Develop new sites for controlled visitation.	Develop 13 sites.	Develop 13 to 25 sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new leased lands). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Same as Alt. II.	Same as Alt. II.
	Continued development of existing leases (127,895 acres) with up to 1,985 acres new	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.

Table 4-54 Comparison of Impacts to Scenic and Historic Byways

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	disturbance.					
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.
Recreation and Transportation	Manage 149 miles of routes; 864 acres of disturbance (per 1985 RMP decision). 1,235 acres of disturbance (per 2000-2002 inventory). Develop 7 facilities.	Manage 139 miles of routes; 806 acres of disturbance. Develop 7 facilities.	Manage 189 miles of routes; 1,096 acres of disturbance. Develop 13 facilities.	Manage 213 miles of routes; 235 acres of disturbance. Develop 20 facilities.	Manage 169 miles of routes; 980 acres of disturbance. Develop 9 facilities.	Manage 172 miles of routes; 997 acres of disturbance. Develop 9 facilities.
Other Resources: Visual Resources	No VRM Classes identified.	Manage 38,598 acres as VRM Class I. Manage 126,643 acres as VRM Class II. Manage 94 acres as VRM Class III.	Manage 25,976 acres as VRM Class I. Manage 41,867 acres as VRM Class II. Manage 104,605 acres as VRM Class III.	Manage 25,976 acres as VRM Class I. Manage 27,535 acres as VRM Class II. Manage 94,327 acres as VRM Class III. Manage 17,497 acres as VRM Class IV.	Same as Alt. II.	Manage 41,724 acres as VRM Class I. Manage 100,394 acres as VRM Class II. Manage 14,190 acres as VRM Class III. Manage 9,972 acres as VRM Class IV.

4.4.2.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-55 Past, Present, and Future Activities influencing Scenic and Historic Byways
Past Activities
80% of the Monument leased for fluid mineral development
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, Clean Air Act, and other legislation protecting natural resources
Designation of the Trail of the Ancients Scenic and Historic Byway
Present Activities
Increased fluid mineral development
National Monument designation by Presidential Proclamation to protect the objects while managing valid existing rights so as not to create any new impacts to the objects
Future Activities (Proposed Plan)
Protection of cultural and natural resources on a landscape level to minimize cumulative impacts and manage for resource setting
Continued increase in fluid mineral development and associated facilities and routes
Spread of noxious weeds
Increased Monument visitation and pass-through traffic
Increased need for law enforcement for traffic control and public safety

The Byway, along County Road 10, was established for its cultural resource values and natural beauty. Fluid minerals development may be the most immediate threat to maintaining the pristine character of this Byway, with potential impacts resulting from already leased areas within the Monument, as well as from fluid minerals exploration and development on neighboring private land.

Furthermore, roadways within, and adjacent to, the Monument would be used more often and, potentially, by the larger and heavier vehicles associated with fluid minerals development. This increased use may result in a greater need for maintenance, litter clean up, and law enforcement for traffic control and public safety. The invasion of noxious weeds from offsite influences may impact vegetation along the Byway, which may, in turn, compromise the natural beauty of the travel corridor, as well as its use by wildlife. The increase in visitors to the Four

Corners region may increase the use of the Byway, regardless of actions taken within the Monument.

4.4.3. Research Natural Areas

The primary goal for the McElmo RNA, as well as for the proposed RNAs, is to provide a natural and undisturbed setting for scientific research and public education. The management objectives related to this goal include:

- maintain and manage the McElmo RNA as a herpetological research area, as a resource for educational institutions, and as an outdoor classroom;
- enhance protections preventing ground-disturbance in the McElmo RNA, and protect RNAs proposed by the Colorado Natural Heritage Program (CNHP) from adverse impacts resulting from ground-disturbing activities;
- enhance research and outdoor educational opportunities within the RNAs;
- reduce livestock grazing pressure within the RNAs;
- protect RNAs from impacts that could adversely impact sensitive plant species;
- evaluate the potential expansion of the McElmo RNA boundary; and
- consider all RNAs as ACECs (see Appendix S).

This section discusses impacts resulting from of the management of RNAs, as well as other key resource management alternatives, to RNAs. (Refer to Table 2.1 for the proposed RNA management actions, and refer to Section 3.3.3 for a description of existing RNA conditions within the Monument.)

Adverse impacts to RNAs may include any action that diminishes habitat for the longnose leopard lizard, and sensitive plant species, as well as for other resources, especially herpetological, within the Monument. Beneficial impacts may include actions that enhance the natural features of the RNAs (such as their vegetation, water, and/or wildlife). Direct impacts may include the direct mortality of lizards and/or of other sensitive plants and wildlife within the RNAs. Indirect impacts may include the degradation of wildlife habitat.

4.4.3.1. Evaluation Criteria and Assumptions

Factors used to quantify impacts to the RNAs include acres, miles, and/or number of AUMs that may impact the natural resources within the RNAs. The number, and kind, of protective measures can also be used to differentiate alternatives.

Assumptions used in analyzing impacts to RNAs include the following:

- This impact analysis, for both individual and cumulative impacts, considers the spatial boundary to be the existing and/or expanded boundary of the McElmo RNA and proposed RNAs, and the temporal boundary to be the next 20-year period.

4.4.3.2. Alternative Analysis

Impacts to RNAs may differ depending upon specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed

for RNAs, as well as those from the management actions proposed for cultural resources, fluid minerals, livestock grazing, and recreation and transportation.

Alternative I (No Action Alternative)

Research Natural Areas Management

Alternative I would continue to manage the Rare Lizard and Snake Instant Study Area (ISA) as both an ACEC and a WSA. The ISA is in the same location as the McElmo RNA. [Note: A land exchange has now been completed that would expand the McElmo RNA; however, the expanded acres would not be included under this alternative because they were not analyzed in the DRMP/DEIS. These acres would be considered under the Proposed Plan.]. Alternative I only analyzes the original McElmo RNA (427 acres). In terms of impacts, more intensive management of livestock grazing within the RNA, and fencing for additional management control, may result in beneficial impacts to vegetation and wildlife, in that rangeland health may be restored.

Cultural Resources Management

Under this alternative, no cultural resource sites would be developed for public visitation within the RNA boundary; therefore, there would be no impact to the McElmo RNA. Management actions that preserve and protect cultural resource sites may also protect natural resources within the RNA.

Fluid Minerals Management

There is currently an NSO stipulation for the McElmo RNA for any new leases established after 1991. This may result in a beneficial impact to the RNA, in that wildlife and vegetation would be protected from surface-disturbing activities related to fluid minerals exploration and extraction. Increased development of leased lands outside of the RNA may result in the RNA acting as a wildlife refuge.

Livestock Grazing Management

Under this alternative, extensive management of livestock grazing within the McElmo RNA would be required after fencing is constructed. This may result in beneficial impacts to vegetation and wildlife, in that livestock would be kept out of sensitive areas, and in that they would be intensely managed in other areas of the Monument to protect the natural and biological resources.

Recreation and Transportation Management

Under this alternative, the two-track route leading into the McElmo RNA would remain in its current condition, and would remain open to the public. This alternative does not proactively manage for the future management of the McElmo RNA.

Alternative V (Preferred Alternative)

Research Natural Areas Management

Under this alternative, the proposed expansion of the McElmo RNA may result in beneficial impacts to the existing RNA, in that it would increase the area protected for research and educational purposes. This alternative would manage 7,826 acres as RNAs. Alternative V may also result in beneficial impacts to the natural, biological, and cultural resources of Cannonball Mesa and Sand Canyon, in that these areas would be designated RNAs. As a result of limiting activities within the RNAs (including seismic activity and livestock grazing), there may be beneficial impacts to the vegetation and wildlife protected by the RNA status. Existing NGD/NSO stipulations for the protection of herpetological resources would be maintained, and

new ones would be established where mineral leasing has not already occurred. In addition, by not improving the access route, and keeping it open for administrative purposes only, route size and traffic levels would be kept down and, therefore, minimize resource damage.

Cultural Resources Management

Under this alternative, there would be no cultural resource sites developed for public visitation within the RNA boundaries; therefore, there would be no impact to RNAs. Management actions that preserve and protect cultural resource sites may also protect natural resources within the RNAs. These management actions may result in beneficial impacts to RNAs, in that RNA resources may be preserved.

Fluid Minerals Management

There is currently an NSO stipulation for the McElmo RNA for any new leases established after 1991. In addition, stipulations to prohibit long-term, ground-disturbing fluid minerals development within the proposed Cannonball and Sand Canyon RNAs would also be implemented for new leases. This management, including the prohibition on all seismic operations, may result in beneficial impacts to the RNAs, in that wildlife and vegetation would be protected from impacts associated with surface-disturbing activities related to fluid minerals exploration and extraction. Increased development of leased lands within, and adjacent to, RNAs may result in impacts to the resources intended for protection. The application of COAs and mitigation measures may help to alleviate some of these impacts.

Livestock Grazing Management

Alternative V may result in beneficial impacts to wildlife and vegetation in the RNAs, in that livestock grazing would only be permitted from November 15 through March 15, and in that the number of AUMs would be fewer than proposed under Alternative I. Improvements in vegetation health, and in overall range condition, may result.

Recreation and Transportation Management

Under this alternative, no new route development would occur within the McElmo RNA. Limiting new route development may result in beneficial impacts to the RNAs, in that it may limit the number of visitors, and may preserve the wildlife and habitat resources.

Alternative VI (Proposed Plan)

Research Natural Areas Management

The impacts would be the same as those described under Alternative V. However, the Proposed Plan would manage 8,881 acres as RNAs (the increase in acres is the result of a land acquisition that occurred between the DRMP/DEIS and the PRMP/FEIS).

Cultural Resources

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

Alternative VI may result in beneficial impacts to wildlife and vegetation in the RNAs, in that livestock grazing would only be permitted from November 15 through March 30. Improved vegetation health, as well as in overall range condition, may result.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V.

Table 4-56 Comparison of Impacts to Areas of Research Natural Areas (RNA)

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
RNA	Manage 427 acres as an RNA.	Manage 7,826 acres as an RNA.	Same as Alt. I.	Same as Alt. I.	Same as Alt. II.	Manage 8,771 acres as an RNA.
Cultural Resources	Develop no cultural resource sites in RNAs.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new leased lands).	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance with an NSO stip. that applies to new leases).	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance with an NSO stip. that applies to new leases).	Same as Alt. II.	Same as Alt. II.
	Continued development of existing leases (127,895 acres) with up to 1,985 acres new disturbance. Some RNA areas fall within existing leases.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Livestock grazing	Apply intensive livestock	Close the RNA to livestock grazing.	Permit livestock grazing from	Apply intensive livestock	Permit livestock grazing from	Permit livestock grazing from

Table 4-56 Comparison of Impacts to Areas of Research Natural Areas (RNA)

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	management.		November 15 to March 15.	management.	November 15 to March 15.	November 15 to March 30.
Recreation and Transportation	Take no specific action for management of the two-track access route.	Close two-track access route.	Manage two-track access route for administrative purposes only.	Improve existing two-track route for public use.	Manage two-track access route for administrative purposes only.	Same as Alt. III.

4.4.3.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future. The analysis begins with the original designation of the McElmo RNA in 1985.

Table 4-57 Past, Present, and Future Activities influencing RNAs
Past Activities
Historic unmanaged livestock grazing
Chaining and other ground disturbing vegetation treatments
Unmanaged transportation and recreation
80% of the Monument leased with standard stipulations
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Designation of the McElmo RNA in 1985
Historic drought
Present Activities
National Monument designation by Presidential Proclamation
The acquisition of private land into public land adjacent to the McElmo RNA, allowing for the expansion of the RNA
Management of livestock grazing to meet Public Land Health Standards
Future Activities (Proposed Plan)
Designation of ACEC dropped except where it overlaps with RNA designation
Cannonball and Sand Canyon PCAs converted to RNAs
Boundary of the McElmo RNA expanded
NSO/NGD stipulations for new fluid mineral leased areas

Numerous past actions have played a part in the resources that exist within the McElmo RNA and in the areas proposed for expansion and addition to the RNA system. Sensitive plant species and herpetological wildlife species are directly tied to the vegetation present within the

McElmo RNA and within areas proposed for RNA status; therefore, anything that has impacted vegetation resources may also have influenced the presence of sensitive plants and animals. Fire regime, livestock grazing, vegetation treatments, and drought, are the primary activities impacting these resources. The acquisition of private land in the vicinity of the McElmo RNA has allowed for the proposed expansion of the RNA, and, as a result, for a larger area to be protected for herpetological species. Designating additional RNAs may promote the continued protection of sensitive plant species within the Monument. The designation and management of these areas as RNAs may help to manage other uses in the area with greater sensitivity towards these resources.

4.4.4. Wild and Scenic Rivers

The primary goal for WSRs within the Monument is to preserve free-flowing rivers with special values in their natural condition. The management objectives related to this goal are to manage rivers found suitable for WSR designation to protect their Outstandingly Remarkable Values (ORVs) and Classification. Currently, there are no WSRs within the Monument. However, 4 rivers are eligible for reclassification as either scenic or recreational (see Appendix B). These stream segments, and the preliminary classification that was assigned to each segment, are as follows:

- Cross Canyon - Scenic;
- Hovenweep Tributary - Scenic;
- Sandstone Canyon - Recreational;
- Bowdish Canyon - Recreational;
- Sand Canyon - Wild; and
- Yellow Jacket Canyon - Scenic.

Beneficial impacts to river segments deemed eligible as WSRs may include any activity that enhances the qualities that initially rendered them eligible (for example, actions that protect native riparian/wetlands vegetation along the stream corridor). Adverse impacts to river segments may include any activity that reduces the qualities that initially rendered them eligible (for example, impoundments would be considered a direct adverse impact).

4.4.4.1. Evaluation Criteria and Assumptions

Impacts on WSR values may result from development actions that diminish the outstandingly remarkable and free-flowing values that rendered the rivers eligible. These may be measured in terms of miles of stream, acres of disturbance, and/or other measures of intrusion or degradation. Often, these qualities cannot be calculated.

Assumptions used in analyzing impacts to river segments deemed suitable as WSR include the following:

- Alternative II in the DRMP/DEIS was the only alternative to assume that all river segments deemed eligible would also be considered suitable for WSR designation.
- Alternatives I, V, and VI assume that all river segments deemed eligible would not be considered suitable for WSR designation; therefore, impacts resulting from other resource management actions under these alternatives are not evaluated.

- The impacts analysis boundary for the WSR would include the stream in which these segments lie.
- The cumulative impacts analysis boundary for the WSR would include the drainage in which these streams lie.

4.4.4.2. Alternative Analysis

Impacts to WSRs may differ depending upon the specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed for WSRs, as well as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Wild and Scenic Rivers Management

Under this alternative, eligibility and a tentative classification study of river segments within the Monument was completed. The BLM determined that 6 rivers within the Monument meet the WSR eligibility criteria, as identified in the Wild and Scenic Rivers Act (WSRA). This alternative maintains the current management of rivers and although they have been determined to be eligible, they would not be considered suitable. Therefore, there would be no impacts to WSRs under this alternative.

Cultural Resources Management

There are currently no WSRs within the Monument.

Fluid Minerals Management

There are currently no WSRs within the Monument.

Livestock Grazing Management

There are currently no WSRs within the Monument.

Recreation and Transportation Management

There are currently no WSRs within the Monument.

Other Resources Management

This alternative protects 2,415 acres of riparian area. This would have no impact on WSRs since none would be designated suitable.

Alternative V (Preferred Alternative)

Wild and Scenic Rivers Management

Under this alternative, no river segments would be considered suitable for WSR designation to the National Wild and Scenic Rivers System (the National System); therefore, this alternative would result in no impacts.

Cultural Resources Management

Under this alternative, no river segments would be considered suitable for WSR designation to the National System; therefore, this alternative would result in no impacts.

Fluid Minerals Management

Under this alternative, no river segments would be considered suitable for WSR designation to the National System; therefore, this alternative would result in no impacts.

Livestock Grazing Management

Under this alternative, no river segments would be considered suitable for WSR designation to the National System; therefore, this alternative would result in no impacts.

Recreation and Transportation Management

Under this alternative, no river segments would be considered suitable for WSR designation to the National System; therefore, this alternative would result in no impacts.

Other Resources Management

This alternative protects 5,312 acres of canyon bottoms, riparian and floodplain area. This would have no impact on WSRs since none would be designated suitable.

Alternative VI (Proposed Plan)

Wild and Scenic Rivers Management

The impacts would be the same as those described under Alternative V.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V.

Other Resources Management

This alternative protects 5,528 acres of canyon bottoms, riparian and floodplain areas. This would have no impact on WSRs since none would be designated suitable.

Table 4-58 Comparison of Impacts to Wild and Scenic Rivers

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Wild and Scenic Rivers	Make no WSR designations.	Consider all eligible river segments suitable as WSR (25.3 miles).	Consider no river segments suitable as WSR.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Cultural Resources	No Impact.	Protect cultural resource settlement clusters, sites, and isolated finds.	No Impact.	No Impact.	No Impact.	No Impact.
Fluid Minerals	No Impact.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new leased lands).	No Impact.	No Impact.	No Impact.	No Impact.
	No Impact.	Continued development of existing leases (127,895 acres) with up to 1,985 acres new disturbance and up to 347 sites potentially impacted.	No Impact.	No Impact.	No Impact.	No Impact.

Table 4-58 Comparison of Impacts to Wild and Scenic Rivers

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Livestock grazing	No Impact	Permit 6,437 AUMs.	No Impact.	No Impact.	No Impact.	No Impact.
Recreation and Transportation	No Impact	Manage 139 miles of routes.	No Impact.	No Impact.	No Impact.	No Impact.
Other Resources: Water Resources	No Impact.	Protect 5,312 acres of canyon bottoms, riparian areas, and floodplains.	No Impact.	No Impact.	No Impact.	No Impact.

4.4.4.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-59 Past, Present, and Future Activities influencing Wild and Scenic River Designation
Past Activities
Water diverted above the Monument for agricultural purposes
80% Monument leased for fluid mineral development
Construction of impoundments
Loss of ground cover from historic overgrazing
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, the National Environmental Protection Act, and other legislation protecting natural resources
Present Activities
Increased fluid mineral development
Prolonged drought
Manage 213 miles of routes
Subdivision of agricultural fields surrounding the Monument
National Monument designation by Presidential Proclamation to protect the objects while managing valid existing rights so as not to create any new impacts to the objects
Future Activities (Proposed Plan)
Disturbance from fluid mineral development on currently leased lands would cumulate to a total of 3,150 acres
Manage 172 miles of routes
GADPs required for long-range planning
Protection of cultural and natural resources on a landscape level to minimize cumulative impacts and manage for resource setting

The primary influence from outside of the Monument that may prevent current eligible and suitable stream segments from consideration as WSRs is the removal of agriculture water flows. Water runoff from irrigation occurring upstream of the Monument is the primary source of year-round water flow within the Monument and, in particular, the 6 stream segments being considered for WSR designation. Given the increase in urban development (subdivisions) in fields once used for crop production, this threat to free-flowing streams may be substantial.

Cumulative impacts from onsite, and offsite, fluid minerals exploration and development, livestock grazing, route construction, and/or from similar activities may potentially contaminate surface and groundwater, deplete water flows, increase soil erosion, reduce natural vegetative cover, and proliferate noxious and invasive weeds along the 6 eligible WSRs. Surface disturbance may be localized to onsite river segments; however, water quality issues may arise anywhere within the watershed. Impacts may be either short- or long-term, depending upon their severity, and may be reduced through adequate planning, mitigation, and monitoring.

4.4.5. Wilderness Study Areas and Citizens' Wilderness Proposal Areas

There are two primary goals for maintaining wilderness characteristics within the Monument:

- Determine management guidance for WSAs, should Congress release these areas from WSA status. The management objective related to this goal is to maintain the non-impairment standard for WSAs, in accordance with Interim Management for the Monument, to prevent undue and unnecessary degradation of wilderness characteristics.
- Protect and preserve wilderness characteristics, where appropriate (such as their "naturalness," their outstanding opportunities for solitude, and their potential for primitive and unconfined recreation) in Citizens' Wilderness Proposal Areas (CWPAAs) located outside of the WSAs.

Beneficial impacts may include activities that enhance wilderness qualities and/or that provide protection for wilderness characteristics. Adverse impacts may include any activity that diminishes wilderness characteristics. Direct impacts may include those resulting from the construction of a new route or a new well pad. Indirect impacts may include those resulting from over-grazing and/or from erosion.

4.4.5.1. Evaluation Criteria and Assumptions

Numerous restrictions and stipulations exist that maintain the integrity of existing WSAs and CWPAAs by significantly reducing impacts.

Assumptions used in analyzing impacts to WSAs and to CWPAAs include the following:

- This impact analysis considers the spatial boundary as the boundary of existing WSAs and the CWPAAs, and the temporal boundary as the next 20-year period.

4.4.5.2. Alternative Analysis

Impacts to wilderness characteristics, whether considering WSAs or CWPAAs, may differ depending upon the specific management actions proposed under each alternative. The following sections describe the impacts from the management actions directly proposed for WSAs and CWPAAs, as well as those from the management actions proposed for cultural resources, fluid minerals, livestock grazing, recreation and transportation, and other resources.

Alternative I (No Action Alternative)

Wilderness Study Areas and Citizen's Wilderness Proposal Areas Management

Alternative I would use the no-impairment standards outlined in the BLM's Interim Management Policy to Manage WSAs, and would provide opportunities for backcountry recreation (such as hiking, dispersed camping, horseback riding). The BLM would preserve these areas (25,549 acres) as suitable for Wilderness until they are reviewed and acted upon by Congress. Law enforcement patrols within WSAs may help to prevent any misuse, or resulting impairment, of these areas. Providing opportunities for backcountry recreation would allow access to, and enjoyment of, these areas, while, at the same time, preserving the natural landscape.

No action would be taken to protect CWPAs.

Cultural Resources Management

Under Alternative I, no cultural resource sites would be developed for public visitation within the WSA boundaries. Additional management actions would preserve and protect cultural resource sites, as well as provide research, interpretation, and education opportunities. These management actions may result in beneficial impacts to WSAs, in that they may provide resource protection, and may enhance the public's knowledge regarding the values of WSAs.

Fluid Minerals Management

Under Alternative I, there would be no new fluid minerals leases within the existing WSAs. The greatest threat to wilderness characteristics may result from the continued development of existing fluid minerals leases. Much of the WSAs were leased with NSO stipulations in place for protection purposes; however, some portions of the WSAs were established after the fluid minerals leases were granted. Therefore, stipulations for the protection of the WSAs were not included. These areas would require extensive use of mitigation measures, COAs, and BMPs to help protect wilderness characteristics.

Livestock Grazing Management

Under this alternative, there would be no specific livestock management actions related to WSAs. This alternative may result in adverse impacts to WSAs, in that there would be no changes to the current management, which includes 8,492 AUMs. This may adversely impact areas within the WSAs that are currently not achieving Public Land Health Standards or PFC. Several areas within the WSAs have been identified as FAR, with a downward trend. Without more restrictive rangeland management, it is unlikely that there would be improvements to resource conditions for soil, vegetation, wildlife habitat, and/or to water quality within these areas.

Recreation and Transportation Management

Under Alternative I, there would be no development of additional routes within WSA boundaries; therefore, there would be no impacts resulting from transportation management actions on WSAs.

Providing backcountry recreation experiences (such as hiking, dispersed camping, horseback riding) would allow public access to, and enjoyment of, these areas, while, at the same time, preserving the natural landscape. This alternative would not have a marketing strategy for tourism; therefore, it would not increase visitation through agency promotion.

Other Resource Management

The management of WSAs to meet VRM Class I objectives would provide an additional degree of protection. VRM Class I objectives require that the visual character of the area be preserved.

The impact of applying a VRM Class I objective would be to exclude projects from the area that may impact visual quality.

Alternative V (Preferred Alternative)

Wilderness Study Areas and Citizens' Wilderness Proposal Areas Management

Alternative V would manage the CWPAs, along with existing WSAs, for wilderness characteristics (30,772 acres). If Congress releases the WSAs from designation, management of these areas would remain consistent with non-impairment standards.

Under this alternative, ground-disturbing activities would be allowed on a site-specific basis for research, recreation, rangeland management, fuels and fire management, and vegetation manipulation for wildlife habitat. Removing unnecessary fencing and/or non-domestic water-related developments, and limiting construction of these features, may result in beneficial impacts to WSA resources, in that unnatural human-created structures would be removed. Beneficial impacts to wildlife and vegetation may include the reduction of barriers and habitat disturbance, as well as the restoration of habitat connectivity. Allowing WSA-appropriate range improvements, at the discretion of the Monument Manager, may result in beneficial impacts, in that they may improve habitat for both livestock and wildlife. Allowing the construction of new fences and water-related developments may result in beneficial impacts to wilderness characteristics as well, in that ecological conditions may be improved, especially along riparian/wetlands corridors where livestock tend to congregate.

Management of CWPAs may result in beneficial impacts to existing WSAs, in that areas set aside to preserve natural, biological, and aesthetic resources of the WSAs would increase. However, much of the CWPAs are already leased for fluid minerals; therefore, only those stipulations in place at the time of leasing would apply. Existing NGO/NSO stipulations within WSAs, and those proposed for unleased areas within CWPAs, may result in beneficial impacts to vegetation, wildlife, and cultural resources. These stipulations would limit ground-disturbing activities that may adversely impact these resources.

Cultural Resources Management

Under Alternative V, no cultural resource sites would be developed for public visitation within WSA or CWPA boundaries. Management actions that protect natural resources would preserve and protect cultural resource sites, and provide research, interpretation, and education opportunities. These management actions may result in beneficial impacts to areas with wilderness characteristics, in that the natural undisturbed character of the areas would be maintained.

Fluid Minerals Management

Under Alternative V, possible impacts to existing WSAs and CWPAs may occur, except for areas where NSO/NGD stipulations apply. This may result in adverse impacts to wilderness characteristics, in that routes and facilities may be constructed. Areas of new leases would be managed with NSO/NGD stipulations to protect wilderness qualities.

Portions of the WSAs are leased for fluid minerals development without NSO/NGD stipulations. This is because these areas were leased prior to being designated as a WSA. Portions of CWPAs are also under active fluid minerals leases. In these cases, valid existing rights to develop the fluid minerals resource would be honored. COAs, BMPs, and mitigation measures would be used to minimize impacts.

Livestock Grazing Management

Removing unnecessary fencing and/or non-domestic water-related developments may result in beneficial impacts to the natural, biological, and aesthetic resources of the WSAs and CWPAs. Beneficial impacts to wildlife and vegetation may include the reduction of barriers and habitat disturbance, as well as the restoration of habitat connectivity. Limiting the construction of new fences and water-related developments, to further enhance the wilderness values, may result in beneficial impacts, in that ecological conditions may be improved. In addition, the construction of WSA-appropriate range improvements may result in beneficial impacts to wilderness characteristics, in that they may improve habitat for both livestock and wildlife as the result of better livestock distribution and management.

In addition, implementing lower stocking levels (6,437 AUMs), spring use restrictions, and stricter utilization standards, may result in beneficial impacts to WSAs and CWPAs, in that land health conditions, including soil, vegetation, wildlife habitat, and water quality, may be improved.

Recreation and Transportation Management

Under Alternative V, there would be no development of additional routes within WSA and CWPA boundaries; therefore, there would be no impacts resulting from transportation management actions in these areas. Alternative V would allow camping and campfires within the WSA and CWPAs; however, it would prohibit geocaching and target shooting. Rock climbing would not be allowed within a WSA or a CWPA. This would allow public access to, and enjoyment of, these areas while, at the same time, preserving the natural landscape. This alternative would promote specific sites within the Monument as destinations for regional, national, and international visitors. Most of the Monument, including the WSA and CWPA, however, would be managed for undeveloped recreation, targeting local residents and incidental visitors.

Other Resource Management

The management of WSAs and CWPAs to meet VRM Class I objectives would provide an additional degree of protection. VRM Class I objectives require that the visual character of the area be preserved. The impact of the VRM Class I objective would be to exclude projects from the area that may impact visual quality.

Alternative VI (Proposed Plan)

Wilderness Study Areas and Citizen's Wilderness Proposal Areas Management

The impacts would be the same as those described under Alternative V.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V.

Other Resource Management

The impacts would be the same as those described under Alternative V.

Table 4-60 Comparison of Impacts to Wilderness Study Area (WSA) and Citizens Wilderness Proposal Area (CWPA)

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Wilderness Study Areas and Citizens Wilderness Proposal Areas	Manage 25,549 acres as WSA.	Manage 25,549 acres as WSA. Manage 5,223 acres of CWPA for wilderness characteristics.	Same as Alt. I.	Same as Alt. I.	Same as Alt. II.	Same as Alt. II.
Cultural Resources	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.	No Impact.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance and up to 3 sites potentially impacted on neighboring leased lands to obtain minerals from new leased lands). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 3,021 new acres available for lease (with up to 73 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Make up to 24,462 new acres available for lease (with up to 447 acres of disturbance). Apply NGD/NSO, CSU/SSR, TL, and COA restrictions.	Same as Alt. II.	Same as Alt. II.
	Continued development of existing leases (127,895 acres) with up to 1,985 acres new	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.

Table 4-60 Comparison of Impacts to Wilderness Study Area (WSA) and Citizens Wilderness Proposal Area (CWPA)

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	disturbance. Some existing leases fall within the WSA and CWPA.					
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing allotments. Not meeting Public Land Health Standards.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments. Take specific actions to meet Public Land Health Standards as rapidly as possible.	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Same as Alt. I	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of Monument lands within grazing allotments.	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of Monument lands within grazing allotments. Take specific actions to meet Public Land Health Standards as rapidly as possible. Apply zero-level accelerated erosion standard. Apply NGD/NSO stipulation to protect slopes steeper than 30 percent (36,607 acres).
Recreation and Transportation	No route development allowed in WSA.	No route development allowed in WSA and in CWPA.	Same as Alt. I.	Same as Alt. I.	Same as Alt. II.	Same as Alt. II.

Table 4-60 Comparison of Impacts to Wilderness Study Area (WSA) and Citizens Wilderness Proposal Area (CWPA)

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
<p>Other Resources: Visual Resources</p>	<p>No VRM Classes identified.</p>	<p>Manage 38,598 acres as VRM Class I. Manage 126,643 acres as VRM Class II. Manage 94 acres as VRM Class III.</p>	<p>Manage 25,976 acres as VRM Class I. Manage 41,867 acres as VRM Class II. Manage 104,605 acres as VRM Class III.</p>	<p>Manage 25,976 acres as VRM Class I. Manage 27,535 acres as VRM Class II. Manage 94,327 acres as VRM Class III. Manage 17,497 acres as VRM Class IV.</p>	<p>Same as Alt. II.</p>	<p>Manage 41,724 acres as VRM Class I. Manage 100,394 acres as VRM Class II. Manage 14,190 acres as VRM Class III. Manage 9,972 acres as VRM Class IV.</p>

4.4.5.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-61 Past, Present, and Future Activities influencing Wilderness Study Areas
Past Activities
No authorized travel management plan or associated map developed
80% of the Monument leased with standard stipulations
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, Clean Air Act, the National Environmental Protection Act, the Wilderness Act, and other legislation protecting natural resources
Present Activities
Increased fluid mineral development
Increased use of OHVs
Increased use by mountain bikers and rock climbers
Concern for air quality not meeting standards
25,549 acres designated Wilderness Study Area
National Monument designated by Presidential Proclamation
Citizens' Wilderness Proposal Areas inventoried
Future Activities (Proposed Plan)
Continued increase in fluid mineral development
Lease 880 new acres for drainage with restrictive stipulations along with current development
Development of private lands adjacent to the WSA, including subdivisions and fluid mineral development
Spread of noxious weeds
Specific marketing strategies for Special Recreation Management Areas identified
Increased visitation to the Monument

Table 4-61 Past, Present, and Future Activities influencing Wilderness Study Areas

Loss of air quality from regional development of fluid minerals and coal-fired power plants
25,549 acres Wilderness Study Area designated with an addition of 5,233 acres designated management for wilderness characteristics
Closure of the Monument to recreational shooting and geocaching
Travel management plan with associated map developed and implemented

Activities outside of the Monument that may impact WSAs and CWPAs include the spread of noxious weeds, the reduction of water-flows from upstream agriculture operations, the development of neighboring private land (and the associated noise and/or ridgeline construction), the increased visitation to the local region through tourism marketing, the loss of air quality, and the increased fly-over traffic from aircrafts. Any activity detectable by any human sense may impact a person's wilderness experience. For example, the placement of an oil well on neighboring private land, or on currently leased land, may send fumes, odors, and noise into the WSA or CWPA, if wind direction allows. These activities may be visually intrusive, if placed on the edge of the WSA or CWPA. Increased traffic on routes adjacent to WSAs and CWPAs may result in increased noise levels within WSAs and CWPAs. In general, the more people that visit an area, and the more development that occurs within, and adjacent to, that area, the greater the level of impacts to wilderness characteristics. The cumulative impact of several of these activities may negate the wilderness experience over a large portion of the area, as well as over a long period of time, if not permanently.

4.4.6. Public Safety and Law Enforcement

The primary goal of public safety and law enforcement is to provide for public safety and for the enforcement of Federal laws and regulations related to the use, management, and development of Monument lands and resources. The management objectives related to this goal include:

- ensure that all illegal activities will be detected, reported, investigated, and/or referred to the appropriate officials;
- protect all Monument lands, resources, and objects from unlawful removal, damage, or destruction;
- hold authorized and unauthorized users of public lands accountable for required repairs, or to the reclamation to natural resources;
- provide a safe and enjoyable experience for public land users that is not marred by the illegal or inappropriate action of others;
- build and maintain effective partnerships with local, county, State, Native American tribal, and other Federal law enforcement agencies;
- foster a positive relationship with public land users;
- provide appropriate law enforcement training related to specific Monument resources and objects; and
- maintain coordination with other agencies and jurisdictions in relation to fire control, emergency response, and Search and Rescue (SAR) functions

Direct impacts to public safety and law enforcement may include visitation and vandalism, without adequate facilities and personnel to manage such issues. Indirect beneficial impacts may include increased signage; safer routes; clear, easily obtainable travel maps; additional law enforcement initiatives (including hotline numbers); and greater public awareness of what to look for, and how to report, violations.

4.4.6.1. Evaluation Criteria and Assumptions

Quantifying individual impacts to public safety and law enforcement can be indirectly determined by measurements of route miles, number of sites developed for visitation, and marketing strategies.

Assumptions used in analyzing impacts to public safety and law enforcement resource uses include the following:

- Federal lands within the boundary of the Monument were used as the impacts analysis area.
- Cumulative impacts were examined in relation to trends within Dolores and Montezuma Counties.

4.4.6.2. Alternative Analysis

Impacts to public safety and law enforcement may differ depending upon the specific management actions proposed under each alternative. The following sections describe the impacts from the management actions proposed for public safety and law enforcement, as well as those from the actions proposed for cultural resources, fluid minerals, livestock grazing, and recreation and transportation.

Alternative I (No Action Alternative)

Public Safety and Law Enforcement Management

Under Alternative I, management actions would include continued coordination with other agencies and jurisdictions for fire control, emergency response, and search and rescue functions. These actions may result in beneficial impacts to public safety and resource protection, in that communication and coordination would be improved.

Under this alternative, the BLM would provide intensive protection of cultural resources from vandals through increased surveillance and law enforcement. In addition, close coordination with other local law enforcement personnel, as well as opportunities for contracting law enforcement with County Sheriffs Departments, would be explored. Periodic aircraft flights, in addition to ground and vehicle patrols, would be used year-round to reduce and/or to prevent pot-hunting. Patrol activity would be complemented by public education and awareness programs, conducted in cooperation with the AHC. These actions may result in beneficial impacts to public safety and resource protection, in that cooperation with other law enforcement personnel would be improved, and in that more extensive patrols would be conducted.

Cultural Resources Management

Cultural resource patrols would be managed as a component of other resource protection activities. As public visitation increases, a greater need for enforcement efforts may occur.

Fluid Minerals Management

Under this alternative, no new wells would be drilled in new lease areas, which would minimize the number of workers accessing Monument routes and resources, thereby minimizing the associated impacts resulting from traffic and equipment.

New fluid mineral development on 127,895 acres of current leased areas for the life of the plan is anticipated to include up to 150 wells, 121 well pads, 67 miles of routes, 8 treatment facilities and 53 miles of pipeline. Ongoing development on leased lands may increase risks to public safety by increasing traffic, and the presence of large industry vehicles and equipment on routes where recreating and residential publics travel.

Livestock Grazing Management

Under Alternative I, enforcement actions would be taken against trespassers grazing illegal livestock within the Monument. Applicable grazing permit laws and regulations would apply. Enforcement of these restrictions may result in beneficial impacts, in that the protection of Monument resources would increase.

Recreation and Transportation Management

Under Alternative I, recreation management would include developing facilities on an as-needed basis, and maintaining developed sites at Lowry, Painted Hand, and Sand Canyon Pueblos. Public safety at these sites includes parking, traffic, and accommodating multiple uses on travel ways to, and from, facilities. Law enforcement efforts would focus on preventing vandalism and property damage.

Under this alternative, the Monument travel system would include up to 149 miles (up to 864 acres) of routes for motorized, mechanized, and/or for non-motorized use. Cross-country motorized and mechanized travel would be prohibited. No new routes would be built related to new fluid minerals leasing. No BLM marketing strategy for tourism would occur; therefore, Monument visitation may continue to be dominated by local residents and incidental visitors. Backcountry safety may continue to be the primary issue, including improper preparation for remote, hot, dry desert terrain.

Alternative V (Preferred Alternative)***Public Safety and Law Enforcement Management***

Under Alternative V, management actions would include increasing patrols during seasonal permit activities, at recreation sites during spring breaks and holidays, as well as in areas experiencing high levels of illegal cross-country travel. It would also include developing a protocol designed to identify, respond to, and remove hazardous materials. Additional management actions that may benefit public safety and Monument resources include cooperating with other law enforcement entities to:

- provide training of, and updates to, personnel conducting patrols during periods with high or extreme fire danger;
- prevent and investigate human-caused fires and suspicious wildfires;
- assist SAR teams and emergency medical services;
- participate in training;
- enforce Monument laws, regulations, and policies; and
- create a protocol for reporting resource management violations.

Cultural Resources Management

Under this alternative, the BLM would establish reporting and investigation procedures and protocols in relation to cultural resource vandalism, trespassing, and human remains discovery between the Dolores Field Office, AHC/Monument staff, BLM law enforcement rangers, and local law enforcement agencies. The BLM would also require that their cultural resources and law enforcement personnel maintain current training in investigation and case preparation, in accordance with the requirements of the Archaeological Resources Protection Act (ARPA). These activities may assist in preparing personnel for management and emergency situations.

Fluid Minerals Management

In addition to impacts from current fluid mineral leases as described in Alternative I, under Alternative V, up to 880 acres would be available for leasing to protect against drainage. A total of up to 18 acres of new ground disturbance would be possible under this alternative. The 18 acres of disturbance may occur on existing leased lands to access minerals associated with new leases. Additional infrastructure, including routes and utilities, as well as offsite infrastructure, may be required for fluid minerals development. Up to 2 new well pads would be allowed. This alternative may slightly increase the potential for impacts to public safety, in that traffic and the potential for toxic spills may increase. The greatest impact to public safety and law enforcement may result from ongoing development, and traffic, associated with existing fluid minerals leases. Fluid minerals development may result in water contamination, increased facilities (along with increased human presence and traffic, including large trucks and other heavy equipment), increased air emissions, and a higher risk of wildfire ignitions; all of which may impact public safety.

Livestock Grazing Management

The impacts would be the same as those described under Alternative I.

Recreation and Transportation Management

Under Alternative V, recreation management would include a combination of strategies. Undeveloped areas with minimal facilities would be combined with destination management strategies for Painted Hand and Sand Canyon Pueblos, as well as for the AHC and Lowry Pueblo RMZs. Up to 7,875 acres would be managed as visitation areas, and 157,460 acres would be managed as backcountry areas. Providing a variety of recreation settings may enhance public safety, in that the ability to direct visitors expecting a particular experience to the location and amenities that meet those expectations would be enhanced.

Under this alternative, the Monument travel system would include up to 169 miles (up to 980 acres) of routes for motorized, mechanized, and/or for non-motorized use. There would be routes specifically designated for OHV, mountain bike, or OHM travel. These forms of travel would be allowed on routes designated as open to all forms of travel. Cross-country motorized and mechanized travel would be prohibited. Maintaining a variety of segregated use routes may require education and law enforcement. Public safety may be enhanced, in that visitors would be provided with a clear travel plan, associated travel map, and adequate signage. These improvements would also assist in law enforcement efforts to manage visitors within the Monument.

Alternative VI (Proposed Plan)

Public Safety and Law Enforcement Management

The Proposed Plan would place a greater emphasis on coordination, cooperation, and partnerships for law enforcement, public safety, and training. It would also create a protocol for

conducting investigations. The Proposed Plan would require a greater up-front effort in relation to establishing and maintaining relationships with law enforcement personnel in other agencies, which may, over the long term, increase productivity and the effectiveness of program goals.

Cultural Resources Management

The impacts would be the same as those described under Alternative V.

Fluid Minerals Management

The impacts would be the same as those described under Alternative V.

Livestock Grazing Management

The impacts would be the same as those described under Alternative V.

Recreation and Transportation Management

The impacts would be the same as those described under Alternative V. However, the Proposed Plan would manage 158,515 acres for backcountry use. The Monument travel system would include up to 172 miles (up to 997 acres) of routes for motorized, mechanized, and/or for non-motorized use.

Table 4-62 Comparison of Impacts to Public Safety and Law Enforcement

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
Public Safety and Law Enforcement	Add additional law enforcement officers.	Add additional law enforcement officers. Promote greater cooperation, more efficient use of resources.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.	Same as Alt. II.
Cultural Resources	Develop new sites for controlled visitation.	Develop 13 sites.	Develop 13 to 25 sites.	Same as Alt. III.	Same as Alt. III.	Same as Alt. III.
Fluid Minerals	Lease 0 new acres. Disturb 0 new acres. Impact 0 sites from new leases.	Make up to 880 new acres available for lease (NSO stip. applies to new leases. Up to 18 acres of disturbance on neighboring leased lands obtain minerals from new leased lands).	Make up to 3,021 new acres available for lease.	Make up to 24,462 new acres available for lease.	Same as Alt. II.	Same as Alt. II.
	Continued development of existing leases (127,895 acres).	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.	Same as Alt. I.
Livestock grazing	Permit 8,492 AUMs. 97% of Monument lands within grazing	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of	Permit 8,368 AUMs, reducing potential impacts from cattle. 94% of	Same as Alt. I.	Permit 6,437 AUMs, reducing potential impacts from cattle. 94% of	Permit 6,437 AUMs reducing potential impacts from cattle. 94% of

Table 4-62 Comparison of Impacts to Public Safety and Law Enforcement

Type of Land Use or Management	Alternative I (No Action Alternative)	Alternative II	Alternative III	Alternative IV	Alternative V (Preferred Alternative)	Alternative VI (Proposed Plan)
	allotments.	Monument lands within grazing allotments.	Monument lands within grazing allotments.		Monument lands within grazing allotments.	Monument lands within grazing allotments.
Recreation and Transportation	Manage 149 miles of routes (per 1985 RMP decision).	Manage 139 miles of routes.	Manage 189 miles of routes.	Manage 213 miles of routes.	Manage 169 miles of routes.	Manage 172 miles of routes.

4.4.6.3. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Present activities are those occurring since the Monument was established in 2000. Future activities are beginning to occur and may increase in the future.

Table 4-63 Past, Present, and Future Activities influencing Public Safety and Law Enforcement
Past Activities
No authorized travel management plan or associated map
Historic vandalism and looting
Historic unmanaged livestock grazing
Designation of the area as an Archaeological Area of Critical Environmental Concern
Limited access points with private land intertwined with the Monument
80% of the Monument leased with standard stipulations
Enforcement of the Antiquities Act, compliance with the Endangered Species Act, the Clean Water Act, Clean Air Act, the National Environmental Protection Act and other legislation protecting natural resources
Unmanaged transportation and recreation
Present Activities
Increased fluid mineral development
Increased use of OHVs
Increase in Monument visitation and demand for recreation opportunities
Increased use by mountain bikers and rock climbers
Unrestricted use of Monument for recreational shooting, climbing, geocaching, camping, and campfires
Designation of the Trail of the Ancients Scenic and Historic Byway
National Monument designated by Presidential Proclamation to protect the objects
Future Activities (Proposed Plan)
Lease 880 new acres along with increased development on leased lands for fluid minerals

Table 4-63 Past, Present, and Future Activities influencing Public Safety and Law Enforcement
Subdivision of lands and urban expansion in and around the Monument
Continued increase in local population and visitation to the Monument
Specific marketing strategies for Special Recreation Management Areas identified
Closure of the Monument to recreational shooting and geocaching with restrictions placed on climbing, camping, and campfire use
Designated travel management plan with associated map

Cumulative impacts on public safety and law enforcement may include enhanced safety and response due to cooperation with other Federal, State, county, and local law enforcement entities. The increased numbers of local residents and visiting publics may increase the need for public safety and law enforcement throughout the region. This may also be true for increased human presence from oil and gas development. These developments may occur both on and off the Monument and may result in more traffic.

Enforcement efforts are required when there are restrictions such as the protection of cultural resources, livestock grazing and other permitted uses, restrictions on recreational activities, or travel restrictions. The more people use the Monument, the greater the impact on resources, and the more restrictions and regulations required to manage those resources.

4.4.7. Social and Economic Conditions

4.4.7.1. Introduction

For this PRMP/FEIS, potential social and economic impacts were analyzed by comparing an economic and social baseline scenario predicted for the study area over the next 20-year period against changes to this baseline that may be expected to result from different planning alternatives. The baseline scenario was developed from a forecast created by Colorado's State Office of Demography and the Bureau of Economic Analysis (BEA 2007). This scenario establishes how the socioeconomic study area is expected to change over the next 20 years, given current economic and social trends for the local area, the Four Corners region, the State of Colorado, and for the western United States. The analysis is based upon the assumption that this predicted baseline for the study area would result under continuation of current management (and subsequent trends), under Alternative I (the No Action Alternative). Therefore, this baseline scenario is described in the following discussion of Alternative I impacts.

4.4.7.2. Economic Impact Analysis

In the economic impact analysis, management actions for the key planning issues (including cultural resources, fluid minerals, livestock grazing, and recreation/transportation) are linked to one of the base industries (mining, agriculture, tourism) to estimate potential impacts to employment and income in Montezuma and Dolores Counties. These individual impacts are summed up to estimate changes in total jobs, total personal income, and population. They are expressed as a departure from the predicted baseline scenario/No Action Alternative estimated impacts across the next 20-year period. These results are summarized in Table 4-64, and are

discussed in detail below. (Appendix I presents background data, information, and methods descriptions for these analyses.)

Table 4-64 Summary of Economic Impacts, End of Planning Period		
Percentage Change from Alternative I (No Action Alternative)		
<i>Measure</i>	<i>Alt V</i>	<i>Alt VI</i>
Total Jobs	(+) 4%-8%	(+) 4%-8%
Total Personal Income	No change	No change
Population	No change	No change
Total Jobs	(+) 4%-8%	(+) 4%-8%
Total Personal Income	No change	No change

Alternative I (No Action Alternative)

Table 4-65 summarizes some of the demographic and economic parameters used to determine the baseline economic scenario described under Alternative I.

Table 4-65 Summary of Economic Baseline/No Action Forecast for Study Area					
Parameter	2005	2010	2015	2020	2025
Montezuma County					
Total Jobs¹	12,600	14,400	15,500	16,700	17,900
Total Base Jobs	7,600	8,300	8,700	9,400	10,200
Total Tourism Jobs	1,460	1,540	1,500	1,460	1,400
Total Personal Income (\$ millions)	660	920	1,270	1,790	2,480
Farm Proprietor Income	9.6	7.7	7.6	7.7	7.5
Annual CO₂ Production (bcf)²	360	490	490	490	490
Annual Oil Production (1000 barrels [Bbls])	200	200	200	150	100

Table 4-65 Summary of Economic Baseline/No Action Forecast for Study Area					
Parameter	2005	2010	2015	2020	2025
Montezuma County					
Annual Natural Gas Production (bcf)	1.1	1.1	1.1	0.75	0.50
Population³	24,900	27,600	30,400	33,800	36,800
Dolores County					
Total Jobs¹	800	930	990	1,060	1,140
Total Base Jobs	680	710	720	750	790
Total Tourism Jobs	30	30	30	30	30
Total Personal Income	50	68	93	130	180
Farm Proprietor Income	1.9	1.5	1.5	1.5	1.5
Annual CO₂ Production (bcf)²	0	65	65	65	65
Annual Oil Production (1000 bbls)	40	40	40	30	20
Annual Natural Gas Production (bcf)	0.3	0.3	0.3	0.2	0.1
Population³	1,850	2,060	2,220	2,380	2,720

(Sources: ¹Region 9 2006 CEDS update, ²RFD, ³CSDO 2006)

Overall, the demographics of Montezuma and Dolores Counties are forecast to parallel those of Colorado, in general. Over the next 20 years, population within the study area is anticipated to grow from just under 30,000 to over 40,000. There will be good and bad years in agriculture; therefore, long-term trends show a drop in farm earnings that may reduce farm income as a percentage of total personal income for the 2 counties to less than one percent. Non-labor income may continue to comprise more than one-third of total personal income, providing a buffer to the cyclical changes in tourism and mining employment.

Tax revenues resulting from fluid minerals production (primarily CO₂ production) comprise almost one-half of the total revenues in Montezuma County, and one-quarter of the total revenues in Dolores County. Therefore, changes to fluid minerals production and prices may have a significant impact on county budgets. Under the No Action Alternative, CO₂ production may increase as a result of increasing pipeline capacity from 1.1 billion cubic feet bcf to 1.5 bcf per day, and may remain steady through the planning period (RFD, BLM 2005c). Note that part of the increased CO₂ production would occur in Dolores County, which would provide a new source of revenue in that county. Oil and natural gas production is forecasted to decline steadily, as the existing fields are depleted. The net change to county tax revenues is forecast

to be neutral. This is because increased CO₂ production and pricing may make up for the decrease in oil and gas production.

Under Alternative I, the proposed rangeland management actions would not change the total active AUMs; however, the depletion of range resources as a result of over-utilization would continue to degrade rangeland conditions to the point that the number of animals the land can sustain would decline. Over the long term, this may result in a slight decrease in agricultural income. The objective is to meet Public Land Health Standards; however, the No Action alternative has already shown that resources are over-allocated and that standards cannot be met. The management actions proposed for recreation and transportation management may increase visitor use of the Monument. Fluid minerals management actions would not include any new leases. This may reduce oil and natural gas production, as well as mining jobs and income over the long term (50+ years). However, current CO₂ development undertaken on existing leases would increase annual production from 360 bcf to 420 bcf.

The economic impacts of Alternative I are summarized in Table 4-66, and include an estimate of total jobs, total personal income, and population for the study area (Montezuma and Dolores Counties, combined).

Parameter	2005	2010	2015	2020	2025
Total Jobs	13,400	15,330	16,490	17,760	19,040
Total Personal Income (\$ millions)	710	990	1,360	1,920	2,660
Population	26,760	29,660	32,620	36,180	39,520

Alternative V (Preferred Alternative)

Under Alternative V, management actions would reduce active AUMs by 25 percent, bringing grazing activity closer to pasture carrying capacity, and to recent actual use. Reducing AUMs by 25 percent may reduce agricultural income in Montezuma County by about one-half of one percent (see Alternative II, as described in the DRMP/DEIS, for details). Recreation and transportation management actions may moderately increase recreational use and visits. This may increase tourism jobs in Montezuma County by 25 to 50 percent above the No Action Alternative.

Under Alternative V, fluid minerals management actions may result in up to 1 new oil and gas well on new leases, which may keep oil and gas production at the levels forecasted in the No Action Alternative. Up to 1 new CO₂ well is anticipated on new leases under Alternative V. This may keep CO₂ production at levels forecasted under the No Action Alternative. Overall, under Alternative V, management actions may result in an increase in total jobs of 4 to 8 percent over the No Action Alternative. Total personal income may be unchanged, as increases in low-wage tourism jobs may be offset by losses in agricultural income resulting from the reduced number of AUMs. Population may also remain unchanged, when compared to the No Action Alternative. The economic impacts of Alternative V are summarized in Table 4-67.

Parameter	2005	2010	2015	2020	2025
Total Jobs	13,940	16,100	17,480	19,000	20,560
Total Personal Income (\$ millions)	710	990	1,360	1,920	2,660
Population	26,760	29,660	32,620	36,180	39,520

Alternative VI (Proposed Plan)

Under the Proposed Plan, management actions would reduce active AUMs by 25 percent, bringing grazing activity closer to pasture carrying capacity, and to recent actual use. Reducing AUMs by 25 percent may reduce agricultural income in Montezuma County by about one-half of one percent (see Alternative II, as described in the DRMP/DEIS, for details). Recreation and transportation management actions may moderately increase recreational use and visits. This may increase tourism jobs in Montezuma County by 25 to 50 percent above the No Action Alternative.

Under the Proposed Plan, fluid minerals management actions may result in up to 1 new oil and gas well on new leases, which may keep oil and gas production at the levels forecasted in the No Action Alternative. Up to 1 new CO₂ well is anticipated on new leases under Alternative VI. This may keep CO₂ production at levels forecasted under the No Action Alternative. Production of fluid minerals within the Monument may be the same as the No Action Alternative; however recent requests for drilling indicate that a substantial increase may occur. This increase may boost the local economy for the short-term, providing tax revenues and jobs. This economic boost may be short-term, however with revenue losses over the long-term. These losses may occur as a result of a drop in tourism, and associated visitation to the Monument. A reduction in tourism may occur as a result of permanent damage to the visual and cultural landscape within the Monument. Overall management actions may result in an increase in total jobs of 4 to 8 percent over the No Action Alternative. Total personal income may be unchanged, as increases in low-wage tourism jobs may be offset by losses in agricultural income resulting from the reduced number of AUMs. Population may also remain unchanged, when compared to the No Action Alternative. The economic impacts of Alternative VI are summarized in Table 4-68.

Parameter	2005	2010	2015	2020	2025
Total Jobs	13,940	16,100	17,480	19,000	20,560
Total Personal Income (\$ millions)	710	990	1,360	1,920	2,660
Population	26,760	29,660	32,620	36,180	39,520

4.4.7.3. Social Impact Analysis

The social impact analysis uses two variables: 1) settlement patterns; and 2) community resources. Settlement patterns measure the rate at which land is converted from existing uses (such as agricultural) to a different land use (such as residential). This may impact the quality of life within the region, as open space amenities are highly valued within the community. Community resources measure impacts to social services and organizations that support the rural lifestyle that defines, and organizes, communities in Montezuma and Dolores Counties. Table 4-69 defines terms used in the social and cumulative impact analysis (see Appendix I, Socioeconomics, for details on estimating social impacts).

Table 4-69 Measures for Social and Cumulative Impact Analysis	
Term	Definition
None	No change to current conditions or baseline forecast.
Negligible	No measurable change from current conditions or baseline forecast. Any changes are of short duration – 1 year or less.
Minor	Small change in current conditions or baseline forecast. Impacts may be detectable, but temporary – less than 2 years.
Moderate	Small, but permanent, change to current conditions or baseline forecast. Impacts may be measurable and directly attributable to management actions. Impacts may be long-term (greater than 2 years) or permanent, and may increase over time.
Major	Highly noticeable long-term or permanent changes from current conditions or baseline forecast that can be directly attributed to management actions. Impacts may be of concern to the public; there is media attention and local officials take action. Impacts may be long-term (greater than 2 years) or permanent, and are likely to increase over time.
Direct	Action may result in a primary reaction or change in the study area’s society and/or economy.
Indirect	Action may result in secondary reaction or change in the study area’s society and/or economy.
Beneficial	Positive impacts.
Adverse	Negative impacts.
Localized	Highly specific location.
Temporary	Impacts may occur only during implementation, and, generally, may last no more than 2 years.
Short-term	Impacts may occur only for a short time (less than 2 years) after

Table 4-69 Measures for Social and Cumulative Impact Analysis	
Term	Definition
	implementation.
Long-term	Impacts may occur for an extended period (more than 2 years) after implementation.
Permanent	The society and/or economy of the study area would never revert back to current condition after implementation

Alternative I (No Action Alternative)

Under Alternative I, improved rangeland health is not likely since no new management actions would occur. There would be no new fluid minerals leases. Combined, these management actions may improve open space amenities within the Monument. Recreation and transportation management actions may support increased recreational use of the Monument. Under the No Action Alternative, rising land values, amenity migration, and increased agricultural input costs may result in conversion of about one-third of existing private agricultural land in the study area into residential and/or other land uses during the next 20 years. This was estimated based upon historical agricultural land conversion rates, as well as upon planning forecasts for the study area (see Appendix I for details).

Under Alternative I, community resources, especially county social services, may be maintained at present levels of availability and quality of service (see Appendix I).

Alternative V (Preferred Alternative)

Under Alternative V, management actions would reduce the number of livestock AUMs, which may, in turn, indirectly impact the viability of agricultural open space amenities. Recreation and transportation management actions may increase the recreational use of the Monument. Fluid minerals development may be managed to maintain the same production levels (and tax revenues) as that proposed under the No Action Alternative. Overall, open space and recreational amenities within the Monument, as well as community resources, may be improved, when compared with the No Action Alternative. Open space amenities associated with private agricultural land may be indirectly reduced, when compared with the No Action Alternative. Therefore, the Preferred Alternative may result in minor beneficial social impacts.

Alternative VI (Proposed Plan)

Under the Proposed Plan, management actions would reduce the number of livestock AUMs, which may, in turn, indirectly impact the viability of agricultural open space amenities. Recreation and transportation management actions may increase the recreational use of the Monument. Fluid minerals development may be managed to maintain the same production levels (and tax revenues) as that proposed under the No Action Alternative; however, recent indications show that such levels are likely to increase. Overall, open space and recreational amenities within the Monument, as well as community resources, may be improved, when compared with the No Action Alternative. Under the Proposed Plan, the impacts of some management actions, such as reducing the number of AUMs, may result in indirect adverse impacts on private open space amenities.

4.4.7.4. Cumulative Impacts

The timeframe for this cumulative impact analysis encompasses past, present, and future activities within the planning area, as well as actions outside of the Monument that may impact the planning area. Cumulative socioeconomic impacts are analyzed by accumulating direct and indirect impacts across time and key trends. The baseline trends driving social and economic changes within the study area include amenity migration and boom/bust cycles. These trends are expected to result in one-third more people living within the study area, about one-third of existing agricultural land being developed for residences, and personal income levels staying below the average for Colorado.

In estimating cumulative socioeconomic impacts, it is important to identify potential tipping points that leverage major shifts in economic and/or social patterns for the study area. Two tipping points have been identified: 1) changes to open space amenities and rural lifestyle that accelerate or decelerate amenity migration; and 2) boom/bust cycles related to fluid minerals development. Amenity migration is shaping future population and demographics for the study area. If management actions were to tip the balance of baseline trends to significantly degrade the quality and/or the quantity of open space amenities (such as vistas, wildlife habitat, and/or remote recreation), the rate of amenity migration may decrease or reverse. Furthermore, management actions that reduce rangeland grazing quality and/or quantity may indirectly impact the viability of agricultural enterprises within the study area, and may reduce private open space amenities. Under the No Action Alternative, Monument open space amenities may become more valuable to residents, as one-third of existing private agricultural land is converted to residential development.

Presently, the Four Corners region is experiencing an economic and population boom resulting from coal-bed methane development in the San Juan Basin. Counties in the Four Corners region are experiencing some of the fastest growth in population and personal income. High natural gas prices and new coal-bed methane recovery technologies are fueling this boom. However, natural gas production within the San Juan Basin peaked in 2003, and is expected to decline in the future as the result of resource depletion (Durango Herald 2006). The study area has been defined in part by boom/bust cycles in hard-rock mining and forestry. If management actions, such as those related to increased fluid minerals development, were to amplify the boom/bust cycle, it may result in social impacts, including insufficient social services and infrastructure to serve the population boom. A bust may likely be the result of an action completely outside the control of the BLM, such as a drastic reduction in natural gas and/or oil prices. A bust may reduce county tax revenues to levels insufficient to support baseline social services. In the cumulative impact analysis, management actions with the potential for resulting in a tipping point are highlighted.

Alternative I (No Action Alternative)

Under Alternative I, management actions may improve the long-term viability of ranching, and may help to maintain the benefits of open space and the rural lifestyle provided by private agricultural lands within the study area. Alternative I may also maintain county tax revenues resulting from fluid minerals development through existing leases, as well as maintain diverse recreation opportunities within the Monument.

Alternative V (Preferred Alternative)

Under the Preferred Alternative, the impacts of some management actions, such as reducing the number of AUMs, may result in indirect adverse impacts on private open space amenities. Under this alternative, the net economic impacts may likely be beneficial, in that income and employment related to tourism and fluid minerals development may offset losses in the

agricultural sector. Continued fluid minerals development may support baseline social services. Increased recreational opportunities and improved rangeland health may enhance the amenities within the Monument. It is not possible to determine whether or not enhanced open space amenities within the Monument would offset private land losses. However, the net impact, when compared with the No Action Alternative, may be minor beneficial cumulative impacts.

Alternative VI (Proposed Plan)

Under the Proposed Plan, the impacts of some management actions, such as reducing the number of AUMs, may result in indirect adverse impacts on private open space amenities. Under the Proposed Plan, the net economic impacts may likely be beneficial, in that income and employment related to tourism and fluid minerals development may offset losses in the agricultural sector. Continued fluid minerals development may support baseline social services; however, it may result in a reduction in revenues associated with recreation and tourism. Increased recreational opportunities and improved rangeland health may enhance the amenities within the Monument. It is not possible to determine whether or not enhanced open space amenities within the Monument would offset private land losses. However, the net impact, when compared with the No Action Alternative, may be minor beneficial cumulative impacts.

4.4.7.5. Environmental Justice

Executive Order 12898 requires that all Federal actions must consider potentially disproportionate impacts on minority and/or on low-income communities. Principles for considering environmental justice are outlined in Environmental Justice Guidance under the National Environmental Policy Act (Council on Environmental Quality 1997). These principles are recognized, and have been considered in this analysis. Native Americans are the only minority race present within the study area in a greater proportion to other minorities than the rest of the State. Native Americans comprise 13 percent of the Montezuma County population (CSDO 2005). Most of these residents are members of the Ute Mountain Ute Tribe (Ute).

During the scoping process, Ute representatives identified several issues of concern (BLM 2003e and 2004d):

- access to, or continuation of, historical uses (such as grazing, offering sites, herb-gathering, and places of prayer offering);
- conflicts with the Brunot Treaty (including access to historical hunting grounds);
- excavation leading to artifacts being taken away and placed in storage or put on display (leading to a loss of control and/or to the ability of people to appreciate artifacts as left by ancestors);
- lack of involvement or of being “heard” in relation to actual decision-making;
- agency failing to honor policies for “returning human remains back to the ground;” and
- oil and gas development impacts to archeological sites and human remains.

Fundamental to each concern is the historical distrust the Ute hold toward Euro-American settlers, and toward the United States government. This distrust is based upon the history of broken treaties with the Ute, beginning around 1849. Originally, the Ute were a large band of Native Americans who occupied portions of New Mexico, Oklahoma, Texas, Kansas, Wyoming, Utah, and Colorado. The discovery of minerals, and the ever-expanding population of settlers, resulted in a rash of renegotiated treaties over the span of 50 years. One of the last, and most relevant, was the Brunot Treaty of 1873. In short, the Ute gave up access to most of their traditional Colorado territory, in return for an annual payment of \$25,000; permission to hunt in

the San Juan Mountains; an increase in Chief Ouray's salary (from \$500 to \$1,000 a year); and a government reaffirmation that unauthorized people should not enter the reservation (USGS 2004). The Ute Mountain Ute and Southern Ute tribes remain concerned about restrictions on access.

Management actions (such as the reduction in permitted grazing, further development of archeological sites, increased oil and gas development, and/or route closures) may impact the tribe, in that their historical sense of exclusion (in relation to access to traditional areas, decisions about use and management, and the gains realized from extraction) may be heightened. Currently, and in the 20-year horizon of this study, the Ute are not adversely impacted economically. In fact, their tourism enterprises stand to benefit from the increased visitation to the Monument. Socially, Ute may be impacted by what is perceived as yet another infringement upon their historic lands and rights. The social impacts to the Ute may be mitigated through careful assessment of how access to popular areas would be altered, through consultation in relation to each planned change to cultural resource sites, and by minimizing further plans to excavate and stabilize new sites. Continuation of a regular collaborative approach between Monument management and Native American tribes and Pueblos may improve relations, and may enhance the overall management of the Monument.