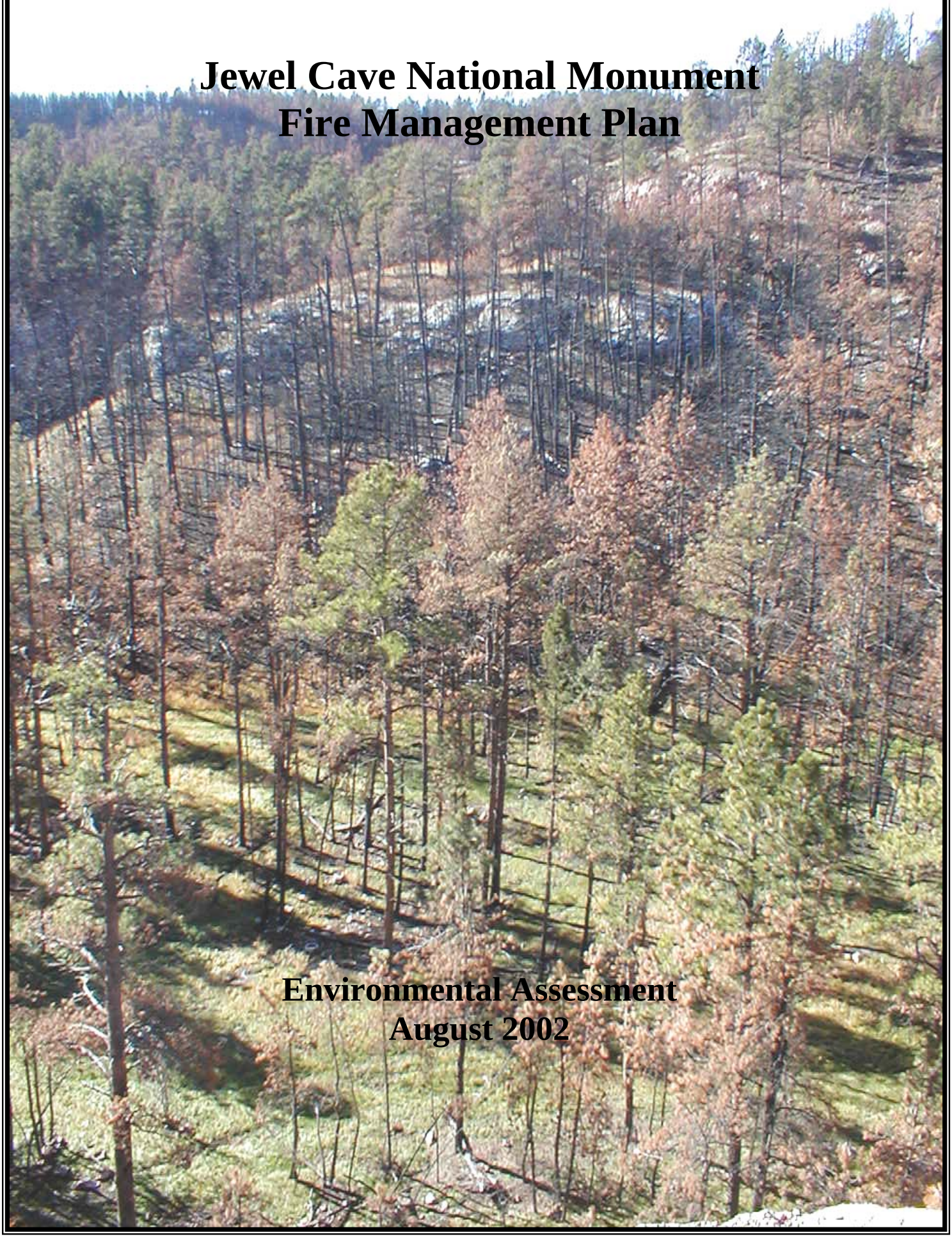
Jewel Cave National Monument
Fire Management Plan



Environmental Assessment
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Chapter 1 - Purpose and Need

1.1 INTRODUCTION

This Environmental Assessment (EA) documents the results of a study of the potential environmental impacts of an action proposed by the National Park Service to amend the Jewel Cave National Monument Fire Management Plan.

The Purpose of an Environmental Assessment (EA)

There are three primary purposes of an EA:

- To help determine whether the impact of a proposed action or alternative could be significant, thus an environmental impact statement (EIS) is needed;
- To aid in compliance with NEPA when no EIS is necessary by evaluating a proposal that will have no significant impacts, but that may have measurable adverse impacts; and
- To facilitate preparation of an EIS if one is necessary.

This EA has been prepared in compliance with:

- The National Environmental Policy Act (NEPA) of 1969 (42 United States Code (USC) 4321 et seq.), which requires an environmental analysis for major Federal Actions having the potential to impact the quality of the environment;
- Council of Environmental Quality Regulations at 40 Code of Federal Regulations (CFR) 1500-1508, which implement the requirements of NEPA;
- National Park Service Conservation Planning, Environmental Impact Analysis, and Decision Making; Director's Order (DO) #12 and Handbook.

Key goals of NEPA are to help Federal agency officials make well-informed decisions about agency actions and to provide a role for the general public in the decision-making process. The study and documentation mechanisms associated with NEPA seek to provide decision-makers with sound knowledge of the comparative environmental consequences of the several courses of action available to them. NEPA studies, and the documents recording their results, such as this EA, focus on providing input to the particular decisions faced by the relevant officials. In this case, the Superintendent of Jewel Cave National Monument is faced with a decision to amend the monument's Fire Management Plan as described below. This decision will be made within the overall management framework already established in the Jewel Cave National Monument's General Management Plan. The alternative courses of action to be considered at this time are, unless otherwise noted, crafted to be consistent with the concepts established in the General Management Plan (copies of the General Management Plan can be obtained by contacting NPS personnel at the monument).

In making decisions about National Park Service administered resources, the Park Service is guided by the requirements of the 1916 Organic Act and other laws, such as the Clean Air Act, Clean Water Act, and Endangered Species Act. The authority for the conservation and management of the National Park Service is clearly stated in the Organic Act, which states the agency's purpose: "...to conserve the scenery and the natural and historic objects and the

wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." This authority was further clarified in the National Parks and Recreation Act of 1978: "Congress declares that...these areas, though distinct in character, are united...into one national park system.... The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress."

Theodore Roosevelt created the monument on February 7, 1908 by Presidential Proclamation 799 (35 Stat. 2180). The Proclamation stated the purpose of the monument to be:

> *Whereas, the natural formation, known as Jewel Cave…is of scientific interest, and it appears that the public interests would be promoted by preserving this formation as a National Monument, with as much land as may be necessary for the proper protection thereof…*

The requirements placed on the National Park Service by these laws, especially the Organic Act, mandate that resources are passed on to future generations "unimpaired" (DOI, 2001a). This EA addresses whether the actions of the various alternatives proposed by Jewel Cave National Monument impair resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for enjoyment of the monument, and (3) identified as a goal in the monument's general management plan or other Park Service planning documents (see *Chapter 3 – Environmental Consequences*).

1.2 PURPOSE AND NEED

Historically, fire played a major role in maintaining the natural ponderosa pine ecosystem and a diversity of wildlife habitat in the area now designated as Jewel Cave National Monument. The ponderosa pine ecosystem historically had a fire regime of frequent, low-severity ground fires (every 1-45 years, with a mean fire return interval of 16 years) that resulted in uneven-aged and open, park-like stands of ponderosa pine. Smaller trees were killed by the fires, while older, larger, fire-resistant trees survived (Brown and Sieg, 1996).

One hundred years of wildland fire suppression in the region resulted in an increased density of pine stands and abundant ladder fuels (e.g. dead and dry lower limbs, small trees), which created ideal conditions for severe crown fires and/or catastrophic fires. The historic pre-European settlement pattern of frequent and low-severity ground fire, which removed ground fuels, shifted to a pattern of potential high severity wildfires that could threaten life, property, and monument resources. This scenario played out during the Jasper Fire of 2000, which resulted in thousands of acres being burned, many of which experienced high-intensity fires that killed thousands of acres of large trees. In spite of this fire, there is a still a need to re-establish the natural fire regime to the ponderosa pine forest and preserve native plant communities while at the same time protect visitors, facilities, and resources on and adjacent to the monument.

National Park Service Wildland Fire Management Guidelines (DO-18) states that "all parks with vegetation that can sustain fire must have a fire management plan." The purpose of this federal action is to develop a fire management plan and program that utilizes the benefits of fire to achieve desired natural resource conditions while minimizing the fire danger to monument resources and adjacent lands from hazardous fuel accumulations. The need for this project is to restore the natural fire regime to the ponderosa pine forest and reduce hazardous fuel levels.

1.3 BACKGROUND

Jewel Cave National Monument encompasses 1,274 acres and is located in Custer County in the southern Black Hills of southwestern South Dakota. The monument is surrounded by the Black Hills National Forest, and the cave underlies the monument surface area and adjacent Forest Service lands (see Figure 1-1). Ponderosa pine forest dominates the vegetation on the monument.

Jewel Cave is a characteristic Black Hills cave formed by the solution of the Mississippian Pahasapa Limestone. The cave contains many rare speleothems, including delicate hydro-magnesite balloons, helicites, and tiny root-like structures called scintillites. Jewel Cave is the world's third longest cave. As of January 2002, more than 110 miles of cave have been discovered, and more is being found continually. It is an extremely complex, three dimensional maze cave with all known passageways contained under less than 3 square miles of surface area. This combination of length and complexity makes it one of the premier caves of the world.

In June 2000, the Jasper Fire burned over 83,500 acres inside and outside of the monument boundary. Virtually the entire acreage contained in the monument was affected by this fire. Much of the Jasper Fire consisted of high-intensity fire, however, in areas within the monument that were previously treated with thinning and prescribed fire, the severity was greatly reduced.

1.4 FIRE MANAGEMENT OBJECTIVES

National Park Service Wildland Fire Management Guidelines (DO-18) requires that all parks with vegetation capable of sustaining fire develop a wildland fire management plan that will meet the specific resource management objectives for that park and to ensure that firefighter and public safety are not compromised. This guideline identifies fire as the most aggressive natural resource management tool employed by the National Park Service. The guideline further states that all wildland fires are classified as either wildfires or prescribed fires. Prescribed fires and wildland fire use may be authorized by an approved wildland fire management plan and contribute to a park's

Wildfires are any non-structure fires, other than prescribed fires, that occur in the wildland. This term encompasses fires previously called both wildfires and prescribed natural fires.

Prescribed Fires are any fires ignited by management actions in defined areas under predetermined weather and fuel conditions to meet specific objectives.

Wildland fire use is the management of naturally ignited wildland fires to accomplish specific prestated resource management objectives in predefined geographic areas outlined in Fire Management Plans.

resource management objectives. Human-caused wildfires are unplanned events and may not be used to achieve resource management objectives.

DO-18 identifies three paramount considerations for each Park's fire management program. They are:

- protect human life and property both within and adjacent to Park areas;
- perpetuate, restore, replace, or replicate natural processes to the greatest extent practicable; and
- protect natural and cultural resources and intrinsic values from unacceptable impacts attributable to fire and fire management activities

The overall objectives of the Jewel Cave Fire Management Plan are the following:

- provide for firefighter and public safety while managing wildland fires;
- allow prescribed fires to replicate a fire regime consisting of frequent (10-20 year return interval), low-severity fires throughout the monument; during restoration, a more frequent prescribed fire regime may be necessary;
- reduce the fire hazard from excessive fuel accumulations as a result of past fire suppression and logging activities; and
- prevent adverse impacts due to the effects from wildfires and fire suppression.

Resource management objectives in relation to the fire management program include the following:

- plan and manage surface resources and developments to maintain, restore and protect natural systems and conditions in Jewel Cave;
- work with management of the Black Hills National Forest and neighboring landowners to ensure that land uses adjacent to the monument do not threaten Jewel Cave in either jurisdiction;
- identify, document, preserve and protect significant cultural, vegetative, and wildlife resources within the monument.

1.5 SCOPING ISSUES AND IMPACT TOPICS

On December 21, 2001, a scoping letter describing the Proposed Action and inviting the public to an open house was sent to a mailing list of approximately 150 individuals and organizations. On January 8, 2002, the public open house was held in Custer to discuss the Fire Management Plan and the proposed use of mechanical thinning and prescribed fire treatments in the monument. Five people signed the attendance list. The major issues and concerns that came from the open house and other public input (e.g. email, written correspondence) were evaluated and sorted. Issues determined to be important were those related to the effects of the proposed action, and those not already adequately addressed by laws, regulations, and policies. Important issues were considered in developing and evaluating the alternatives to the Proposed Action discussed in this EA.

1.5.1 *Important Issues*

- Issue: Prescribed fires (broadcast burns) may escape or spot outside of control lines and/or discharge too much smoke, thus having the potential to impact human health and safety, private structures, and property

1.5.2 *Issues Considered but not Evaluated in this Environmental Assessment*

- Issue: Herbicides should be used to reduce fuels around monument facilities to prevent wildland fires from originating at those locations. The authorized use of herbicides for fuel reduction purposes would be addressed and analyzed as part of the monument's General Management Plan.

- Issue: The fuels buildup in the Black Hills is heavier now than it has ever been. This issue is associated with the purpose and need of the federal action and the alternatives in this EA have been developed to address fuel accumulations on the monument. The need to reduce fuel accumulations in the remainder of the Black Hills is beyond the scope of the monument's Fire Management Plan and this EA.

1.5.3 *Impact Topics Evaluated in this Environmental Assessment*

Impact topics are derived from issues raised during internal and external scoping. Not every conceivable impact of a proposed action is substantive enough to warrant analysis. The following topics, however, do merit consideration in this EA:

Geology and Soils: Intense fires, thinning activities, and suppression activities can adversely impact soils, therefore, impacts to soils are analyzed in this EA. Fire management activities may impact the Cave and therefore, geological impacts are addressed in this EA.

Water Resources (Including Floodplains and Wetlands): Presidential Executive Orders mandate floodplain management and protection of wetlands and NPS policies require protection of water resources consistent with the Federal Clean Water Act. Jewel Cave National Monument contains several intermittent streams (Hell Canyon and Lithograph Canyon) and a few small springs. Thinning treatments, prescribed fires and fire suppression efforts can adversely impact stream channels and water flows into Jewel Cave, therefore, impacts to water resources are analyzed in this EA.

Vegetation: Ponderosa pine forests of varying age is the dominant vegetation type in the monument. Since fire management activities would include fuels reduction and the restoration of natural fire regimes, vegetation impacts are analyzed in this EA.

Wildlife: There are resident populations of various species of reptiles, amphibians, birds, mammals, fish, and invertebrates that can be impacted by thinning treatments and prescribed fires. Therefore, impacts to wildlife are evaluated in this EA.

Air Quality: The Federal 1963 Clean Air Act stipulates that Federal agencies have an affirmative responsibility to protect a park's air quality from adverse air pollution impacts. Moreover, Jewel Cave National Monument is designated as a Class II area. While the park generally enjoys excellent air quality, it is not pristine air quality. Air pollution from industrial and electric utility facilities in the region, which includes nitrate and sulfate emissions, impact air quality at the monument. All types of fires generate smoke and particulate matter, which can impact air quality within the monument and surrounding region. In light of these considerations, air quality impacts are analyzed in this EA.

Visitor Use and Experience: The 1916 NPS Organic Act directs the Service to provide for public enjoyment of the scenery, wildlife and natural and historic resources of national parks "in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." Fire management activities can result in the temporary closure of certain areas and/or result in visual impacts that may affect the visitor use and experience of the monument. Therefore, the potential impacts of the proposed FMP on visitor use and experience are addressed in this EA.

Human Health and Safety: Fires can be extremely hazardous, even life-threatening, to humans, and current federal fire management policies emphasize that firefighter and public safety is the first priority; all FMP's must reflect this commitment (NIFC, 1998). Therefore, impacts to human health and safety are addressed in this EA.

Cultural Resources: Section 106 of the National Historic Preservation Act of 1966 provides the framework for Federal review and protection of cultural resources, and ensures that they are considered during Federal project planning and execution. Jewel Cave National Monument contains 20 archeological sites and several historic structures, including the old CCC camp area, the historic cave entrance, historic ranger cabin, and remains of the Jewel Cave Hotel. These cultural resources can be affected both by fire itself and fire suppression activities, thus potential impacts to cultural resources are addressed in this EA.

Park Operations: Severe fires can potentially affect operations at national parks, especially in more developed sites like visitor centers and administrative and maintenance facilities. These impacts can occur directly from the threat to facilities of an approaching fire, and more indirectly from smoke and the diversion of personnel to firefighting. Fires have caused closures of facilities in parks around the country. Thus, the potential effects of the FMP alternatives on park operations will be considered in this EA.

1.5.4 *Impact Topics Considered but not Evaluated in this Environmental Assessment*

NEPA and the CEQ Regulations direct agencies to "avoid useless bulk…and concentrate effort and attention on important issues" (40 CFR 1502.15). Certain impact topics that are sometimes addressed in NEPA documents on other kinds of proposed actions or projects have been judged to not be substantively affected by any of the FMP alternatives considered in this EA. These topics are listed and briefly described below, and the rationale provided for considering them, but dropping them from further analysis.

Threatened and Endangered Species: The Federal Endangered Species Act prohibits harm to any species of fauna or flora listed by the U. S. Fish and Wildlife Service (USFWS) as being either threatened or endangered. Such harm includes not only direct injury or mortality, but also disrupting the habitat on which these species depend. There are no known threatened or endangered species that reside within Jewel Cave National Monument, nor is there any critical habitat. Therefore, this impact topic is not included for further analysis in this EA.

Noise: Noise is defined as unwanted sound. Fuels reduction, prescribed fires and fire suppression efforts can all involve the use of noise-generating mechanical tools and devices with engines, such as chain saws, trucks, helicopters, and airplanes. Each of these devices, in particular helicopters and chain saws at close range, are quite loud (in excess of 100 decibels). The use of machines, such as chainsaws, would be infrequent and not pervasive enough to substantially interfere with human activities in the area or with wildlife behavior. Nor will such infrequent bursts of noise chronically impair the solitude and tranquility associated with monument. Another factor for the dismissal of noise from an in-depth analysis is the paucity of nearby "noise-sensitive receptors" (e.g. schools, hospitals, nursing homes, churches) in the area. Therefore, this impact topic is eliminated from further analysis in this EA.

Waste Management: None of the FMP alternatives would generate noteworthy quantities of either hazardous or solid wastes that need to be disposed of in hazardous waste or general sanitary landfills. Therefore this impact topic is dropped from additional consideration.

Transportation: None of the FMP alternatives would substantively affect road, railroad, water-based, or aerial transportation in and around the monument. One exception to this general rule would be the temporary closure of nearby roads during fire suppression activities or from heavy smoke emanating from wildland fires or prescribed fires. Over the long term, such closures would be very infrequent and would not significantly impinge on local transportation. Therefore, this topic is dismissed from any further analysis.

Utilities: Generally speaking, some kinds of projects, especially those involving construction, may temporarily impact above and below-ground telephone, electrical, natural gas, water, and sewer lines and cables, potentially disrupting service to customers. Other proposed actions may exert a substantial, long-term demand on telephone, electrical, natural gas, water, and sewage infrastructure, sources, and service, thereby compromising existing service levels or causing a need for new facilities to be constructed. None of the FMP alternatives will cause any of these effects to any extent, and therefore utilities are eliminated from any additional analysis.

Land Use: Visitor and administrative facilities occur within the monument, and it is surrounded by the Black Hills National Forest. Fire management activities would not affect land uses within the monument or in adjacent areas, therefore land use is not included for further analysis in this EA.

Socioeconomics: NEPA requires an analysis of impacts to the "human environment" which includes economic, social and demographic elements in the affected area. Fire management activities may bring a short-term need for additional personnel in the monument, but this addition would be minimal and would not affect neighboring communities' overall populations,

incomes and employment bases. Therefore, this impact topic is not included for further analysis in this EA.

Environmental Justice / Protection of Children: Presidential Executive Order 12898 requires Federal agencies to identify and address disproportionate impacts of their programs, policies and activities on minority and low-income populations. Executive Order 13045 requires Federal actions and policies to identify and address disproportionately adverse risks to the health and safety of children. None of the alternatives would have disproportionate health or environmental effects on minorities or low-income populations as defined in the Environmental Protection Agency's Environmental Justice Guidance, therefore, these topics are not further addressed in this EA.

Prime and Unique Agricultural Lands: Prime farmland has the best combination of physical and chemical characteristics for producing food, fed, forage, fiber, and oilseed crops. Unique land is land other than prime farmland that is used for production of specific high-value food and fiber crops. Both categories require that the land is available for farming uses. Lands within Jewel Cave National Monument are not available for farming and, therefore, do not meet these definitions. This impact topic is not evaluated further in this EA.

Wilderness: According to National Park Service Management Policies (2001), proposals having the potential to impact wilderness resources must be evaluated in accordance with National Park Service procedures for implementing the National Environmental Policy Act. Because Jewel Cave does not have any proposed or designated wilderness areas within it or adjacent to it, this impact topic is not evaluated further in this EA.

Indian Trust Resources: Indian trust assets are owned by Native Americans but held in trust by the United States. Indian trust assets do not occur within Jewel Cave National Monument and, therefore, are not evaluated further in this EA.

Resource Conservation, Including Energy, and Pollution Prevention: The National Park Service's *Guiding Principles of Sustainable Design* provides a basis for achieving sustainability in facility planning and design, emphasizes the importance of biodiversity, and encourages responsible decisions. The guidebook articulates principles to be used such as resource conservation and recycling. Proposed project actions would not minimize or add to resource conservation or pollution prevention on the monument and, therefore, this impact topic is not evaluated further in this EA.

Table 1-1 Impact Topics for Jewel Cave National Monument Fire Management Plan Environmental Assessment

Impact Topic	Retained or Dismissed from Further Evaluation	Relevant Regulations or Policies
Geology and Soils	Retained	NPS *Management Policies 2001*
Water Resources	Retained	Clean Water Act; Executive Order 12088; NPS *Management Policies*
Vegetation	Retained	NPS *Management Policies*
Wildlife	Retained	NPS *Management Policies*
Air Quality	Retained	Federal Clean Air Act (CAA); CAA Amendments of 1990; NPS *Management Policies*
Visitor Use and Experience	Retained	NPS *Management Policies*
Human Health & Safety	Retained	NPS *Management Policies*
Cultural Resources	Retained	Section 106; National Historic Preservation Act; 36 CFR 800; NEPA; Executive Order 13007; Director's Order #28; NPS *Management Policies*
Park Operations	Retained	NPS *Management Policies*
Threatened and Endangered Species and their Habitats	Dismissed	Endangered Species Act; NPS *Management Policies*
Noise	Dismissed	NPS *Management Policies*
Floodplains and Wetlands	Dismissed	Executive Order 11988; Executive Order 11990; Rivers and Harbors Act; Clean Water Act; NPS *Management Policies*
Waste Management	Dismissed	NPS *Management Policies*
Transportation	Dismissed	NPS *Management Policies*
Utilities	Dismissed	NPS *Management Policies*
Land Use	Dismissed	NPS *Management Policies*
Socioeconomics	Dismissed	40 CFR Regulations for Implementing NEPA; NPS *Management Policies*
Environmental Justice	Dismissed	Executive Order 12898
Prime and Unique Agricultural Lands	Dismissed	Council on Environmental Quality 1980 memorandum on prime and unique farmlands
Wilderness	Dismissed	The Wilderness Act; Director's Order #41; NPS *Management Policies*
Indian Trust Resources	Dismissed	Department of the Interior Secretarial Orders No. 3206 and No. 3175
Resource Conservation, Including Energy, and Pollution Prevention	Dismissed	NEPA; NPS *Guiding Principles of Sustainable Design*; NPS *Management Policies*

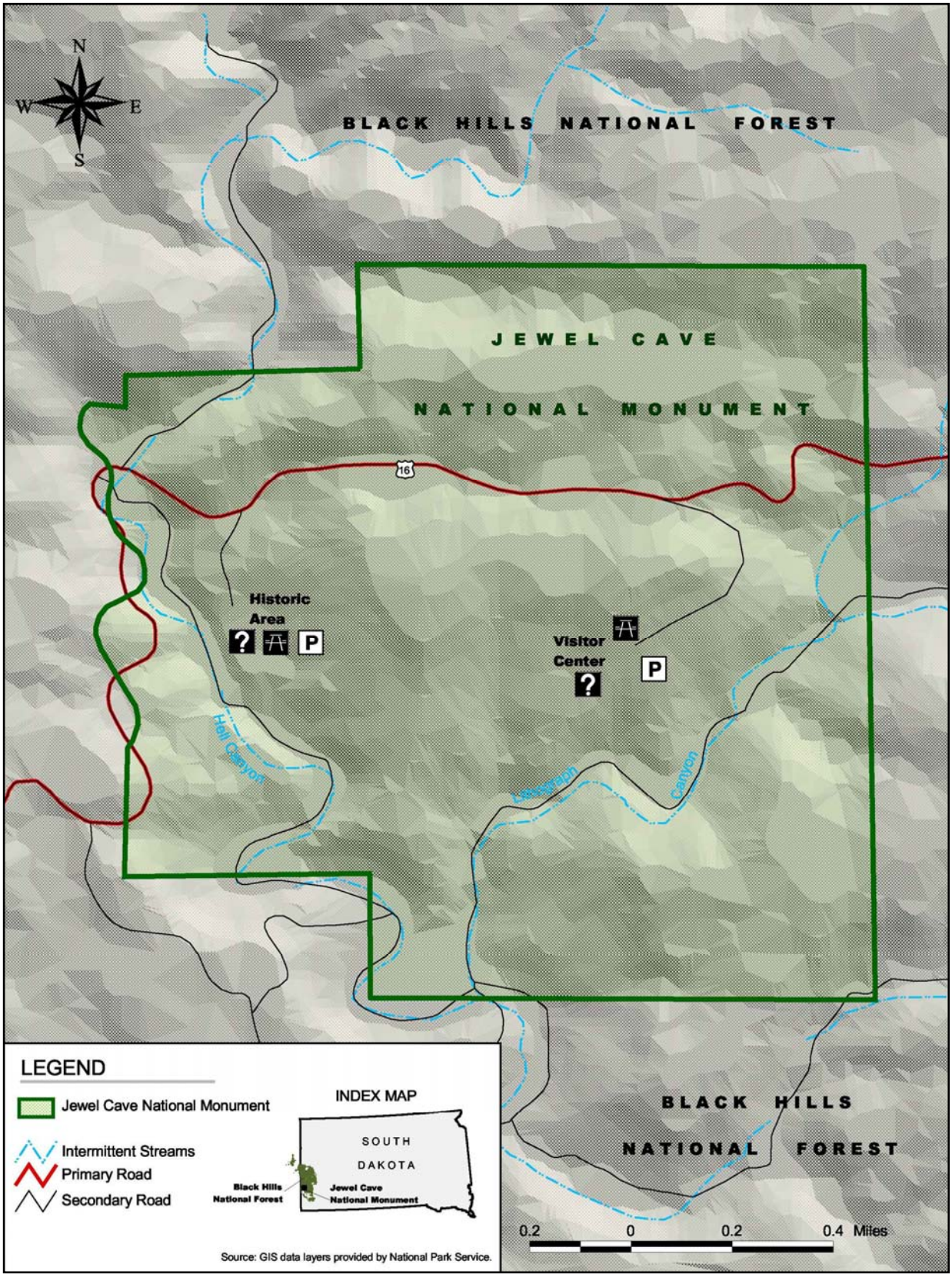

Figure 1-1 Jewel Cave National Monument Vicinity

Chapter 2 - Issues and Alternatives

This Chapter describes the range of alternatives, including the Proposed Action and No Action Alternatives, formulated to address the purpose of and need for the proposed project. These alternatives were developed through evaluation of the comments provided by individuals, organizations, governmental agencies, and the Interdisciplinary Team (IDT).

2.1 ALTERNATIVES CONSIDERED BUT NOT ANALYZED FURTHER IN THIS EA

2.1.1 *Revision of the 1987 Fire Management Plan to include Wildland Fire Use*

Wildland fire use involves the management of fires ignited by natural means (usually lightning) that are permitted to burn under specific environmental conditions for natural resource benefits. In many cases, national parks and forests employ wildland fire use as a part of their fire management program to obtain natural resource benefits from wildfire. These parks and forests typically have large acreages and the areas identified for its use contain few if any private residences and structures nearby (wildland urban interface). In such cases, wildland fire use is a critical component in meeting fire management objectives of federal agencies. This alternative was considered but not analyzed further in this EA because the 1,274 acres of the monument is too small to ensure fire containment within monument boundaries, and valuable resource and cultural resources would be at risk if the wildfire burned out-of-prescription. In the event of a resulting catastrophic wildfire, forest stands could be entirely consumed and monument and private residences and structures could be destroyed. Monument staff concluded that the potential risks to human health and safety and cultural resources under this alternative outweigh any potential resource benefits that would be obtained from including wildland fire use.

2.1.2 *Mechanical Fuel Treatments as a Fire Surrogate*

Under this alternative, hazardous fuel accumulations would be removed or manipulated by mechanical means to the extent practicable. Fuels would be burned in place during winter months with ample snow on the ground or removed to another on-site location away from public views. This alternative was rejected because it would be cost prohibitive as the sole means of achieving hazardous fuels reduction for the entire monument, and the absence of prescribed fire would not meet resource objectives of the monument to return the forests to natural fire regimes.

2.2 ALTERNATIVES CONSIDERED AND ANALYZED IN THIS EA

2.2.1 *Alternative 1 (No Action Alternative) - Implement the 1987 Fire Management Plan*

This alternative meets the purpose and need by continuing the fire program according to the Fire Management Plan approved in 1987, however it would not be updated to reflect current fire policy guidance. The No Action Alternative would include the suppression of wildland fires, provide for prescribed fires, and allow for mechanical thinning treatments.

The entirety of Jewel Cave National Monument is contained in one Fire Management Unit since the following characteristics are similar throughout the monument: climate, weather, topography, vegetation, elevation, air quality concerns, access, fire history, fuel types, major fire regimes and expected fire behavior. Under this alternative, all wildland fires in the monument, human-caused fires and naturally-ignited fires (usually lightning), would be declared wildfires and controlled in a manner that minimizes harm to the environment. During wildfire suppression efforts, fire retardants and foams may be used.

Under the Fire Management Plan, the monument is divided into two sections: Class A and Class B. Class A areas are the more critical ones and include all areas within 50-75 yards of structures. Class B refers to all other areas. Prescribed fires would only be conducted in Class A areas after mechanical thinning and after slash pile burning if this is deemed necessary for safe execution of the project. Prescribed fires in Class B areas would follow the same procedures as in Class A, however, depending on fuel arrangement and continuity, prescribed fire could be conducted via broadcast burns and slash pile burning without mechanical thinning treatments. Thinning treatments would concentrate on small understory trees and would not include large diameter trees or old growth. Prescribed fire would be used to maintain fuel loadings on the monument and help restore forest health to the ponderosa pine stands. Interagency cooperative burns would be sought for areas near and adjacent to monument boundaries. Under this alternative, mechanical equipment such as chainsaws, fire engines, and aircraft would be employed. In the wake of the Jasper Fire, monument staff does not anticipate conducting prescribed fires for restoration purposes in the next five years.

2.2.2 Alternative 2 (Proposed Action) - *Revise 1987 Fire Management Plan to Reflect Current Fire Policy Guidance*

Under this alternative, the 1987 Fire Management Plan would be revised to reflect current fire policy guidance. Fire management activities and prescriptions would remain the same as those described under the No Action Alternative, however, the monument would no longer be divided into two sections (Class A and Class B).

Since the completion of the monument's previous version of its Fire Management Plan in 1987, national fire policy guidance has changed. The National Fire Plan of 2000 embodied the philosophical changes in fire policy and outlined four major goals. These included:

- Improve Prevention and Suppression
- Reduce Hazardous Fuels
- Restore Fire Adapted Ecosystems
- Promote Community Assistance

The National Fire Plan placed emphasis on the use of prescribed fire, wildland fire use and mechanical thinning as tools that could be used to meet these goals. Congress also embraced this new fire policy direction through its appropriations to fund projects nationwide that would help meet the national fire plan. In particular, Congress emphasized the need to protect the wildland urban interface by reducing hazardous fuel levels. A final difference under the new National Fire Plan involved administrative changes that allowed certain fire management activities of federal agencies to be funded from "emergency funds."

Besides the philosophical changes in fire policy, there have also been terminology changes since the memorial's Fire Management Plan from 1993. The key terminology changes were the following:

- "Prescribed natural fire" would be known as "wildland fire use";
- "Management-ignited prescribed fires" would be known as "prescribed fire";
- The use of the terms "contain, control, and confine" would no longer be used as descriptive strategies for wildland fire suppression in fire management plans. Formerly, each term was defined in a fire management plan with an accompanying description of the fire management strategy associated with it. Under new policy guidance, the terms would only be used during fire management activities to describe firefighter's progress in suppressing wildfires

2.2.3 Alternative 3 – *Suppression of Wildland Fires and No Prescribed Fire*

This alternative responds to the public's concern regarding the possible escape of prescribed fire and any associated human health & safety issues associated with such an event. Under this alternative, the 1987 Fire Management Plan would be updated to reflect current fire policy guidance and would state that all wildland fires (human-caused and naturally-ignited) would be declared wildfires and suppressed. In addition, prescribed fire would not be permitted on the monument for resource benefits or for slash pile burning. Mechanical thinning treatments would be similar to those described in the No Action Alternative. Priority areas to be treated would include those adjacent to structures, roadways, and the monument's boundary for protection of private resources outside the monument.

2.2.4 *Environmentally Preferred Alternative*

The National Park Service is required to identify the environmentally preferred alternative(s) for any of its proposed projects. That alternative is the alternative that will promote the national environmental policy expressed in NEPA (Section 101 (b)). This includes alternatives that:

1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

2) ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;

3) attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;

4) preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;

5) achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and

6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

In essence, the environmentally preferred alternative would be the one(s) that "causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources" (DOI, 2001a).

In this case, the Proposed Action is the environmentally preferred alternative for Jewel Cave National Monument since it meets goals 1, 2, 3, and 4 described above. Under this alternative, fire management activities would reduce hazardous fuel loadings on the monument, mimic the natural ecological processes, and help protect monument resources and adjacent lands from the threat of wildfires. Finally, the alternative best protects and helps preserve the historic, cultural, and natural resources in the monument for current and future generations.

2.3 IMPACT DEFINITIONS

Table 2-1 depicts the impact definitions used in this Environmental Assessment. Significant impact thresholds for the various impact topics were determined in light of compliance with existing state and federal laws, compliance with existing Jewel Cave National Monument planning documents.

Table 2-1 Impact Definitions

	"Minor" Impact	**"Major" or "Significant" Impact**
Impact topics		
Soils	Minor damage to or loss of the litter/humus layers that causes minor localized increases in soil loss from erosion; fire intense enough to cause minor harm to soil community; minor, temporary surface sterilization of soils that does not cause long term loss of soil productivity that would alter or destroy vegetation community; short-term and localized compaction of soils that does not prohibit re-vegetation	Damage to or loss of the litter/ humus layers that would increase soil loss from erosion on a substantial portion of the burn area; fire severe enough to damage soil community; substantial surface sterilization of soils that may cause long term loss of soil productivity and that may alter or destroy a portion of the vegetation community; long-term and widespread soil compaction that affects a large number of acres and prohibits re-vegetation
Water Resources	Minor damage to or loss of the litter/humus layers that increases sedimentation on no more than 0.1% of a subwatershed; localized and indirect riparian impact that does not substantively increase stream temperatures or affect stream habitats; negligible alteration of hydrology of Jewel Cave	Damage to or loss of the litter/ humus layers that increases sedimentation on greater than 0.1% of a subwatershed; localized and indirect riparian impact that may substantively increase stream temperatures or affect stream habitats; alteration of hydrology of Jewel Cave

	"Minor" Impact	"Major" or "Significant" Impact
Impact topics		
Vegetation	Short-term changes in plant species composition and/or structure, consistent with expected successional pathways of a given plant community from a natural disturbance event; thinning of small diameter understory trees; increase in exotic species; occasional death of a canopy tree	Violation of the Endangered Species Act of 1973; removal of numerous large diameter or old growth trees greater than 80cm at breast height;
Wildlife	Temporary displacement of a few localized individuals or groups of animals; mortality of individuals of species not afforded special protection by state and/or federal law; mortality of individuals that would not impact population trends	Violation of the Endangered Species Act of 1973; mortality of species that jeopardize the resident population
Air Quality	Minimal to negligible air emissions and temporary smoke accumulation; temporary and limited smoke exposure to sensitive resources	Violation of state and federal air quality standards; violation of Class II air quality standards; prolonged smoke exposure to sensitive receptors
Visitor Use & Experience	Temporary displacement of recreationists or closure of trails, and recreation areas during off-peak recreation use; temporary or short-term alteration of the vista, or temporary presence of equipment/structures in localized area; smoke accumulation during off-peak recreation use	Permanent closure of trails and recreation areas; conflict with peak recreation use; long-term change in scenic integrity of the vista; substantive smoke accumulation during peak recreation use
Human Health & Safety	Minor injuries to any worker (e.g. minor cuts or bruises); limited exposure to hazardous compounds or smoke particulates at concentrations below health-based levels	Serious injury to any worker or member of the public; exposure to hazardous compounds or smoke particulates at concentrations above health-based levels.
Cultural Resources	Temporary, non-adverse effects to registered cultural sites, eligible cultural sites, sites with an undetermined eligibility, and traditional cultural properties	Temporary or long-term adverse impacts to registered cultural sites, eligible cultural sites, sites with an undetermined eligibility, and traditional cultural properties
Park Operations	Temporary suspension of non-critical monument operations; negligible impact to monument buildings and structures	Prolonged suspension of all monument operations; adverse impacts to monument buildings and structures

2.4 MITIGATION MEASURES AND MONITORING

The National Fire Effects monitoring program, based on the Fire Monitoring Handbook, provides a means of measuring the effects of prescribed fire, and determination whether prescribed fire objectives are being met. Monitoring consists of pre-burn vegetation and fuel inventory, fire behavior observations during prescribed fire, and post-burn vegetation and fuel

inventories. Monitoring types, based on dominant vegetation communities, are developed for each park by resource managers and fire effects monitoring personnel. Fire effects monitoring plots have been established at Jewel Cave National Monument and post-burn vegetation inventories are conducted 1, 2, 5, 10, and 20 years, etc., after prescribed fires. This monitoring cycle begins again with additional prescribed fires in the same burn unit. These plots are re-measured at regularly determined intervals to verify that prescribed fire objectives are being met, that desired conditions are being reached, and that unwanted fire effects are not occurring.

Mitigation measures are prescribed to prevent and/or mitigate adverse environmental impacts that may occur from fire management activities. Mitigation measures are common to all alternatives.

2.4.1 *Fire Management Activities*

- Whenever consistent with safe, effective suppression techniques, the use of natural barriers would be used as extensively as possible;
- All suppression guidelines will follow MIST guidelines;
- Fire retardant agents must be on an approved list for use by the Forest Service and Bureau of Land Management;
- Earth moving equipment such as tractors, graders, bulldozers or other tracked vehicles would generally not be used for fire suppression. The Superintendent can authorize the use of heavy equipment in extreme circumstances in the face of loss of human life and/or property);
- When handline construction is required, construction standards would be issued requiring the handlines to be built with minimum impact. No handlines exposing mineral soil would be allowed through cultural sites, and all handlines would be rehabilitated. Erosion control methods would be used on slopes exceeding 10% where handline construction took place;
- All sites where improvements are made or obstructions removed would be rehabilitated to pre-fire conditions, to the extent practicable.

2.4.2 *Soil and Water Resources*

- Stream crossings would be limited to set and existing locations;
- Except for spot maintenance to remove obstructions, no improvements would be made to intermittent/perennial waterways, trails, or clearings in forested areas;
- Fire lines would be located outside of highly erosive areas, steep slopes, and other sensitive areas. Following fire suppression activities, fire lines would be re-contoured, water barred, and possibly seeded (with native plant species)

2.4.3 *Visitor Experience and Use*

- Prescribed fires would not be ignited in close proximity to monument structures during periods of peak visitation unless the areas were closed to the public;

2.4.4 *Cultural Resources*

- Prior to all fire management activities, cultural resources in treatments areas would be identified and avoided.

2.5 COMPARISON OF ALTERNATIVES

Table 2-2 briefly summarizes the environmental effects of the various alternatives. It provides a quick comparison of how well the alternatives respond to the project need, objectives, important issues, and impact topics. Chapter 3 discusses the environmental consequences of the proposed alternatives in detail.

Table 2-3 Comparison of Alternatives' Responses to Project Need, Objectives, Important Issues, and Impact topics

	Alternative 1 - No Action Alternative	Alternative 2 - Proposed Action	Alternative 3 – Suppress Wildland Fires and No Prescribed Fire
Project Need			
Reduces hazardous fuels	Yes, hazardous fuels reduction over time on ~1,274 acres of the monument This alternative provides hazardous fuels reduction similar to that under the Proposed Action	Yes, hazardous fuels reduction over time on ~1,274 acres of the monument This alternative provides hazardous fuels reduction similar to that under the No Action Alternative	Yes, marginal hazardous fuels reduction over time on ~1,274 acres of the monument This alternative provides less hazardous fuels reduction than that provided under the No Action Alternative
Restoration of fire regime, plant and wildlife habitat diversity	Yes, a low-severity, high frequency fire regime favoring fire adapted plant and animal species would result The degree to which this alternative restores a historic fire regime and contributes to plant and wildlife habitat diversity is similar to that achieved under the Proposed Action	Yes, a low-severity, high frequency fire regime favoring fire adapted plant and animal species would result The degree to which this alternative restores a historic fire regime and contributes to plant and wildlife habitat diversity is similar to that achieved under the No Action Alternative	No, habitat and diversity in ponderosa pine stands would continue to decline in the absence of fire; noxious weeds would spread This alternative does **not** restore a historic fire regime and **marginally** contributes to plant and wildlife habitat diversity
Project Objectives			
Reduces the fire danger to the monument and adjacent communities	Yes, reduced fire danger to the monument and adjacent communities This alternative provides a similar fire danger reduction as that provided under the Proposed Action	Yes, reduced fire danger to the monument and adjacent communities This alternative provides a similar fire danger reduction as that provided under the No Action Alternative	Yes, reduced fire danger to the monument and adjacent communities This alternative provides **less** fire danger reduction than the No Action and Proposed Action Alternatives

Table 2-3 Comparison of Alternatives' Responses to Project Need, Objectives, Important Issues, and Impact topics

	Alternative 1 - No Action Alternative	Alternative 2 - Proposed Action	Alternative 3 – Suppress Wildland Fires and No Prescribed Fire
Important Issues			
Potential escape of prescribed fire	This alternative allows for prescribed fire, however, potential for escape would be minimal in light of mitigation measures and adherence to guidelines and procedures for ignition of prescribed fire	This alternative allows for prescribed fire, however, potential for escape would be minimal in light of mitigation measures and adherence to guidelines and procedures for ignition of prescribed fire	No potential for escape of prescribed fire since there would be no prescribed fires
Impact topics			
Geology and Soils	Very minor short-term soil erosion impacts resulting from thinning and prescribed fire activities; benefits to soil development and soil nutrification	Very minor short-term soil erosion impacts resulting from thinning and prescribed fire activities; benefits to soil development and soil nutrification	Very minor short-term soil erosion and compaction impacts resulting from thinning activities; increased potential for high-severity fire in the future and adverse soil impacts
Water Resources	No impacts to surface water resources; negligible effects on Jewel Cave hydrology	No impacts to surface water resources; negligible effects on Jewel Cave hydrology	No impacts to surface water resources; negligible effects on Jewel Cave hydrology
Vegetation	Plant habitat and diversity improved; historic forest structure and fuel loadings begin to return; noxious weed species reduced; fuel loadings reduced on ~1,274 acres	Plant habitat and diversity improved; historic forest structure and fuel loadings begin to return; noxious weed species reduced; fuel loadings reduced on ~1,274 acres	Plant habitat and diversity degraded; continued spread of noxious weeds; fuel loadings marginally reduced on ~1,274 acres
Wildlife	Thinning and prescribed fire activities would temporary displace some wildlife species; individual mortality of some species likely; no impact on T&E or Sensitive species; wildlife habitat improved in the long-term with restoration of historic fire regime	Thinning and prescribed fire activities would temporary displace some wildlife species; individual mortality of some species likely; no impact on T&E or Sensitive species; wildlife habitat improved in the long-term with restoration of historic fire regime	Wildlife benefits resulting from historic fire regime not realized; no impact on T&E or Sensitive species

Table 2-3 Comparison of Alternatives' Responses to Project Need, Objectives, Important Issues, and Impact topics

	Alternative 1 - No Action Alternative	Alternative 2 - Proposed Action	Alternative 3 – Suppress Wildland Fires and No Prescribed Fire
Impact topics			
Air Quality	Very minor and temporary effects resulting from prescribed fire; no smoke impacts on sensitive receptors	Very minor and temporary effects resulting from prescribed fire; no smoke impacts on sensitive receptors	Suppression efforts reduce air quality impacts from wildfires
Visitor Use and Experience (including Park Operations)	Minor and short-term impacts during thinning and prescribed fire activities (e.g. trail or road closures, presence of work crews in the vista); no effect on park operations	Minor and short-term impacts during thinning and prescribed fire activities (e.g. trail or road closures, presence of work crews in the vista); no effect on park operations	Minor and short-term impacts during thinning activities (e.g. trail closures or limited access to certain areas, presence of work crews in the vista); potential for impacts on park operations in the event of high-severity fire
Human Health & Safety	Human health and safety improved by reducing fire danger to the monument; potential for injury from thinning activities; very minor exposure to smoke by workers and the public during prescribed fire	Human health and safety improved by reducing fire danger to the monument and adjacent communities; potential for injury from thinning activities; very minor exposure to smoke by workers and the public during prescribed fire	Human health and safety improved marginally with reduction of hazardous fuels via thinning alone; increased fire danger to monument and adjacent lands in the long-term with fuels buildup in the absence of prescribed fire
Cultural Resources	No impact to known cultural resources	No impact to known cultural resources	No impact to known cultural resources

Chapter 3 – Environmental Analysis

This chapter summarizes the existing environmental conditions and the probable environmental consequences (effects) of implementing the action and No-Action alternatives. This chapter also provides the scientific and analytical basis for comparing the alternatives. The probable environmental effects are quantified where possible; where not possible, qualitative descriptions are provided.

3.1 GEOLOGY AND SOILS

3.1.1 *Affected Environment*

Jewel Cave National Monument is located on the southwestern slope of the Black Hills Uplift. The area bedrock consists primarily of the Minnelusa Formation, with some underlying Pahasapa Limestone showing through. Jewel Cave is situated entirely in the Pahasapa Limestone. Two canyons dominate the topography: Hell Canyon on the west and Lithograph canyon on the southeast with the two meeting at the southern boundary. While mineral resources in commercial quantities are found near the monument, the Forest Service has withdrawn 2,387 acres of Forest Service land surrounding the monument from new mineral entry.

Soils, which are generally thin, are composed of a mixture of sand and clay and are generally well drained and quick drying. There are no prime or unique agricultural soils in the monument. The depth of litter and humus layers average from 2 to 3 inches; this material is primarily derived from ponderosa pine. The Jasper Fire had several areas of moderate fire severity and some very limited areas of high fire severity. In many areas within Hell and Lithograph canyons, the litter and humus layers were consumed by the Jasper Fire, which has increased the potential for soil loss. Prior to the fire, soil loss for the area was estimated to be approximately 13 tons/acre. The potential for soil loss on high severity burn areas increased by a factor of 10 to 135 tons/acre as a result of the effects of the Jasper Fire (Loadholt, 2001).

3.1.2 *Environmental Consequences*

Soil impacts were qualitatively assessed using soil characteristics, literature reviews, and mitigation measures.

3.1.2.1 Alternative 1 – No Action

Proposed activities with the potential to impact soils include building fire lines, thinning, and prescribed fire.

Very minor and localized soil compaction would occur from thinning activities, and vehicle use would be restricted to existing roads. Fire line construction would result in soil disturbance and could lead to increased erosion, especially in steeply sloped areas within the monument. To avoid these potential impacts, fire lines would be located outside of highly erosive areas, steep

slopes, and other sensitive areas. Following fire suppression activities, fire lines would be re-contoured, water barred, and possibly seeded (with native plant species).

Prescribed fire would release nutrients into the soil and the fertilization effects of ash would provide an important source of nutrients for vegetation in the area. In addition to increasing nitrification of the soils and increasing minerals and salt concentrations in the soil, the ash and charcoal residue resulting from incomplete combustion aids in soil buildup and soil enrichment by being added as organic matter to the soil profile. The added material works in combination with dead and dying root systems to make the soil more porous, better able to retain water, and less compact while increasing needed sites and surface areas for essential microorganisms, mycorrhizae, and roots (Vogl, 1979; Wright and Bailey, 1980).

If a prescribed fire exceeded a burn prescription and burned "hot", resulting in areas of high-burn severity, the organic layer of the soil could be consumed and soil layers could become water repellant. Fire management personnel would contain and/or suppress out-of-prescription fires, minimizing the potential for and effects of any high-burn severity prescribed fires.

3.1.2.2 Alternative 2 – Proposed Action

General soil impacts under Alternative 2 would be similar to those described under the No Action Alternative.

3.1.2.3 Alternative 3 – Wildland Fire Suppression and No Prescribed Fires

General soil impacts would be similar to those described under the No Action Alternative, except the benefits accruing to soils from prescribed fire would not occur.

Conclusion

The implementation of any of the alternatives would not impair geologic and soil resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for enjoyment of the monument, and (3) identified as a goal in the monument's general management plan or other Park Service planning documents.

3.2 WATER RESOURCES

3.2.1 *Affected Environment*

Intermittent streams occur in Hell and Lithograph Canyons and there are two springs that are active on the monument: Prairie Dog and Chokecherry. There are no floodplains or wetlands within the monument. The monument is within the Cheyenne River drainage basin, which circles the south end of the Black Hills.

Water is a critical factor affecting cave resources. Surface developments and other influences have substantially altered the quality and quantity of water infiltrating the cave. The pattern of

infiltration has also changed. Following the Jasper Fire, Hell and Lithograph Canyons experienced severe flooding events, however, preliminary data suggests that the hydrology pattern in the cave was unaffected by these events (Wiles, 2001).

3.2.2 *Environmental Consequences*

Water resource impacts were qualitatively assessed using presence/absence of surface water resources, literature reviews, and mitigation measures.

3.2.2.1 Alternative 1 – No Action

Proposed activities with the potential to impact water resources include building fire lines, thinning, fire retardant/foam use, and prescribed fire.

In light of the mitigation measures employed during fire management activities (e.g. no fire line construction in intermittent streams or adjacent to natural springs), there would not be any direct impacts on surface water resources on the monument. Results of flow modeling in the aftermath of the Jasper Fire indicate a high potential for flooding in Lithograph Canyon at the generator/emergency cave exit site on the monument (FS, 2001). Prescribed fires would be primarily low-severity in nature and would not increase the potential for severe flooding events.

The use of fire retardants or foams could potentially cause short and long-term impacts to water resources if misapplied or mishandled. Retardants contain ammonia and phosphate or sulfate ions, which can change the chemistry of a water body, thus making it lethal to fish and other aquatic organisms. Foams contain detergents that can interfere with the ability of fish gills to absorb oxygen. The degree of impact would depend on the volume of retardant/foam dropped into the water body, the size of the water body, and the volume of flow in the stream or river. For example, if a 800-gallon drop is made into a fast flowing river, it is likely that the lethal effects to aquatic resources will be short-lived as dilution below the toxic level is quickly achieved. On the other hand, a 3,000-gallon drop in a stagnant pond would likely cause toxic levels to persist for some time (USDA, 2001).

For several reasons, it is not anticipated that thinning and prescribed fire treatments that change forest stand structure, reduce fuel loadings, and restore historic fire regimes on the monument would significantly affect the hydrologic conditions within Jewel Cave. They include: 1) preliminary hydrologic data suggests that the Jasper Fire, which burned the entirety of the monument in a short time period, and the resulting effects from it (severe flooding, loss of vegetation and soil layers) did not significantly alter hydrologic processes in the cave, and 2) proposed thinning and prescribed fire treatments would occur over a period of several years, so that only limited areas would be without ground vegetation (grasses, forbs, and shrubs) or small understory trees at any one time.

3.2.2.2 Alternative 2 – Proposed Action

General water resources impacts under Alternative 2 would be similar to those described under the No Action Alternative.

3.2.2.3 Alternative 3 – Wildland Fire Suppression and No Prescribed Fires

General water resources impacts under Alternative 3 would be similar to those described under the No Action Alternative.

Conclusion

The implementation of any of the alternatives would not impair water resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for enjoyment of the monument, and (3) identified as a goal in the monument's general management plan or other Park Service planning documents.

3.3 VEGETATION

3.3.1 *Affected Environment*

The vegetation in the area is predominantly ponderosa pine (*Pinus ponderosa*) forest, covering approximately 90% of the monument. The forest stands include areas of old growth. While the Jasper Fire helped reduce some of the unnatural stand densities on the monument, there still exist some pine stands that are overly crowded and contain hazardous fuel levels. The number of standing dead trees (snags) and large downed logs on the monument will continue to increase over the years in the aftermath of the Jasper Fire.

Ponderosa Pine stands integrate with open meadows commonly found on the bottoms of the two canyons. Ground cover consists primarily of small shrubs and grasses. The most common shrubs are ninebark and snow berry, while the most abundant grasses are blue grama, western wheatgrass, *Stipa* species, and the bluestems. Figure 3-1 illustrates the location of major vegetation communities on the monument and Table 3-1 describes the dominant plant species found within the vegetation communities. Other common plant species on the monument include Sheep fescue (*Festuca saximontana*), Stiff sunflower (*Helianthus pauciflorus*), Green needlegrass (*Stipa viridula*), Cudweed sagewort (*Artemisia ludoviciana*), Common yarrow (*Achillea millefolium*), Northern bedstraw (*Galium boreale*), Missouri goldenrod (*Solidago missouriensis*), and Pasqueflower (*Anemone patens*)

A 1986 inventory of vegetation on the monument identified over 50 non-native plants in the monument, eight of which are considered noxious weeds by the state of South Dakota. Control of 3 of these species is required in Custer County, and the NPS and other land managers have enacted management plans to control them. The two noxious weeds of greatest management concern to the monument are Canada thistle (*Cirsium arvense*) and Leafy spurge (*Euphorbia esula*). Other notable species include hound's tongue (*Cynoglossum officinale*), black henbane (*Hyoscyamus niger*), and sow thistle (*Sonchus oleraceus*). Noxious weeds are likely to increase in number and distribution following the Jasper Fire since suppression activities have resulted in ground disturbance and since many areas have reduced vegetation cover, both of which provide opportunities for noxious weed establishment. Jewel Cave National Monument does not contain any plant species that are protected under the Endangered Species Act or by the State.

Figure 3-1 Vegetation Communities of Jewel Cave National Monument

Map Unit	Map Unit Name	Plant Associations
BW	Ash Leaf Maple / Choke Cherry Forest	Ash Leaf Maple (*Acer negundo*) / Choke Cherry Forest (*Prunus virginiana*)
GS	Grass / Shrub Complex	Western Snowberry Shrubland (*Symphoricarpos occidentalis*) Little Bluestem (*Schizachyrium scoparium*) – Side-Oats Grama (*Bouteloua curtipendula*) and Blue Grama (*Bouteloua gracilis*) - Threadleaf Sedge Herbaceous Vegetation (*Carex filifolia*) Western-Wheat Grass (*Pascopyrum smithii*) - Blue Grama - Threadleaf Sedge Herbaceous Vegetation Kentucky Bluegrass Disturbed Community (*Poa pratensis*)
P1	Ponderosa Pine Complex I	Ponderosa Pine (*Pinus ponderosa*) / Little Bluestem Woodland Ponderosa Pine / Sun Sedge Woodland (*Carex inops*) Ponderosa Pine / Bearberry Woodland (*Arctostaphylos uva-ursi*)
P2	Ponderosa Pine Complex II	Ponderosa Pine / Snowberry Forest Ponderosa Pine / Common Juniper Woodland (*Juniperus communis*) Ponderosa Pine / Ninebark (*Physocarpus monogynus*)
PT	Quaking Aspen / Choke Cherry Forest	Quaking Aspen (*Populus tremuloides*) / Choke Cherry Forest

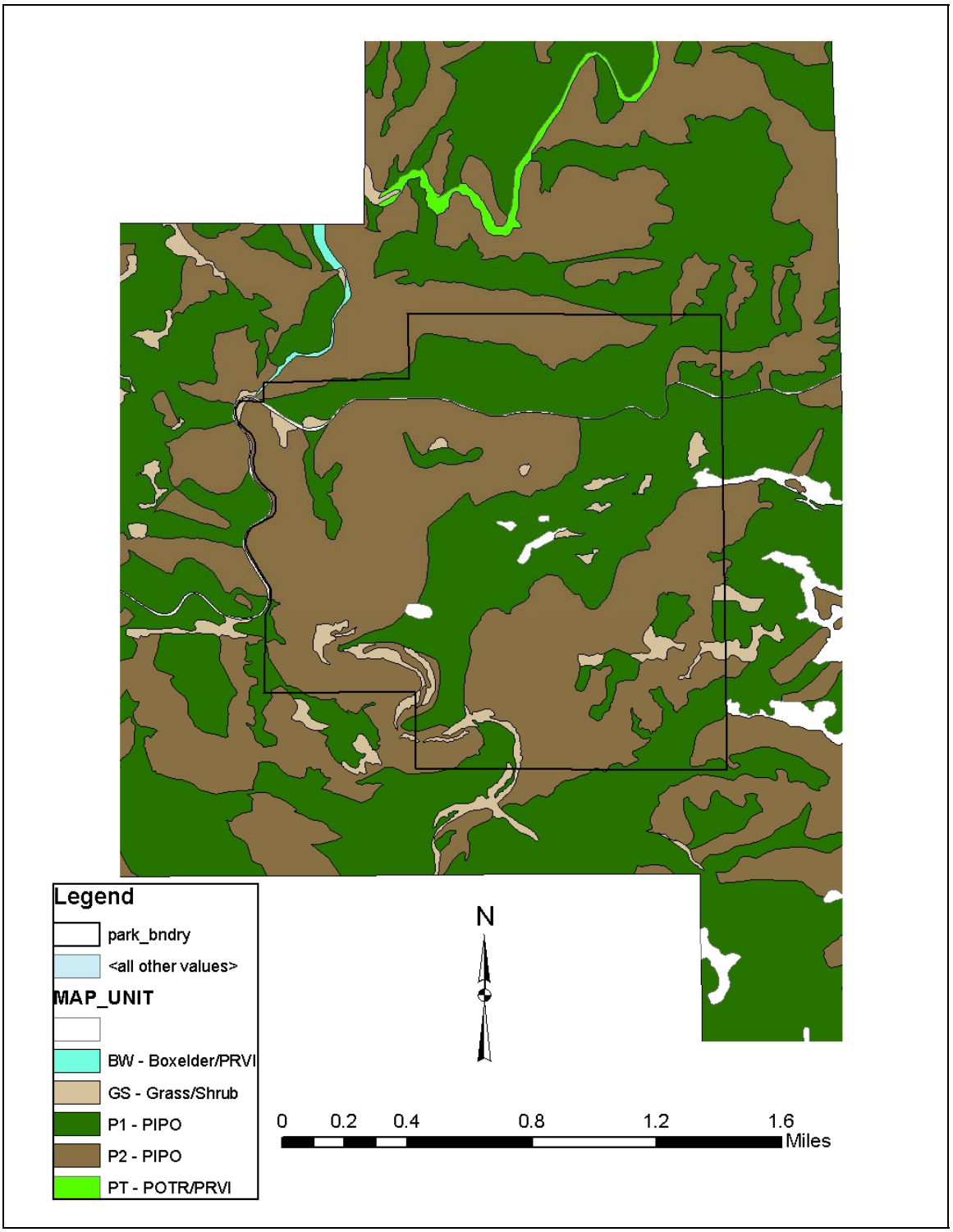

Figure 3-1 Vegetation Communities of Jewel Cave National Monument

3.3.2 *Environmental Consequences*

Vegetation impacts were qualitatively assessed using literature reviews and quantitatively assessed by acres impacted.

3.3.2.1 Alternative 1 – No Action

Thinning activities would occur on a maximum of 1,274 acres of the monument under this alternative; however, it is not anticipated that funding levels necessary to support thinning operations on the entirety of the monument would be available. Priority would be given to areas adjacent to administrative facilities and to boundary areas, which would minimize the potential of unwanted fire ingress or egress over jurisdictional boundaries. Prescribed fire could be used on a maximum of 1,274 acres of the monument, however, it is not anticipated that prescribed fires would need to be conducted in the monument for restoration or maintenance purposes over the next five years.

The restoration of the historic fire regime to the ponderosa pine ecosystem (10-20 year fire return interval) would enhance the variety and diversity of native plant species and habitats, while at the same time help control noxious weeds. Plant communities adapted to high frequency, low-severity fires would be favored with prescribed fire. Prescribed fire would also release nutrients into the soil and the fertilization effects of ash would provide an important source of nutrition for vegetation in the area. Finally, prescribed fire would kill some trees and ensure a renewable supply of snags in the forest.

Thinning activities would focus on small understory trees, which would reduce tree densities and help promote forest stand health in the ponderosa pine. Many standing dead trees (snags) and all old growth trees would be preserved unless they posed a risk to human health and safety and were deemed hazardous.

Suppression activities that resulted in soil disturbance (fire lines) would make those disturbed areas more susceptible to noxious weed infestation. Disturbed areas would be seeded with native grasses. Thinning and fire activities would retard the encroachment of woody tree species into meadows and would reduce prevent hazardous fuels buildup on the monument.

3.3.2.2 Alternative 2 – Proposed Action

General vegetation impacts under Alternative 2 would be similar to those described under the No Action Alternative.

3.3.2.3 Alternative 3 – Wildland Fire Suppression and No Prescribed Fires

Thinning activities would occur on a maximum of 1,274 acres of the monument under this alternative; however, it is not anticipated that funding levels necessary to support thinning operations on the entirety of the monument would be available. Priority would be given to areas adjacent to administrative facilities and to boundary areas, which would minimize the potential of unwanted fire ingress or egress over jurisdictional boundaries.

The absence of prescribed fire would eliminate the benefits to plant habitat and diversity that accrue from a high frequency, low-severity fire regime in ponderosa pine forests. In particular, noxious weeds and/or fire-intolerant plant species would continue to increase in number and out-compete favorable native species.

Conclusion

The implementation of any of the alternatives would not impair vegetation resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for enjoyment of the monument, and (3) identified as a goal in the monument's general management plan or other Park Service planning documents.

3.4 WILDLIFE

3.4.1 *Affected Environment*

Wildlife in Jewel Cave National Monument is typical of the region, including large mammals such as mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), elk (*Cervus elaphus*), and coyote (*Canus latrans*). Smaller mammals include porcupines, cottontail rabbits, squirrels, marmots, and chipmunks. A total of 84 resident and migratory bird species have been documented in the monument. A systematic inventory of the monument's animal species, however, has not been conducted.

At least 10 species of bats have been reported in the southern Black Hills, and most of them have been found within the monument. For some species, the artificially enlarged Historic Entrance to the cave has allowed access to portions of Jewel Cave, which have become hibernacula and/or roosting areas. Very little is known about the ecology of bats in the Black Hills or the importance of Jewel Cave to them.

There are no federally-listed wildlife species that reside within the monument. The Townsends big-eared bat (*Corynorhinus townsendii*)is considered a sensitive species by the U.S. Fish and Wildlife Service and regularly uses Jewel Cave.

NPS *Management Policies* states "*the National Park Service will inventory, monitor, and manage state and locally listed species in a manner similar to its treatment of federally listed species, to the greatest extent possible*." There are 13 species of animals that are listed by the State of South Dakota as endangered. They are peregrine falcon (*Falco peregrinus*), whooping crane, eskimo curlew (*Numenius borealis*), bald eagle (*Haliaeetus leucocephalus*), interior least tern (*Sterna antillarum*), black-footed ferret (*Mustela nigripes*), lined snake (*Tropidoclonion lineatum*), Blanding's turtle (*Emydoidea blandingii*), pallid sturgeon (*Scaphirhynchus albus*), finescale dace (*Phoxinus eos*), central mudminnow (*Umbra limi*), blacknose shiner (*Notropis heterolepis*), and banded killifish (*Fundulus diaphanus*). Of these species, the bald eagle and peregrine falcon are the most likely to be sighted within the monument during winter and migration, respectively (Ode, 2002).

At the present time, there are 15 species of animals that are listed by the State of South Dakota as threatened. They are: American dipper (*Cinclus mexicanus*), osprey (*Pandion haliaetus*), piping plover (*Charadrius melodus*), black bear (*Ursus americanus*), mountain lion (*Felis concolor*), swift fox (*Vulpes velox*), river otter (*Lutra canadensis*), false map turtle (*Graptemys pseeudogeographica*), Eastern hognose snake (*Heterodon platirhinos*), trout-perch (*Percopsis omiscomaycus*), sturgeon chub (*Machrhybopsis gelida*), sicklefin chub (*Machrhybopsis meeki*), northern redbelly dace (*Phoxinus eos*), pearl dace (*Semotilus margarita*), and longnose sucker (*Catostomus catostomus*). Of these species, only the mountain lion is known to frequent the monument, however, a sighting of black bear was recently reported in the Black Hills region (Ode, 2002).

3.4.2 *Environmental Consequences*

Wildlife impacts were qualitatively assessed using presence/absence determinations, fire's role in ponderosa pine ecosystems, and mitigation measures.

3.4.2.1 Alternative 1 – No Action

Proposed activities with the potential to impact wildlife include building fire lines, fire retardant use associated with suppression activities, thinning, and prescribed fires.

Habitat conditions for many wildlife species that inhabit ponderosa pine would improve with the restoration of the historic high frequency, low intensity fire regime characteristic of the ponderosa pine forest stands in the Black Hills. Such a fire regime would help restore and enhance the variety and diversity of native plant and wildlife habitats. Nutrients released to plants through the fertilization effects of ash would provide an important source of nutrition for wildlife in the area. While some trees would be killed from the effects of fire, these dead standing trees (snags) would be left as these provide important habitat for a variety of wildlife species. Snags that are deemed hazardous trees would be removed.

All the fire management activities could result in the temporary displacement of wildlife or individual mortality of wildlife species. The loss of individual species, however, would not jeopardize the viability of the populations on and adjacent to the monument. The mountain lion would not be directly affected since the animal would simply avoid any areas where fire management activities were being undertaken.

While there would be the potential for very minor smoke-related impacts on bat hibernacula during prescribed fire activities in specific locations, adherence to a prescribed fire plan that allowed for adequate smoke dispersion would minimize and/or eliminate this potential impact. The Jasper Fire and its associated smoke does not appear to have impacted bat population numbers in Jewel Cave since total number of bats reported during winter 2001 bat hibernacula surveys fall within the range reported over the past ten years (Ohms, 2001).

There would be no impacts to federally or state listed species from fire management activities under this alternative.

3.4.2.2 Alternative 2 – Proposed Action

General wildlife impacts under Alternative 2 would be similar to those described under the No Action Alternative.

3.4.2.3 Alternative 3 – Wildland Fire Suppression and No Prescribed Fires

In the long-term, the absence of prescribed fire in the ponderosa pine forest ecosystem would lead to increased fuels and would result in more intense and severe fires. Such a fire regime would not help restore and maintain the forest's native plant and wildlife habitats, but would rather further degrade them. While the potential for individual mortality would increase under this alternative, the viability of populations on and adjacent to the monument would not be affected.

Conclusion

The implementation of any of the alternatives would not impair wildlife resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for enjoyment of the monument, and (3) identified as a goal in the monument's general management plan or other Park Service planning documents.

3.5 AIR QUALITY

3.5.1 *Affected Environment*

Under the terms of the 1990 Clean Air Act amendments, the monument is designated as a Class II quality area. By definition, Class II areas of the country are set aside under the Clean Air Act, but identified for somewhat less stringent protection from air pollution damage than Class I areas. The primary means by which the protection and enhancement of air quality is accomplished is through implementation of National Ambient Air Quality Standards (NAAQS). These standards address six pollutants known to harm human health including ozone, carbon monoxide, particulate matter, sulfur dioxide, lead, and nitrogen oxides (USDA, 2000a).

Historically, the monument's air quality has been considered excellent. Several major sources of air pollution (sources that emit more than 100 tons/year of one or more regulated pollutants) are within a 62-mile radius of Jewel Cave. These include coal-fired power plants in Rapid City and Lead, South Dakota, and Osage, Wyoming; three cement plants in Rapid City; and a refinery and a natural gas pipeline compressor station in Newcastle, Wyoming. A number of minor sources are also located in the vicinity of the monument, including sawmills in the areas of Pringle and Custer, South Dakota, and Newcastle, Wyoming and a feldspar mill in Custer. A railroad and state cement plant/limestone kiln are in the planning stages.

Air quality and visibility monitoring have been conducted in the Black Hills for many years, but no air quality monitoring systems are operating in the monument. There are several monitors in Rapid City, approximately 40 air miles northeast of the monument, which measure total

suspended particulates (TSP), fine particles, sulfur dioxide and nitrogen dioxide. Other TSP monitors are located at Mount Rushmore National Memorial, twenty miles northeast of Jewel Cave, and at Newcastle, Wyoming, twenty-four miles west of Jewel Cave. Additional information regarding air quality regulations and standards can be found at http://www.state.sd.us/denr/DES/Quality/Monitoring/ambientstandards.htm and at http://www.state.sd.us.denr/DES/AirQuality/openburn.htm.

3.5.2 *Environmental Consequences*

Air quality impacts were qualitatively assessed upon review of National Park Service best management practices to reduce air emissions, State of South Dakota prescribed fire permit specifications and requirements, and the extent of proposed prescribed fire activities under all the alternatives.

3.5.2.1 Alternative 1 – No Action

Smoke consists of dispersed airborne solids and liquid particles, called particulates, which could remain suspended in the atmosphere for a few days to several months. Particulates can reduce visibility and contribute to respiratory problems. Very small particulates can travel great distances and add to regional haze problems. Regional haze can sometimes result from multiple burn days and/or multiple owners burning within an airshed over too short a period of time to allow for dispersion.

Prior to any prescribed fire, the monument would submit an open burning permit application to the South Dakota Division of Resource Conservation and Forestry that, among other things, identifies the location and size of the proposed prescribed fire, as well as the fuel types to be burned. The permit is necessary for all open burning conducted in the Black Hills Forest Fire Protection District. The State would then review the burn application and, upon a favorable review, the state would provide the monument with an open fire permit for that particular prescribed fire. While the state does not require general open burning permit applications to contain quantified emissions from the proposed prescribed fires, it does require a smoke management plan (Hermanson, 2002).

For prescribed fires, there are three principle strategies to manage smoke and reduce air quality effects. They include:

1. Avoidance - This strategy relies on monitoring meteorological conditions when scheduling prescribed fires to prevent smoke from drifting into sensitive receptors, or suspending burning until favorable weather (wind) conditions;

2. Dilution – This strategy ensures proper smoke dispersion in smoke-sensitive areas by controlling the rate of smoke emissions or scheduling prescribed fires when weather systems are unstable, not under conditions when a stable high-pressure area is forming with an associated subsidence inversion. An inversion would trap smoke near the ground; and

3. Emission Reduction – This strategy utilizes techniques to minimize the smoke output per unit area treated. Smoke emission is affected by the number of acres burned at one time, pre-burn fuel loadings, fuel consumption, and the emission factor. Reducing the number of acres that are burned at one time would reduce the amount of emissions generated by that burn. Reducing the fuel beforehand, e.g. removing firewood, reduces the amount of fuel available. Conducting prescribed fires when fuel moistures are high can reduce fuel consumption. Emission factors can be reduced by pile burning or by using certain firing techniques such as mass ignition.
If weather conditions changed unexpectedly during a prescribed fire, and there was a potential for violating air quality standards or for adverse smoke impacts on sensitive receptors, the monument would implement a contingency plan, including the option for immediate suppression. Even if prescribed fires were conducted throughout the monument over the next five years, considering the relatively small number of acres that would be affected by prescribed fire, approximately 1,274 acres, and in light of the current air quality in the area and review and approval of the burn permit by the state, prescribed fire would not violate daily national or state emission standards and would cause very minor and temporary air quality impacts. The greatest threat to air quality would be smoke impacts on sensitive receptors, however, the paucity of sensitive receptors adjacent to the monument minimizes and/or eliminates this potential air quality impact.

3.5.2.2 Alternative 2 – Proposed Action

General air quality impacts under Alternative 2 would be similar to those described under the No Action Alternative.

3.5.2.3 Alternative 3 – Wildland Fire Suppression and No Prescribed Fires

Under Alternative 3, air quality impacts from wildfires would be reduced by suppression efforts.

Conclusion

The implementation of any of the alternatives would not impair air quality resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for enjoyment of the monument, and (3) identified as a goal in the monument's general management plan or other Park Service planning documents.

3.6 VISITOR USE AND EXPERIENCE (INCLUDING PARK OPERATIONS)

3.6.1 *Affected Environment*

Jewel Cave National Monument is a day-use area: an average visit lasts 2.5 hours. The visitor center, which is the primary contact point, is open year-round. Guided cave tours are the main visitor activity and are generally available year-round. Other cave uses are by permit only. Interpretive walks are offered on surface trails near the visitor center on the basis of demand and

staff availability. A 0.5 mile self-guided interpretive loop is available near the visitor center. Topics relate to the surface resources and the relationship between surface and cave.

On average, the monument supports approximately 150,000 visitors each year. About 95% of visitation occurs from May through September, and July and August generally are the busiest months. Visitation occurs predominantly during the weekdays.

Jewel Cave National Monument contains a visitor center and several residential and maintenance buildings near the visitor center complex, as well as the historic area, which includes the historic cabin that is used as a visitor contact station. Fire management on the monument is administered with the aid of fire management personnel from Wind Cave National Park.

3.6.2 *Environmental Consequences*

Recreation impacts were qualitatively assessed in light of the intensity and duration of fuel treatment activities as they related to visitor use and experience. Visual resource impacts in this environmental assessment were assessed in terms of scenic integrity, visual wholeness, and unity of the landscape.

3.6.2.1 Alternative 1 – No Action

There would be some short-term reduction in scenic integrity and visitor use during and immediately following any thinning, prescribed fire, or wildfire suppression activities from the presence of engines and thinning or fire crews. Short-term reduction in scenic integrity, however, would be minor because 1) fire management activities would involve only short-term presence of vehicles and people, 2) stumps would be cut flush with the ground, 3) smoke accumulation would be temporary since prescribed fires would be ignited under favorable conditions for smoke dispersion. In the long-term, scenic integrity would continue to be predominantly affected by the effects of the Jasper Fire, which resulted in large numbers of dead and dying trees on the monument.

Any prescribed fires would likely produce short-term smoke accumulations that impact local visual quality. Minimizing smoke emissions through best management practices and prohibiting prescribed fires during times of peak recreation use would reduce any short-term impacts.

Visitor use would also be temporarily affected under this alternative since access to locations where crews were conducting thinning, prescribed fire, and suppression activities would be restricted. Since prescribed fires would not be ignited during the summer months, and since a vast majority of visitors come to the monument to travel underground to tour Jewel Cave, thinning and prescribed fire activities on the surface of the monument would not significantly impact the visitor use and experience. Associated interpretive programs that focused on prescribed fire would help educate monument visitors about the historic role of fire in the ponderosa pine forest ecosystem in the Black Hills. It is likely that visitors who might otherwise have their experience affected by the presence of fire management activities would be less affected after exposure to the interpretive program. Cave visitation would not be affected by use

restrictions above ground, unless fire management activities occurred near the historic cave entrance and historic ranger station.

With the aid of fire management personnel from Wind Cave National Park and other National Park Service units, park operations would not be affected under this alternative. In the event of a wildfire within or adjacent to the monument, park operations could be temporarily affected depending on the severity of the fire and situation at hand as visitors and non-essential monument personnel were evacuated to off-site and safe locations.

3.6.2.2 Alternative 2 – Proposed Action

General impacts to visitor use and experience would be similar to those described under the No Action Alternative.

3.6.2.3 Alternative 3 – Wildland Fire Suppression and No Prescribed Fires

General impacts to visitor use and experience would be similar to those described under the No Action Alternative. In the short-term, the absence of prescribed fire would result in fewer temporary impacts to visitor use and experience, however, in the long-term, it would increase the potential for more intense and severe wildland fires that could affect visitor use and experience, and park operations.

3.7 HUMAN HEALTH AND SAFETY

3.7.1 *Affected Environment*

Prior to the ignition of any prescribed fire in the monument, all the burn parameters of the existing and approved prescribed fire burn plan would be met to ensure a safe and effective prescribed fire. In addition, staff would prepare brochures for the public that advise them of the time and extent of the proposed burn and educate them about the role of fire in the ponderosa pine forests of the Black Hills. In the event of potentially hazardous fires within the monument, the Park Superintendent and Chief Ranger would coordinate public notification efforts within and outside the monument. The extent of public notice would depend on the specific fire situation. In every case, assuring visitor and monument staff safety would take priority over other activities.

3.7.2 *Environmental Consequences*

Human health & safety impacts were qualitatively assessed through determination of activities, equipment and conditions that could result in injury, literature review of type and extent of injury caused by equipment and conditions, and in light of mitigation measures and best management practices.

3.7.2.1 Alternative 1 – No Action

Factors most likely to adversely impact firefighter health and safety include activities associated with wildland fire suppression efforts (accidental spills, injuries from the use of fire-fighting equipment, smoke inhalation, and, in severe cases, injuries from wildland fires). Impacts to the public could include smoke inhalation, and in severe cases, injuries from wildland fires.

Accidental spills of fire retardants and foams are the most likely to adversely impact human health & safety. Fire retardants used in controlling or extinguishing fires contain about 85% water, 10% fertilizer, and 5% minor ingredients such as corrosion inhibitors and bactericides. Fire suppressant foams are more than 99% water. The remaining 1% contains surfactants, foaming agents, corrosion inhibitors, and dispersants. These qualified and approved wildland fire chemicals have been tested and meet specific requirements with regard to mammalian toxicity as determined by acute oral and dermal toxicity testing as well as skin and eye irritation tests (USDA, 2001). However, they are strong detergents, and can be extremely drying to skin. All currently approved foam concentrates are irritating to the eyes as well. Application of a topical cream or lotion can alleviate the effects of a retardant, and protective goggles can prevent any injury to the eyes when using foams.

Fuel break construction can pose safety threats to firefighters. Injuries can occur from the use of equipment as well as from traveling overland to targeted areas for firefighting efforts during suppression efforts. While each of the crew is trained in the use of firefighting equipment, accidental injuries may occur from time to time. Strict adherence to guidelines concerning firefighter accreditation, and equipment and procedure safety guidelines would minimize accidents.

Smoke inhalation can also pose a threat to human health & safety. Smoke from wildland fires is composed of hundreds of chemicals in gaseous, liquid, and solid forms. The chief inhalation hazard appears to be carbon monoxide (CO), aldehydes, respirable particulate matter with a median diameter of 2.5 micrometers (PM2.5), and total suspended particulate (TSP). Adverse health effects of smoke exposure begin with acute, instantaneous eye and respiratory irritation and shortness of breath, but can develop into headaches, dizziness, and nausea lasting up to several hours. Based on a recent study of firefighter smoke exposure, most smoke exposures were not considered hazardous, but a small percentage routinely exceeded recommended exposure limits for carbon monoxide and respiratory irritants (USDA, 2000b).

Use restrictions applied to areas of wildland fires or prescribed fires would minimize or eliminate public human health & safety concerns resulting from smoke exposure and fire injuries. When using prescribed fire, mitigation measures, such as construction of fire lines, the presence of engines, and strict adherence to prescribed fire plans, would minimize the potential for an out-of-prescription burn or escape. Elements of the prescribed fire plan that relate to ensuring a safe burn include such measures as fuel moisture, wind speed, rate of fire spread, and estimated flame lengths. While the potential for a fire escape will always exist when conducting prescribed fires, that potential is extremely small. Recent statistics summarized by the Boise Interagency Fire Center report that approximately 1% of prescribed fires on federal lands required suppression activities of some kind. In most cases these prescribed fires jumped a control line and

suppression tactics were successfully used to control them. Out of the 1% of prescribed fires that required suppression, 90% were controlled without incident. Statistically, this result leaves about 0.1% of prescribed fires that required major suppression actions (Stevens, 2000).

3.7.2.2 Alternative 2 – Proposed Action

The general impacts to human health & safety under Alternative 2 would be similar to those described under the No Action Alternative.

3.7.2.3 Alternative 3 – Wildland Fire Suppression and No Prescribed Fires

The general impacts to human health & safety under Alternative 3 would be similar to those under the Proposed Action. The exclusion of prescribed fire (broadcast burning) to reduce ground fuels would eliminate the possibility of an out-of-prescription burn or fire escape. Since slash pile burning would be conducted during winter, the potential for escape from a slash pile burn and for a subsequent wildfire would be very low. In the long-term, however, fuels buildup in the absence of prescribed fire would result in more intense and severe wildland fires that could be more difficult to suppress.

3.8 CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act requires federal agencies to consider the effects of their proposals on historic properties, and to provide state historic preservation officers, tribal historic preservation officers, and, as necessary, the Advisory Council on Historic Preservation a reasonable opportunity to review and comment on these actions.

3.8.1 *Affected Environment*

A level III (intensive) Cultural Resource Survey of Jewel Cave National Monument was documented in a report dated March 1998 (DOI, 1998). Of the 20 archeological sites at the monument, 16 sites are prehistoric and four sites are Euro-American origin, dating since 1861 A.D. The four Euro-American sites include remains of early developments at Jewel Cave and remains of agricultural activity. Four of the sites are listed in good condition and the remaining sites have yet to be evaluated for condition. Known site types in the monument are rock shelters, open campsites, and lithic reduction sites (tool manufacture).

The historic cabin near the original cave entrance is the only historic structure in the monument. The foundation of the Jewel Cave Hotel is in the same vicinity, as are the remains of other historic sites that might be associated with Civilian Conservation Corps activity in the area. The surface trail leading to the original cave entrance from the cabin is considered historically significant, as are the original cave entrance and a short segment of the cave adjacent to that entrance.

Registration of cultural resources is an on-going process at the monument. At present, some monument properties are officially listed on the National Register of Historic Places while others have been determined to be eligible for listing on the Register. Protection measures for sites are

keyed to determinations of each site's eligibility for inclusion in the National Register of Historic Places. Officially listed cultural sites and sites determined eligible or with an undetermined eligibility are of concern. Ineligible sites are dropped from management concerns, and determinations of effect on these properties are not addressed in this analysis.

3.8.2 *Environmental Consequences*

Cultural resource impacts were qualitatively assessed through a presence/absence determination of significant cultural resources and mitigation measures to be employed during wildfire suppression, thinning, and prescribed fire activities.

3.8.2.1 Alternative 1 – No Action

Proposed activities with the potential to impact cultural resources include building fire lines, thinning, and prescribed fire.

Sites that could be potentially affected during thinning, fire line construction and slash piling would be avoided to eliminate damage to cultural sites. Site boundaries would be clearly marked for avoidance, and sites would be monitored during and after completion of the activities. Because these sites would be avoided, there would be no effect to these cultural resource sites.

Sites with combustible materials (i.e. exposed wood) that cannot be avoided during prescribed fires would be covered with fire resistant foam or fire shelters. If needed, a fire line would be built around the perimeter of these sites. Fuels would be removed from the interior of the sites and from the area surrounding the site to maintain low burn temperatures. Back burning may also take place around the site to reduce fuel loading. Burning over chipped stone scatters does not require additional protective measures. Burning is considered to have no adverse effect on these cultural resource sites.

3.8.2.2 Alternative 2 – Proposed Action

General impacts to cultural resource sites under Alternative 2 would be similar to those described under the No Action Alternative.

3.8.2.3 Alternative 3 – Wildland Fire Suppression and No Prescribed Fires

Proposed activities with the potential to impact cultural resources include building fire lines and thinning. Impacts to cultural resource sites from these activities are similar to those described under the No Action Alternative.

Conclusion

The implementation of any of the alternatives would not impair cultural resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for

enjoyment of the monument, and (3) identified as a goal in the monument's general management plan or other Park Service planning documents.

3.9 CUMULATIVE EFFECTS

The cumulative effects analysis for the Fire Management Plan environmental assessment considers the past, present, and reasonably foreseeable future actions on land uses that could add to (intensify) or offset (compensate for) the effects on the resources and that may be affected by the fire Management Plan alternatives. Cumulative effects vary by resource and the geographic areas considered here are generally the monument and areas adjacent to the monument. In some instances, activities may result in both negative and positive impacts when considering the short and long-terms. As a result, some resource categories in Table 3-2 show both positive and negative impacts resulting from a particular activity. The information provided in Table 3-2 is the basis for the cumulative effects described in Table 3-3.

Table 3-2 Affected Impact Topics and Activities/Land Uses
Contributing to Fire Management Plan Implementation Cumulative Effects

	Geology & Soils	Water Resources	Vegetation	Wildlife	Air Quality	Visitor Use & Experience	Human Health & Safety	Cultural Resources
Mineral extraction, timber harvests in Black Hills National Forest	-	-	-	+ -		-		-
Jasper Fire 2001	-	-	+ -	+ -	-	+ -	+ -	-
Rehabilitation measures post-Jasper Fire	+	+	+	+		+	+	+
Past prescribed fires and thinning on the monument	+ -	+ -	+ -	+ -	-	+ -	+ -	+
Lightning & human-caused wildfires	+ -	+ -	+ -	+ -	-	+ -	+ -	+
Wildfire suppression past, present, future	-	+ -	-	-	+	+ -	+	+
Visitation on the monument						+		

DIRECT/INDIRECT EFFECTS KEY: (+) Positive/beneficial; (-) Negative/detrimental; (Blank) Neutral/no effect

Table 3-3 Cumulative Effects

Resource	Past and Present Actions	Proposed Actions	Future Actions	Cumulative Effects
Geology & Soils	Adverse soil impacts (soil erosion or loss) from past timber practices, road building, mineral extraction in surrounding areas, past willdland fires and suppression efforts; Beneficial soil impacts from past wildland fires (nutrification of soils) and Jasper Fire rehabilitation efforts	Prescribed fire and thinning activities would have temporary and minor adverse effects on soils (soil erosion), but beneficial effects as well over the short and long-terms (soil development and soil nutrification)	Continued rehabilitation efforts would reduce soil loss	Soils inside of the monument would improve over time with soil development and nutrification from prescribed fires; Fire Management Plan would not result in significant cumulative impacts; the No Action and Proposed Action Alternatives would contribute the most to soil cumulative impacts, while Alternative 3 would contribute the least
Water Resources	Jewel Cave hydrology probably altered by development, road building in and adjacent to the monument; hydrology of the cave protected as mineral exploration around the cave is restricted	Thinning and prescribed fires would have minimal impacts on jewel cave hydrology, no impacts on surface waters (intermittent streams)	Water resources would benefit from Jasper Fire rehabilitation efforts; intensity of flooding events in intermittent streams should be reduced	Minor effect on water resources; Fire Management Plan would not result in significant cumulative impacts; the No Action and Proposed Action Alternatives would contribute the most to water resource cumulative impacts, while Alternative 3 would contribute the least
Vegetation	Natural fuel loading increased in absence of historic low-severity, high frequency fire regime; native plant habitat and diversity declined; increased infestation of noxious weeds; Jasper Fire reduced fuel loadings, altered forest stand structure in some areas; rehabilitation efforts help re-establish vegetation and reduce infestation of noxious weeds	Thinning and prescribed fire would decrease hazardous fuel loadings; native grass and forb species would be favored; forest stand structure in some areas would return to historic conditions	Future noxious weeds treatments would continue to control their spread; thinning and prescribed fire efforts in the Black Hills National Forest would reduce fuel loadings and help restore historic fire regime to ponderosa pine stands	Ponderosa pine habitat and diversity would continue to improve; noxious weeds would continue to decline; fuel loadings would pose a reduced fire danger; Fire Management Plan would not result in significant cumulative impacts; the No Action and Proposed Action Alternatives would contribute the most to vegetation cumulative impacts, while Alternative 3 would contribute the least
Wildlife	Fire suppression efforts within the monument, timber activities and mineral extraction in adjacent national forest degraded wildlife habitat and diversity; Jasper Fire altered wildlife habitat in the short-term, but long-term effects would be beneficial with the re-introduction of fire in the ecosystem	Thinning and prescribed fire would result in minor, short-term disturbance and displacement with minimal species loss; improved habitat and increased wildlife diversity with restoration of historic fire regime	Future noxious weeds treatments would continue to control their spread and improve wildlife habitat; thinning and prescribed fire efforts in the Black Hills National Forest would help restore historic fire regime to ponderosa pine stands and benefit habitat and species diversity	Wildlife habitat and diversity increases; Fire Management Plan does not result in significant cumulative impacts; the No Action and Proposed Action Alternatives would contribute the most to wildlife cumulative impacts, while Alternative 3 would contribute the least

Table 3-3 Cumulative Effects

Resource	Past and Present Actions	Proposed Actions	Future Actions	Cumulative Effects
Air Quality	Industry and agricultural practices emit pollutants and particulate matter; automobiles, past wildland and prescribed fires contribute to some temporary deterioration in air quality and visibility	Prescribed fire emissions would result in very minor, short-term air quality and visibility impacts	Future wildland fires would contribute to temporary deterioration in air quality and visibility	Class II air quality standards would not be violated; Fire Management Plan would not result in significant cumulative impacts; the No Action and Proposed Action Alternatives would contribute the most to air quality cumulative impacts, while Alternative 3 would contribute the least
Visitor Use and Experience (including Park Operations)	Establishment of the monument, improved roads and trails provided access for recreation opportunities; increased population growth results in increased recreational use; scenic integrity compromised in the short-term as a result of Jasper Fire	Very minor visitor use and experience impacts resulting from thinning and prescribed fire activities	Increased recreation use as population grows	Long-term enhancement of recreation resources and opportunities offsets short-term recreation inconveniences from fuel treatments; Fire Management Plan would not result in significant cumulative impacts; the No Action and Proposed Action Alternatives would contribute the most to visitor use and experience cumulative impacts, while Alternative 3 would contribute the least
Human Health & Safety	Past suppression efforts protected monument staff and visitors	Thinning and prescribed fire activities might result in very minor impacts; long-term improvement in human health & safety with reduction in fuels	Similar effects as described in Past and Present Actions	Human health and safety would improve over time with thinning and prescribed fire activities; Fire Management Plan would not result in significant cumulative impacts; the No Action and Proposed Action Alternatives would contribute the most to human health and safety cumulative impacts, while Alternative 3 would contribute the least
Cultural Resources	Establishment of the monument helped protect cultural resources; past suppression efforts may have impacted un-recorded sites	There would be no impact to cultural resources	Similar effects as described in Past and Present Actions	Cultural resources continue to be discovered and protected; Fire Management Plan would not result in significant cumulative impacts; the No Action and Proposed Action Alternatives would contribute the most to cultural resources cumulative impacts, while Alternative 3 would contribute the least

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U.S. Fish and Wildlife Service
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Scoping

Details of the scoping process and the issues that arose from it are described in Chapter 1, Section 1.5 – *Scoping Issues and Impact Topics*.

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FINDING OF NO SIGNIFICANT IMPACT

Fire Management Plan
Jewel Cave National Monument
December 2004

Jewel Cave National Monument encompasses 1,274 acres and is located in Custer County, 14 miles west of Custer, South Dakota. The Monument is surrounded by the Black Hills National Forest, and the cave underlies the Monument surface area and adjacent Forest Service lands with 130 miles of passages. Ponderosa pine forest dominates the vegetation on the Monument.

Jewel Cave is a characteristic Black Hills cave formed by the solution of the Mississippian Pahasapa Limestone. The cave contains many rare speleothems, including delicate hydro-magnesite balloons, helicites, and tiny root-like structures called scintillites. Jewel Cave is the world's third longest cave. As of December 1, 2004,, more than 130 miles of cave have been discovered, and more is being found continually. It is an extremely complex, three dimensional maze cave with all known passageways contained under less than 3 square miles of surface area. This combination of length and complexity makes it one of the premier caves of the world.

Historically, fire played a major role in maintaining the natural ponderosa pine ecosystem and a diversity of wildlife habitat in the area now designated as Jewel Cave National Monument. The ponderosa pine ecosystem historically had a fire regime of frequent, low-severity ground fires that resulted in uneven-aged and open, park-like stands of ponderosa pine. Smaller trees were killed by the fires, while older, larger, fire-resistant trees survived.

One hundred years of wildland fire suppression in the region resulted in an increased density of pine stands and abundant ladder fuels (e.g. dead and dry lower limbs, small trees), which created ideal conditions for severe crown fires and/or catastrophic fires. The historic pre-European settlement pattern of frequent and low-severity ground fire, which removed ground fuels, shifted to a pattern of potential high severity wildfires that could threaten life, property, and Monument resources. This scenario played out during the Jasper Fire of 2000, which resulted in thousands of acres being burned, many of which experienced high-intensity fires that killed thousands of acres of large trees. In spite of this fire, there is a still a need to re-establish the natural fire regime to the ponderosa pine forest and preserve native plant communities while at the same time protect visitors, facilities, and resources on and adjacent to the Monument.

An environmental assessment (EA) was prepared to better understand the environmental effects associated with employing prescribed fire and thinning to protect the cultural and natural resources of the Monument, while at the same time protecting employee and visitor safety during these fire management activities. Environmental issues identified during scoping and evaluated in the EA included geology and soils, surface water resources, vegetation, wildlife (including federally threatened and endangered species), air quality, visitor use and experience, human health and safety, and cultural resources.

Alternatives for restoring the natural fire regime to the ponderosa pine forest ecosystem and reducing hazardous fuels on the Monument included employing the use of prescribed fire and thinning treatments (the preferred alternative) and employing thinning treatments only.

PREFERRED ALTERNATIVE

The entirety of Jewel Cave National Monument is contained in one Fire Management Unit since the following characteristics are similar throughout the Monument: climate, weather, topography, vegetation, elevation, air quality concerns, access, fire history, fuel types, major fire regimes and expected fire behavior. Under this alternative, all wildland fires in the Monument, human-caused fires and naturally-ignited fires (usually lightning), would be declared wildfires and controlled in a manner that minimizes harm to the environment. During wildfire suppression efforts, fire retardants and foams may be used.

Thinning treatments would concentrate on small understory trees and would not include large diameter trees or old growth. Prescribed fire would be used to maintain fuel loadings on the Monument and help restore forest health to the ponderosa pine stands. Interagency cooperative burns would be sought for areas near and adjacent to Monument boundaries. Under this alternative, mechanical equipment such as chainsaws, chippers, etc. may be used in conjunction with prescribed fire activities to reduce hazardous fuels accumulations. In the wake of the Jasper Fire, Monument staff and Northern Great Plains Area staff will monitor the vegetative condition to determine when prescribed fire should be implemented. . Prescribed fire and suppression activities would likely include mechanical equipment such as fire engines and aircraft.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The "prescribed fire" alternative is the environmentally preferred alternative. The environmentally preferred alternative is the alternative that will promote the national environmental policy as expressed by §101 of the National Environmental Policy Act (NEPA). This includes alternatives that:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

2. Assure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings

3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;

4. Preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice

5. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and

6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

In essence, the environmentally preferred alternative would be the one(s) that "causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources".

In this case, the Proposed Action Alternative is the environmentally preferred alternatives for Jewel Cave National Monument since it meets goals 1, 2, 3, and 4 described above. Under these alternatives, fire management activities would reduce hazardous fuel loadings on the Monument, mimic the natural ecological processes, and combat the invasion of exotic invasive plants. In addition, the alternatives help protect Monument resources and adjacent lands from the threat of wildfires. Finally, the alternatives best protect and help preserve the historic, cultural, and natural resources in the Monument for current and future generations.

THE PREFERRED ALTERNATIVE AND SIGNIFICANCE CRITERIA

As defined at 40 CFR §1508.27, from the regulations of the Council on Environmental Quality that implement the provisions of NEPA, significance is determined by examining the following criteria:

Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

Periodic burning in the ponderosa pine forest ecosystem is an important component in maintaining a healthy forest. The restoration of the historic fire regime to the ponderosa pine ecosystem would enhance the variety and diversity of native plant species and habitats, while at the same time help control noxious weeds. Plant communities adapted to high frequency, low-severity fires would be favored with prescribed fire, and hazardous fuels would be reduced (surface and ladder fuels). Prescribed fire would also release nutrients into the soil and the fertilization effects of ash would provide an important source of nutrition for vegetation in the area. These effects are considered to be minor and not significant impacts because they exemplify natural ecological processes that occur under a natural fire regime for ponderosa pine forest ecosystems in the Black Hills of South Dakota.

The EA also discusses the negligible to minor impacts to air quality associated with the preferred alternative. Considering the relatively small number of acres that would be affected by prescribed fire, approximately 1,274 acres, and in light of the current air quality in the area and review and approval of the burn permit by the state of South Dakota, air quality impacts are felt to be negligible to minor, and not significant.

The degree to which the proposed action affects public health or safety

When conducting fire management activities, human health and safety is the primary concern. Under the preferred alternative, there would likely be very minor human health and safety impacts (small cuts and bruises) to firefighters resulting from wild land fire suppression and prescribed fire activities. The preferred alternative provides the best protection since prescribed fire and thinning will help reduce hazardous fuels on the Monument and minimize the fire danger to the Monument staff and nearby private residences and communities. Before conducting any prescribed fire, fire management officials would ensure that adequate weather conditions existed to facilitate smoke dispersion, thus minimizing and/or eliminating potential smoke impacts on sensitive receptors and the general public.

Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

As described in the EA, the intent of the action alternatives was to provide the maximum amount of protection for the important natural and cultural resources of the Monument. The implementation of the preferred alternative will result in no significant adverse effects to cultural resources since these would be marked and avoided during fire management activities. As discussed under the first significance criteria above, the preferred alternative will have a minor beneficial impact on the ponderosa pine forest ecosystem since fire is so important in the perpetuation of that ecosystem. There would be very minor and insignificant impacts to Jewel Cave and to surface water resources resulting from fire management activities. There are no prime farmlands or wild and scenic rivers affected.

The degree to which the effects on the quality of the human environment are likely to be highly controversial.

There were no controversial impacts identified during the analysis done for the EA, and no controversial issues were raised during the public review of the EA.

Degree to which the possible effects on the quality of the human environment are highly uncertain or involve unique or unknown risks.

There are no identified risks associated with the preferred alternative that are unique or unknown, and there are no effects associated with the preferred alternative that are highly uncertain identified during the analysis for the EA or during the public review of the EA.

The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

The preferred alternative does not establish a precedent for any future actions that may have significant effects, nor does it represent decisions about future considerations. The purpose of this action is to develop a fire management plan and program that utilizes the benefits of fire to achieve desired natural resource conditions while minimizing the fire danger to Monument resources and adjacent lands from hazardous fuel accumulations. Under such a program,

prescribed fire and thinning activities would be conducted over several years to restore the ponderosa pine forest ecosystem by promoting fire-adapted plant and wildlife species, reducing the hazardous fuels in the Monument (surface and ladder fuels) and reducing the extent of noxious weeds. This program will be evaluated and, if necessary, revised during future revisions to the Monument's Fire Management Plan.

Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.

Since the vegetation resources thrive under a management scheme that includes fire, the application of fire on an annual basis will cumulatively improve the ponderosa pine forest ecosystem on the Monument. The air quality impacts associated with prescribed fire would be permitted through the South Dakota Division of Resource Conservation and Forestry and would have a very minor cumulative effect on the region's air quality. The EA determined that there would be no significant cumulative impacts associated with the preferred alternative.

The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed on National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

Registration of cultural resources is an on-going process at the Monument. At present, some Monument properties are officially listed on the National Register of Historic Places while others have been determined to be eligible for listing on the Register. A level III (intensive) Cultural Resource Survey of Jewel Cave National Monument was documented in a report dated March 1998 (DOI, 1998). Of the 20 archeological sites at the Monument, 16 sites are prehistoric and four sites are Euro-American origin, dating since 1861 A.D. The four Euro-American sites include remains of early developments at Jewel Cave and remains of agricultural activity. Four of the sites are listed in good condition and the remaining sites have yet to be evaluated for condition. Known site types in the Monument are rock shelters, open campsites, and lithic reduction sites (tool manufacture).

Compliance with section 106 of the National Historic Preservation Act was completed with a concurrence with the NPS determination of no effect by the South Dakota State Historic Preservation Officer on November 29, 2004. The SHPO requested continue involvement as projects enter the planning phases.

The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

The U.S. Fish and Wildlife Service concurred with the determination of no effect on threatened or endangered species on November 15, 2004. The U.S. Fish and Wildlife Service had one suggestion:

1. If possible, conduct a survey of spring areas to determine whether the Black Hills mountainsnail may inhabit these springs. If found, the Service suggested minimizing impact to spring areas to reduce disruption to the site.

Whether the action threatens a violation of Federal, state, or local law or requirements imposed for the protection of the environment.

This action violates no federal, state, or local environmental protection laws.

Impairment

In addition to reviewing the list of significance criteria, the National Park Service has determined that implementation of the proposal will not constitute an impairment to the critical resources and values of the Monument. This conclusion is based on a thorough analysis of the environmental impacts described in the Fire Management Plan and its EA, public comment, relevant scientific studies, and the professional judgment of the decision-maker guided by the direction in NPS *Management Policies 2001* (December 27, 2000). The plan under the preferred alternative will result in only negligible to minor adverse impacts to air quality resources, primarily in the form of smoke impacts to visibility. Overall, the plan results in benefits to park resources and values, opportunities for their enjoyment, and it does not result in their impairment.

PUBLIC INVOLVEMENT

The environmental assessment was made available for public review and comment during a 30-day period ending January 19, 2002. A legal notice announcing its availability was published in the local paper on August, 2002. No one from the general public requested copies of the document and no comments from the general public were received. A public meeting was held on January 8, 2002.Two letters were received from other agencies (one from the State Historic Preservation Officer and one from the U.S. Fish and Wildlife Service). There were no substantive issues raised upon review of the EA. The lack of comment on the part of the general public and other agencies resulted in no changes to the text of the environmental assessment.

The preferred alternative does not constitute an action that normally requires preparation of an environmental impact statement (EIS). The preferred alternative will not have a significant effect on the human environment. Negative environmental impacts that could occur are negligible or minor in intensity. There are no significant impacts on public health, public safety, threatened or endangered species, sites or districts listed in or eligible for listing in the National Register of Historic Places, or other unique characteristics of the region. No highly uncertain or controversial impacts, unique or unknown risks, significant cumulative effects, or elements of precedence were identified. Implementation of the action will not violate any federal, state, or local environmental protection law.

CONCLUSION

Based on the foregoing, it has been determined that an EIS is not required for this Fire Management Plan and thus will not be prepared.

Recommended: /s/ Todd J. Suess 12/22/2004
Todd J. Suess, Superintendent Date

Approved: /s/ Ernest Quintana 12/29/2004
Ernest Quintana, Midwest Regional Director Date