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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 (NPS) to prepare and implement a Fire Management Plan (FMP) for Hot Springs National Park in Arkansas.

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 human 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 #12 and Handbook.

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.

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. There is also opportunity for the public to provide input into the decision. 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 Hot Springs National Park (the Park) is faced with a decision on what kind of Fire Management Plan to approve and implement as described below.

This decision will be made within the overall management framework that being established in the Park's General Management Plan (GMP) and its Resource Management Plan (RMP). 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 Park's RMP (copies of which can be obtained by contacting NPS personnel at park headquarters).

In making decisions about NPS-administered resources, the NPS is guided by the requirements of the 1916 Organic Act and other laws, such as the Clean Air Act, Clean Water Act, National

Historic Preservation Act, and Endangered Species Act (summarized in Appendix C). The authority for the conservation and management of the NPS 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."

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

1.2 PURPOSE AND NEED

Prior to European settlement of Arkansas, natural (lightning) and human-caused (Indian) fires would burn in a mosaic pattern guided only by climatic conditions, natural barriers (streams, bluffs) and available fuels. Native Americans had set fires for a variety of purposes over many thousands of years (Stanturf et al., 2001). Written accounts strongly suggest the use of fire by Indians to burn off prairies and to prevent woodlands from becoming cluttered by underbrush (Ladd, 1991). This was done to encourage the emergence of lush new grasses, grazed by free-ranging elk and bison, and to drive wildlife toward hunters.

The fire return interval, or average period of time for successive fires to pass over a given point, has been estimated at approximately 32 years for the period 1780-1938 (Johnson and Schnell, 1985). From 1938 to 1983, during the era of fire suppression that predominated in Federal land management during much of the last century, the estimated fire return interval at a given point in the park lengthened to 1,229 years. The longer interval between fires, the greater the likelihood that fires, when they do occur, will be more severe and kill larger trees rather than just small trees and undergrowth (Stanturf et al., 2001).

One of the primary resource management objectives for the Park is to conserve the forests above the recharge area of the aquifer that supplies water to the hot springs. NPS Wildland Fire Management Guidelines (DO-18) state that "all parks with vegetation that can sustain fire must have a fire management plan." Up to the present, the Park has not had an FMP, but practiced suppression of all natural or human-caused fires. Prescribed fires have been used on a very

limited basis. The purpose of this Federal action is to develop a fire management plan and program at the Park that utilize the benefits of fire to achieve desired natural resource conditions while minimizing the fire danger to park resources and adjacent lands from hazard fuel accumulations. **The need for the action is that DO-18 requires that all park units with vegetation capable of sustaining fire develop a Fire Management Plan.**

1.3 BACKGROUND

Hot Springs National Park conserves two contrasting kinds of resources: 1) historic bathhouses and their thermal/mineral waters in the center of the town of Hot Springs, Arkansas, and 2) surrounding, low-lying mountains cloaked in forests that abound in plant and animal life. These mountains and forests also protect the recharge area of the aquifers that supply water to the hot springs. Waters that have been underground for more than 4,000 years (according to geologists), issue from the hot springs at an average rate of 850,000 gallons per day. The water contains traces of dissolved minerals and a constant water temperature of 143° F (NPS, 2000).

The allegedly therapeutic waters of the hot springs and nearby cold springs have drawn visitors to this area for centuries – Hot Springs has a long history that precedes Euro-American colonization of the area. It is known that American Indians bathed in these hot springs as early as the late 1700's, and perhaps well before that.

While there is no clear evidence to substantiate which Europeans or Americans were the first to see the springs, legend has it that Spanish *conquistador* Hernando de Soto and his troops may have done so in 1541; during the 17th and 18th centuries, French trappers and traders traversed Arkansas and may well have learned of these thermal springs firsthand. After the young United States acquired this area from France as part of the 1803 Louisiana Purchase, Present Thomas Jefferson sent an expedition headed by William Dunbar and George Hunter to explore the hot springs. Their enthusiastic report back to the president publicized the hot springs and prompted more and more people to travel to the area and soak in the waters.

Hot Springs National Park is recognized for a conservation “first.” In 1832, the Federal government took the unprecedented step of “reserving” the springs for the public, the first such reservation of a natural resource in the history of the United States, a full four decades before Yellowstone was set aside as the country’s and world’s first national park. By the 1870’s, the government was allowing private bathhouses to be built in the vicinity of the springs. And by 1921, the Hot Springs Reservation was such a popular destination for vacationers and health enthusiasts that Stephen Mather, the first director of the National Park Service, was able to convince Congress to declare it the country’s 18th national park. In its heyday, the so-called Golden Age of Bathing, more than a million visitors a year soaked in the springs and strolled Bathhouse Row.

After World War II, sweeping socioeconomic changes in the United States led to a decline in the popularity of thermal waters and the resorts they supported. In Hot Springs, the elegant bathhouses lost business and began to close. Today, only one, the Buckstaff, remains active and open to the public. Over the years, the NPS has acquired many of the historic bathhouses along Central Avenue in the heart of Hot Springs and is endeavoring to preserve the facades of these

historic structures. The NPS has restored the Fordyce Bathhouse and converted it into the park's visitor center.

The Park is approximately 5,500 acres in area, most of which is forested, mountainous terrain managed to preserve the hydrological system that feeds the springs (Figure 1). These forests belong to the pine-oak-hickory ecosystem that dominates natural landscapes in the southeastern United States. Before colonization by Euro-Americans, fire played an integral role in the ecology of these forests (Johnson and Schnell, 1985).

In its 1986 *General Management Plan*, the Park included statements on both the natural and historic significance of the park, which are paraphrased and summarized below:

- Natural Significance – While the hot springs are the park's primary natural resources, they are unlike the thermal features found in other natural parks, such as Yellowstone geysers, in that they have not been preserved in their natural condition. Rather, they have been managed to conserve the production of uncontaminated water for public use. The park's mountain lands have been managed and conserved under the same philosophy, so as to preserve the hydrologic system that feeds the springs. These lands have remained primarily unaltered, and a good example is a shortleaf pine stand on Sugarloaf Mountain.
- Historical Significance – In the context of History and Prehistory in the National Park System and the National Historic Landmarks System, the park represents the following themes and sub-themes:

America at Work

Science and Invention – the field of medicine

Architecture – commercial-industrial structures in the Classical and Eclectic Revival styles

Society and Social Conscience

Environmental Conservation – conservation of the natural environment before 1865

Recreation-unorganized recreation (vacationing, tourism, and other leisure activities)

The Park is acknowledged as a significant historical resource for its role in the emergence of the American conservation movement. The idea of reserving land and resources for the public and posterity that was expressed here later fostered the creation of national parks that preserved “pleasuring grounds” for the general benefit of society. The park is also historically significant as an example of the spa movement in the United States that flourished in the late 18th and early 19th centuries. Mineral spas were the first recreation resorts in America. They emphasized the curative powers of the thermal and mineral waters, outdoor activities, relaxation, and romantic attitudes toward nature.

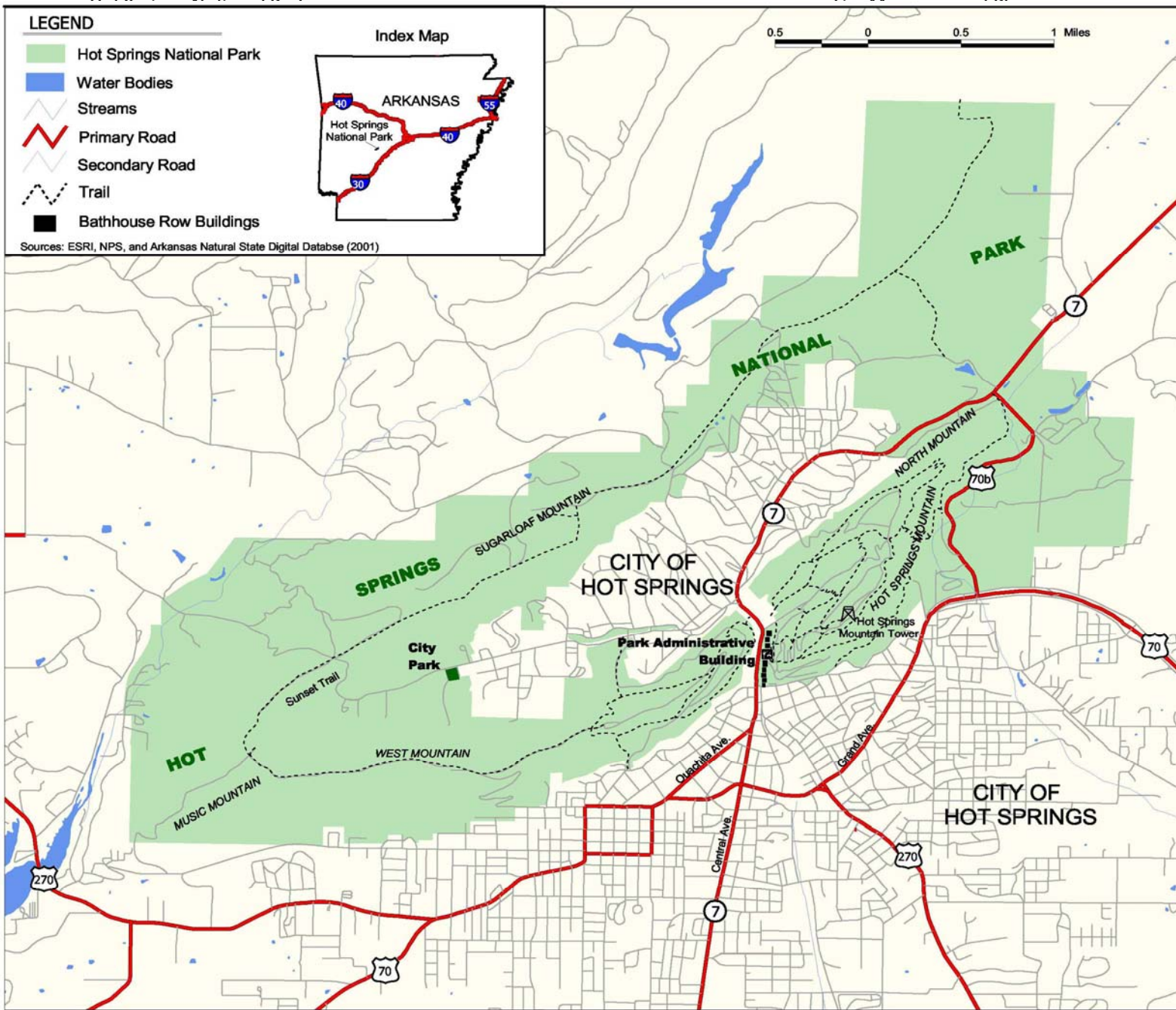


Figure 1 – Hot Springs National Park Vicinity Map

There are three basic goals of the 1986 GMP that relate to the FMP.

1. Investigate and protect the recharge area of the thermal springs.
2. Improve vegetation management and restore disturbed areas.
3. Research and document the park's natural resources.

Four objectives from the draft of a new RMP also relate this FMP:

1. To ensure the preservation of the thermal springs, and protect the entire hydrologic system and the purity of the thermal water.
2. To maintain healthy ecological systems.
3. To protect and maintain the natural diversity of plants and animals outside of areas managed primarily for cultural resources or developed areas.
4. To promote public understanding and appreciation of the park's thermal features, geological and hydrological resources, and ecological communities.

1.4 FIRE MANAGEMENT OBJECTIVES

NPS Wildland Fire Management Guidelines (DO-18) require 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. These guidelines identify fire as the most aggressive natural resource management tool employed by the NPS. All wildland fires are classified as either wildfires, wildland fire use 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 resource management objectives. Human-caused wildland fires 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 history of fire use in the area of the park goes back to the Native Americans present when Euro-American settlers first appeared on the scene. While lightning could be considered the normal or natural source of ignition, few lightning fires are recorded today. This indicates that anthropogenic fires are a likely source of fires. Fires were probably used to reduce vegetation or drive game. These fires probably had a significant effect on the vegetation present at settlement.

Fire has been a cultural activity in the in the southeastern United States, including Arkansas, since the early Europeans arrived. Human-caused fires are an important factor to be considered in fire management planning.

The FMP should be seen as a vehicle for achieving GMP and RMP goals and objectives. Fire can be used to provide a natural-appearing landscape vista for the park. With proper planning and execution, prescribed fire can manipulate vegetation to produce healthier habitats as a background for the developed zone of the park. At the same time, fuel management, using both mechanical means and prescribed fire, can reduce the risk to cultural and historic structures on the unit. Implementation of the FMP will achieve relevant GMP and RMP objectives listed above.

The Fire Management Goals and Objectives in the proposed FMP for the Park are:

1. Suppress all wildfires, and preventing human-caused fires, while providing for firefighter safety.
2. Reduce hazard fuels to reduce the potential for wildfires.
3. Restore forest vegetation.
4. Provide for public safety.

Wildland Fires are any non-structure fire that occurs in the wildland.

Wildfires are any unplanned, unwanted wildland fire including unauthorized human-caused fires, escaped wildland use events, escaped prescribed fires and all other wildland fires where the objective is to put out the fire.

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 pre-stated resource management objectives in predefined geographic area..

1.5 SCOPING ISSUES AND IMPACT TOPICS

On February 4, 2002, a scoping news release was sent to a mailing list of approximately 15 individuals and organizations. Interested parties were given until March 1, 2002 to send in comments, suggestions and input on those topics that should be addressed in the Environmental Assessment of the proposed Fire Management Plan revisions.

One letter was received during scoping, from the Fire Chief of the Hot Springs Fire Department (see Appendix D).

1.5.1 Important Issues

The letter from the chief of the Hot Springs Fire Department raised several important issues and concerns related to human health and safety and protection of property and historic resources:

1. The Park's interior and exterior boundaries are in close proximity to numerous residential and business districts of the City of Hot Springs.

2. Because the national park surrounds the historic downtown area of Hot Springs, and the city surrounds a large portion of the park, wildfires out of control have the potential to cause great damage to constructed property not only in the park, but also in the city. They could also cause injury to residents or visitors. Earlier fires in Hot Springs have destroyed the entire downtown area.
3. Numerous wildfires and prescribed fires have escaped control and caused great loss of personal property and life in and around national parks and national forests.

In view of the above considerations, the Hot Springs Fire Chief recommended that The Park continue to aggressively suppress all wildfires and limit the use of prescribed fire to burning stacked fuels in area where it is incapable of spreading to the park's forests and any developments in the park or city.

1.5.2 Impact Topics Evaluated

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: Geologic formations and geothermal processes are responsible for heating the water at Hot Springs. Intense fires, hazard fuel reduction, and suppression activities can adversely impact soils; therefore, impacts to soils are analyzed in this EA.

Water Resources: NPS policies require protection of water resources consistent with the Federal Clean Water Act. Streams drain mountainous portions of the park. More importantly, the Park's thermal and mineral waters are its most crucial natural resource and the very reason for establishment of the park in the first place. Wildfires, prescribed fires and fire suppression efforts can adversely impact water quality and quantity (flows); therefore, impacts to water resources are analyzed in this EA.

Vegetation: Most of the park acreage is forested. Since fire management activities could include fuels reduction, prescribed fire and the restoration of natural fire regimes, all of which affect vegetation, these impacts are analyzed in this EA.

Wildlife: There are resident populations of various species of reptiles, amphibians, birds, mammals, fish, and invertebrates that could be impacted directly or indirectly by prescribed and wildfires. Therefore, impacts to wildlife are evaluated in this EA.

Rare and Threatened and Endangered Species: The Federal Endangered Species Act of 1973 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. In addition, the State of Arkansas maintains own list of imperiled or rare species. Several listed species occur on or adjacent to the Park that could conceivably be directly impacted by prescribed and wildfires, by

fire suppression, as well as indirectly impacted by post-fire habitat changes and habitat changes from fire exclusion. Therefore, this impact topic is retained for further analysis 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, the Park is designated as a Class II area. While the park generally enjoys good air quality, and is in attainment with the National Ambient Air Quality Standards on all parameters, it does not have pristine air quality. All types of fires generate smoke and particulate matter, which can impact air quality within the park, the adjacent community, and the 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 NPS 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 park. 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 (NHPA) 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. The Park preserves a variety of cultural and historic resources, including the Historic Landmark District of Bathhouse Row and 25 state-registered archaeological sites. 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, campgrounds, 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.

1.5.3 Impact Topics Considered but not Evaluated

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 deemed 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.

Floodplains and Wetlands: Presidential Executive Orders mandate floodplain management and protection of wetlands. Executive Order 11988 on Floodplain Management requires all Federal agencies to take action to reduce the risk of flood loss, to restore and preserve the natural and beneficial values served by floodplains, and to minimize the impact of floods on human safety, health, and welfare. Executive Order 11990, Protection of Wetlands, states an overall wetlands policy for all Federal agencies, requiring them follow avoidance/mitigation/ preservation procedures with public input before proposing new construction projects.

Bathhouse Row is located within the 100-year floodplain, as is the Gulpha Gorge campground. The NPS is cooperating with the City of Hot Springs to control flooding in the drainages of Hot Springs and Whittington creeks. Since the Park is located in mountainous terrain, it does not contain extensive wetlands. None of the FMP alternatives will substantially affect floodplains and wetlands. Therefore, this impact topic is not addressed further in the 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 (perhaps several days or weeks per decade on average at any given site) and not pervasive enough to substantially interfere with human activities in the park and adjacent community, or with wildlife behavior. Moreover, since the Park is situated immediately adjacent to an urban area, there is already substantial ambient noise from a host of sources, against which the infrequent noise associated with fire management would be almost negligible. 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 park or in the City of Hot Springs. One exception to this general rule would be the temporary closure of certain nearby roads during fire suppression activities or from heavy smoke being emitted from wildfires or prescribed fires. Over the long term, such closures would be very infrequent and would not significantly interfere with local or regional transportation or traffic flow. 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 to meet the increased demand. 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: Portions of the park are directly adjacent to the City of Hot Springs, as well as rural semi-rural residential development beyond the city limits. Since fire management activities would not substantially affect land uses within the developed park or adjacent areas, 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 park, but this addition would be minimal and would not affect neighboring communities’ overall populations, incomes employment bases, tax revenues, school attendance, or any other major socioeconomic indicator. 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. None of the alternatives would result in disproportionate health or environmental effects on minorities or low-income populations as defined in the Environmental Protection Agency’s Environmental Justice Guidance, and therefore this topic is not further addressed in this EA. Executive Order 13045 requires Federal actions and policies to identify and address disproportionately adverse risks to the health and safety of children. Since none of the fire management alternatives involves disproportionate risks to the well-being of children, this topic is excluded from further analysis.

Ecologically Critical Areas: The Council on Environmental Quality regulations require consideration of the severity of impact on unique characteristics of the geographic area such as proximity to ecologically critical areas (e.g. International Biosphere Reserve, World Heritage Site). No ecologically critical areas have been identified within or adjacent to Hot Springs National Park, and this impact topic has been dismissed from further evaluation.

Prime and Unique Agricultural Lands: Prime farmland has the best combination of physical and chemical characteristics for sustainable production of 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 be available for farming uses. Lands within the park are neither available nor suitable for farming and, therefore, do not meet these criteria. Thus, 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. According to National Park Service personnel, Indian trust assets do not occur within Hot Springs National Park 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 park and, therefore, this impact topic is not evaluated further in this EA.

Wilderness: The 1964 Wilderness Act states that wilderness, “in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain.” This statute established a National Wilderness Preservation System; designated areas in that system are to be left unimpaired for future use and enjoyment. However, The Park contains neither designated Wilderness nor recommended Wilderness. Moreover, the park does not have any “de facto wilderness;” that is, wildlands that might qualify for wilderness designation some day. Although most of the Park’s acreage is wooded mountainsides, these lands are neither wild enough nor extensive enough to be recommended for Wilderness designation relative to the Wilderness Act. Therefore, this topic is examined no further.

Table 1-1 Impact Topics

Impact Topic	Retained or Dismissed from Further Evaluation	Relevant Regulations or Policies
Geology and Soils	Retained	<i>NPS Management Policies 2001</i>
Water Resources	Retained	Clean Water Act; Executive Order 12088; <i>NPS Management Policies</i>
Vegetation	Retained	<i>NPS Management Policies</i>
Wildlife	Retained	<i>NPS Management Policies</i>
Rare and Threatened and Endangered Species	Retained	Endangered Species Act; <i>NPS Management Policies</i>
Air Quality	Retained	Federal Clean Air Act (CAA); CAA Amendments (CAAA) of 1990; <i>NPS Management Policies</i>
Visitor Use and Experience	Retained	<i>NPS Management Policies</i>
Human Health & Safety	Retained	<i>NPS Management Policies</i>
Cultural Resources	Retained	Section 106; National Historic Preservation Act; 36 CFR 800; NEPA; Executive Order 13007; Director’s Order #28; <i>NPS Management Policies</i>
Park Operations	Retained	<i>NPS Management Policies</i>
Floodplains and Wetlands	Dismissed	Executive Order 11988; Executive Order 11990; Rivers and Harbors Act; Clean Water Act; <i>NPS Management Policies</i>
Noise	Dismissed	<i>NPS Management Policies</i>
Waste Management	Dismissed	<i>NPS Management Policies</i>
Transportation	Dismissed	<i>NPS Management Policies</i>
Utilities	Dismissed	<i>NPS Management Policies</i>
Land Use	Dismissed	<i>NPS Management Policies</i>
Socioeconomics	Dismissed	40 CFR Regulations for Implementing NEPA; <i>NPS Management Policies</i>

Environmental Justice	Dismissed	Executive Order 12898
Ecologically Critical Areas	Dismissed	Wild and Scenic Rivers Act; 36 CFR 62 criteria for national natural landmarks; NPS <i>Management Policies</i>
Prime and Unique Agricultural Lands	Dismissed	Council on Environmental Quality 1980 memorandum on prime and unique farmlands
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 <i>Guiding Principles of Sustainable Design</i> ; NPS <i>Management Policies</i>
Wilderness	Dismissed	The Wilderness Act; Director's Order #41; NPS <i>Management Policies</i>

Chapter 2 - 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 Park staff.

2.1 ALTERNATIVES CONSIDERED AND ANALYZED

2.1.1 *Alternative 1 (No Action Alternative) – Full Suppression and No Prescribed Fire*

The No Action Alternative would include suppression of all wildfires (both natural and human-caused) and it would not utilize prescribed fires for resource objectives or hazard fuel reduction. Rather, mechanical treatments such as thinning within buffer zones surrounding all properties, structures and resources needing protection would be conducted.

Under this alternative, the FMP would be written to reflect current Federal fire policy guidance. The FMP would state that all wildfires in the park (human-caused and naturally-ignited) would be suppressed. In addition, prescribed fire would not be permitted on the park for resource benefits or for slash pile burning. Priority areas for mechanical thinning treatments would include those adjacent to structures, developed sites, historic/cultural resources, roadways, and the park's boundary for protection of private property and resources on private lands outside the park.

Wildfire Suppression

All wildfires would receive an appropriate response. Since the Park maintains a minimal number of firefighters, other park personnel would be encouraged to qualify for and maintain fire qualifications. If resource needs exceed the park's ability, then local resources from volunteer departments would be requested. Additional resources may be available from other Arkansas Area Park Group, the Ouachita National Forest and the Arkansas Forestry Commission.

Suppression strategies would seek to control the spread of wildfires through direct or indirect attack. Modes of attack would be determined by the on-site Incident Commander with consideration given to various fire parameters and an assessment of values at risk including firefighter safety, protection of the visiting public and the potential for fire movement to private property.

Suppression activities would also emphasize preparedness, including prevention (preventing human-caused wildfires and incorporating prevention messages into interpretive programs), annual training, readiness, pre-season risk analysis, a step-up plan and a pre-attack plan. All suppression efforts on the ground would employ Minimum Impact Suppression Tactics (MIST). Rehabilitation would be undertaken to mitigate the impacts of fireline construction and mop-up activities. Proper placement of hand-constructed firelines should reduce the need for major work. Areas with handlines would be restored to their pre-fire condition as soon as possible.

The nature of fires on the park indicates that long-term rehabilitation should not be necessary. Should a Burned Area Emergency Rehabilitation Team (BAER) be required on the park an archeologist or cultural resource specialist will be part of the team.

Mechanical Treatments

Mechanical treatments would be conducted to reduce hazard fuels within the Park. Treatments would focus along the park boundaries, along roads, and around developed areas. Mechanical treatments would be conducted with chainsaws. The cut material would be removed from the site. Mechanical treatments may stand alone or be an interim step prior to application of prescribed fire.

2.1.2 Alternative 2 (Proposed Action) – *Full Suppression with Prescribed Fire*

Under this alternative, the Fire Management Plan to be approved and implemented would reflect current Federal fire policy guidance. Overall FMP goals and objectives would be those presented in Section 1.4. There would be no wildland fire use in the park under Alternative 2; that is, all wildfires subject to suppression.

Wildfire Suppression

All wildfires would receive an appropriate response. Since the Park maintains a minimal number of firefighters, other park personnel would be encouraged to qualify for and maintain fire qualifications. If resource needs exceed the park's ability, then local resources from volunteer departments would be requested. Additional resources may be available from other Arkansas Area Park Group, the Ouachita National Forest and the Arkansas Forestry Commission.

Suppression strategies would seek to control the spread of wildfires through direct or indirect attack. Modes of attack would be determined by the on-site Incident Commander with consideration given to various fire parameters and an assessment of values at risk including firefighter safety, protection of the visiting public and the potential for fire movement to private property.

Suppression activities would also emphasize preparedness, including prevention (preventing human-caused wildfires and incorporating prevention messages into interpretive programs), annual training, readiness, pre-season risk analysis, a step-up plan and a pre-attack plan. All suppression efforts on the ground would employ Minimum Impact Suppression Tactics (MIST). Rehabilitation would be undertaken to mitigate the impacts of fireline construction and mop-up activities. Proper placement of hand-constructed firelines should reduce the need for major work. Areas with handlines would be restored to their pre-fire condition as soon as possible. The nature of fires on the park indicates that long-term rehabilitation should not be necessary. Should a Burned Area Emergency Rehabilitation Team (BAER) be required on the park an archeologist or cultural resource specialist will be part of the team.

Prescribed Fire

Under Alternative 2, park management would use prescribed fire both to achieve resource management objectives and to reduce hazard fuel loads. Use of prescribed fire would help maintain the historic landscape, maintain a healthier vegetation resource and reduce the likelihood of insect and disease outbreaks. In addition prescribed fire would reduce fuel loads, especially where ice storm damage has occurred, as in December 2000.

The use of prescribed fire with other hazard fuel reduction methods along the park boundary would serve the dual function of reducing the likelihood of wildfire coming from adjacent private lands and threatening park resources as well as protecting private adjoining lands from fires ignited on the park.

A schedule of proposed fires would be developed and reviewed annually. The annual review would determine if fuels conditions are such that burn implementation could take place. Fire effects monitoring would be implemented to determine if prescribed fire objectives are being met, and to ensure that unwanted effects are not occurring.

Prescribed fire would be used to reduce fuel loads to protect park resources. In addition, fire would help to maintain healthy vegetation that would be resistant to insect and disease infestations. Each prescribed will follow a prescribed fire plan following RM 18, Chapter 10.

Mechanical Treatments

Mechanical treatments would be conducted to reduce hazard fuels within the Park. Treatments would focus along the park boundaries, along roads, and around developed areas. Mechanical treatments would be conducted with chainsaws. The cut material would be removed from the site. Mechanical treatments may stand alone or be an interim step prior to application of prescribed fire.

2.1.3 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(s) 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 Hot Springs National Park since it meets goals 1, 2, 3, and 4, and partially achieves goal 6 (by enhancing the quality of renewable resources) described above. Under this alternative, fire management activities would reduce hazard fuel loadings on the park, help to restore natural ecological processes, and help protect park 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 park for current and future generations.

2.2 ALTERNATIVES CONSIDERED BUT NOT ANALYZED

2.2.1 Allow 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. This alternative would establish one Fire Management Unit (FMU) that encompasses the entire park, and depend on wildland fire use throughout the park instead of prescribed fires as a means of controlling hazard fuels and achieving vegetation and resource objectives.

This alternative was considered but not analyzed further in this EA because of its inherent risks and impracticability at the Park. Because of the configuration of the park (surrounding the City of Hot Springs) and its comparatively small size, as well as the immediate proximity of private improved properties – including homes and numerous other structures – fire containment within park boundaries and away from nearby structures and developments requiring protection could not be guaranteed. Moreover, valuable cultural and historic resources located in a number of places throughout the park could conceivably be put at risk.

Finally, since a small percentage of the park's fires are from natural ignition, the opportunities for wildland fire use at the Park are limited. In all probability, due to the lack of prescribed fire, this alternative would allow for excessive fuel accumulation over a period of years, followed by a catastrophic fire that might overwhelm suppression efforts and cause major disruptions and/or damage to life and property in the City of Hot Springs. Thus, this alternative would counter the

top priority of NPS fire policy, that of protecting human life and property in and adjacent to parks.

In conclusion, park staff concluded that the potential risks to human health and safety, historic resources, and improved property under this alternative outweigh any possible resource benefits that would be obtained from emphasizing wildland fire use and excluding prescribed fires.

2.2.2 Mechanical Fuel Treatments as a Fire Surrogate

Under this alternative, hazard fuel accumulations would be removed or manipulated by mechanical means to the extent practicable. Fuels would be burned in place 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 hazard fuels reduction for the entire park. Furthermore, the absence of both prescribed fire and wildland fire use in an ecosystem that is fire-adapted would not meet the resource management objective of the park “to protect and maintain the natural diversity of plants and animals.”

2.3 IMPACT DEFINITIONS

Table 2-1 depicts the impact definitions used in this Environmental Assessment. Each impact topic is analyzed in terms of intensity, duration and extent. Intensity is divided into 4 categories: negligible, minor, moderate and major.

Table 2- 1: Impact Definitions

Impact Topic	Intensity				Duration	Extent
	Negligible	Minor	Moderate	Major		
Geology and Soils	Soils and geologic resources would not be affected or changes would be below levels of detection.	The effects would be detectable. Effects to soil fertility and structure or natural physical features would be of little consequence.	The effects would be readily apparent. Changes to soil fertility and structure and natural physical resources would be measurable and of consequence.	The effects would be readily apparent. There would be substantial changes to the character of the soils. Changes to natural physical resources would be measurable and severely adverse.	Short-term – Recovery would take less than 3 years Long-term – Recovery would take more than 3 years.	Localized – Impacts would occur in small areas within the treatment area. Local – Impacts would occur over large areas of the Park. Regional – Impacts would extend beyond Park boundaries.
Water Resources	Neither water quality nor hydrology would be affected, or changes would be below levels of detection.	Changes in water quality or hydrology would be measurable, although the changes would be small.	Changes in water quality or hydrology would be measurable and of some consequence.	Changes in water quality or hydrology would be readily measurable, would have substantial consequences.	Short term – Recovery would occur within 1 month Long term – Recovery would occur more than 1 month.	Local – Impacts would occur within Park boundaries. Regional – Impacts would extend beyond Park boundaries.
Vegetation	Vegetation would not be affected, or changes would not be detectable.	Small changes in plant communities would occur. Plant community composition and structure would be within the historic range of variability. There would be little invasion of exotic plants.	Moderate changes in plant communities would occur. Plant community and structure would be within the range of historic variability. There would be noticeable increase in	Large changes in plant communities would occur. Plant community and structure would be outside the historic range of variability. There would be substantial increases in exotic plants.	Short term – Recovery of species would occur within 1 year. Long term – Recovery of species would occur more than a year.	Local – Impacts would occur within park boundaries. Regional – Impacts would extend beyond park boundaries.

			exotic plants.			
Wildlife	Wildlife and its habitat would not be affected, or changes would be below levels of detection.	Mortality of individuals may occur, but population would not be expected to be outside the natural range of variability. Slight improvement of habitat may occur.	There would be substantial mortality of individuals that would cause populations to be outside their natural range of variability. Substantial improvement of habitat may occur.	There would be extensive mortality, causing the extirpation of species.	Short term – Recovery of species would occur within 1 year. Long term – Recovery of species would occur in more than a year.	Local – Impacts would occur within park boundaries. Regional – Impacts would extend beyond park boundaries.
Rare, Threatened and Endangered Species	There would be no observable or measurable impacts to rare or listed species.	Occasional flight responses by animals are expected, but without interference with feeding, or reproduction.	There would be mortality of a couple individuals of rare of listed species, but within the range of their natural variability.	There would be mortality of many individuals, interference with their breeding, feeding, or changes in habitat that would influence their survival.	Short term – Population would recover within one year. Long term – Population would recover in more than one year.	Local – Impacts would occur within the park. Regional – Impacts would occur outside the park.
Air Quality	Air quality would not be affected, or changes would be below levels of detection.	Changes in air quality would be measurable, but would have little impact on staff, visitors or neighbors.	Changes in air quality would be measurable, would have consequences, impacting staff, visitors and neighbors.	Changes in air quality would be in violation of Class II airshed standards.	Temporary – Recovery would take less than in one day. Short- Term – Recovery would take less than one week. Long- term – Recovery would take more than one week.	Localized – Impacts would occur within park boundaries Local – Impacts would extend within 5 miles of park boundaries Regional – Impacts would extend beyond 5 miles park boundaries.
Visitor Use and Experience	The visitor would not likely be aware of the effects associated with the alternative.	The visitor would be aware of the effects, but the effects would be slight.	Visitor would be aware of the effects, and would likely be able to express an opinion about the changes.	The visitor would be aware of the effects, and would likely express a strong opinion about the changes.	Short term – Changes would last less than 1 month. Long term – Changes would last more than one month.	Localized – Impacts would affect areas of the park. Widespread – Impacts would affect the entire park.

<p>Human Health and Safety</p>	<p>Human health and safety would not be affected, or the changes would be below levels of detection.</p>	<p>The effects would be detectable, but would not have an appreciable effect on public health and safety</p>	<p>The effects would be readily apparent, and would result in noticeable effects to public health and safety.</p>	<p>The effects would be readily apparent and long- term, and would result in substantial effects to public health and safety.</p>	<p>Short- Term – Threats to safety would take place during fire or treatments. Long- term – Recovery last beyond fire or treatment.</p>	<p>Localized – Impacts would be restricted to fire or treatment area. Local – Impacts would be restricted to park. Regional – Impacts would extend beyond park boundaries.</p>
<p>Cultural Resources</p>	<p>Cultural resources would not be impacted, or impacts would be below levels of detection.</p>	<p>Disturbance of a site(s) results in little, if any, loss of integrity. Artifacts would be discolored or have surficial damage. Changes in landscape patterns or features would not diminish the overall integrity of the landscape.</p>	<p>Disturbance of a site(s) results in loss of integrity. Artifacts would be cracked, crazed or have other structural damage. Changes in landscape patterns or features would diminish the overall integrity of the landscape, although mitigation could be successful.</p>	<p>Disturbance of a site(s) results in loss of integrity. Artifacts would be lost, crushed, or removed completely from their historic context. Changes in landscape patterns or features would diminish the overall integrity of the landscape, and mitigation would not be successful.</p>	<p>Short term- – Recovery would occur within a year. Long term – Recovery of would take over a year. Permanent – Impacts would be permanent.</p>	<p>Local- Impacts would impact one or two sites. Widespread – Impacts would impact more than 2 sites.</p>

2.4 MITIGATION MEASURES AND MONITORING

The NPS fire effects monitoring program, as described in the Fire Monitoring Handbook (NPS 2003), sets forth standards for National Parks conducting prescribed fire operations. Monitoring consists of pre-burn vegetation and fuel inventory, fire behavior and weather observations during prescribed fires, and post-burn vegetation and fuel inventories. Monitoring units, based on dominant vegetation communities, are developed for each park by resource managers and fire effects monitoring personnel.

The Ozark Highlands Fire Effects Crew would install permanent vegetation plots prior to prescribed fires following the Fire Monitoring Handbook (NPS 2003). These plots will be remeasured immediately following the fires, and at pre-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 would follow MIST guidelines;
- Fire retardant agents would 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 could 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 Resources*

Minimum Impact Suppression Tactics (MIST) will be used in all fire suppression activity. MIST relevant to protecting soils include the following:

- The fire-edge would be cold-trailed when practical.

- Wetlines, or environmental lines, would be used wherever possible in lieu of handline construction if water and pumps are available. Waterbars would be constructed on handlines on steep slopes.
- Soaker hose or foggers will be utilized in mop-up. "Boring" and hydraulic action on shallow soils would be avoided.
- Firelines would be kept to the minimum width necessary to allow backfiring or safe blackline to be created. Natural barriers would be utilized wherever possible to avoid "tunnel effect."
- If a mineral soil line is needed, fireline explosives would be utilized whenever possible instead of a bulldozer.
- 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 *Water Resources*

- Stream crossings would be limited to set and existing locations.
- Log jams/debris would be left in streams to protect fish and aquatic insect habitat.

The following special restrictions apply to aerially-applied retardant and different types of foam suppressant use:

Retardant – No retardant drops within 400 feet of open water.

Foam (aerial delivery) – Aerial delivery of foam requires Park Superintendent approval on a case-by-case basis. When approved, the following guidelines apply:

- Foam concentrate will only be injected into the holding tank after the water pick-up operation has been completed.
- Drops from T2 & T3 helicopters – no drops within 200 feet of open water.
- Drops from T1 helicopters and heavy airtankers – no drops within 400 feet of open water.

Foam (ground delivery with motorized pumps):

- No application within 25 feet of open water when using small pumps.
- No application within 50 feet of open water when using Mk III or equivalent pumps.
- All foam concentrate used for injection will be located in impermeable containment basins, i.e. visqueen (plastic sheet) spread over rocks or logs to form a catch basin.

Foam (ground delivery with backpack pumps):

- No application within 10 feet of open water.
- All backpack pumps will be filled a minimum of 10 feet from open water. A separate, uncontaminated container must be used to transport water from source to backpack pump. This container must be kept uncontaminated by concentrate.

2.4.4 *Vegetation*

The NPS would set up a monitoring program to measure vegetation and fuels to determine if management objectives are being met, and if unwanted effects are occurring. Monitoring would be conducted by the Ozarks National Scenic Riverways fire effects crew, under the direction of the Ozarks Fire Ecologist. A monitoring plan would be developed. Protocols would follow the NPS Fire Monitoring Handbook (NPS 2003), unless other protocols are determined to better measure management objectives.

2.4.5 *Rare, Threatened and Endangered Species*

The NPS would consult and coordinate with the USFWS and the Arkansas Game & Fish Commission to ensure that prescribed fires and other fire activities would minimize detrimental effects and maximize benefits to all known listed species in the park.

During a prescribed fire, chinquapins would be protected by using a foam or wetline around the stand. Other mitigation measures may also be employed as needs are identified.

2.4.6 *Air Quality*

The following are the management guidelines for all phases of the fire management program:

- No prescribed fires would be ignited during air pollution alerts, temperatures inversions or when a burn ban has been established by any local government.
- Prescribed fires would be conducted only when conditions result in rapid smoke dispersal.
- Firing techniques to lower smoke production would be utilized, when feasible.
- Timing of prescribed fires would occur after 9:00 am with ignition ending before 4:00 pm.
- Smoke projection maps would be prepared to assist in projecting smoke dispersal patterns.
- Local police and fire agencies would be notified of any prescribed fires so they may provide any needed assistance with traffic flow if any problems with smoke dispersal occur.
- Prescribed fires would be planned and conducted when proper wind flow would disperse smoke over unpopulated or low-density population areas.
- Federal Clean Air Act standards would not be violated by any prescribed fires.

Smoke-Sensitive Targets

Management needs to recognize areas where smoke problems are likely and take steps to notify visitors and/or mitigate the smoke intrusion. The notification process would be part of the public information and interpretation program outlined in Chapters IX and X of the FMP. Information on the objectives of the park fire management program would be explained to visitors and residents exposed to smoke discomfort from any fires.

Smoke management guidelines produced by the U.S. Forest Service recommend identifying all sensitive areas downwind of and within 10 miles for backing fires, 20 miles of head fires or large fires (over 250 acres), or 30 miles for logging debris or slash fires.

Other Mitigation Strategies

- a. Prescribed fires – Fires to improve resource values would have a smoke dispersion component in the prescription. If smoke creates a prolonged hazard or significant nuisance, appropriate actions would be taken to mitigate the condition causing the problem or the fire would be suppressed.
- b. Suppression – Suppress or mop up smoldering fuels when they are likely to generate smoke management "problems."
- c. Ignition – Ignite smoldering fuels to get them to burn with an active flame, which generates less than half the emissions than smoldering combustion. Flaming combustion also generates convection columns, which raise smoke above ground level.
- d. Dispersion – Recognize poor dispersion conditions that would last several days, such as the predicted passage of a slow-moving warm front; a lingering high pressure system with stable atmosphere; or high humidity conditions, and adjust burning strategies as necessary.
- e. Firefighter Safety – During high smoke production phases of a fire suppression operation, crews would be rotated out of high smoke areas.

Air Quality and Smoke Monitoring

The Incident Commander or Prescribed Burn Boss (RxBB) is responsible for monitoring weather and smoke dispersion conditions and forecasts, and taking appropriate action.

No special quantitative smoke or emissions monitoring is possible beyond the normal air quality monitoring instruments in the park. Unfortunately, these do not provide useful real-time data for fire management purposes. Unusual or adverse smoke conditions would be documented by the Incident Commander or prescribed burn boss in the fire log (and with photographs when possible). District Rangers would be responsible for alerting the IC or RxBB of impending or actual smoke problems in their districts.

In extraordinary circumstances, portable air quality monitoring equipment may be available from the NPS Air Quality Division.

2.4.7 Visitor Use and Experience

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

An excellent opportunity is available for fire information dissemination at each visitor contact area. To further public information and education, the following guidelines would be followed:

- Timely and accurate information would be provided to the media and visitors regarding the status of fire actions and suppression efforts.
- Informational handouts explaining the fire management program would be prepared and updated as necessary. During periods when management fires are burning, these handouts would be distributed to park visitors and general public.
- The prescribed fire program would be discussed in informal contacts with all unit personnel, neighbors and visitors.
- Adjacent landowners would be notified when fires, particularly wildfires, are a threat to residential areas.

2.4.8 *Human Health and Safety*

In order to make Service employees and the general public aware of such hazards, the following mitigation measures would be considered:

- General public will be made aware of wildfires and prescribed fires through press releases and general interpretive presentations.
- The general public will not be allowed access to any areas affected by fire.
- Safety briefings will be conducted for NPS personnel prior to any participation in wildland suppression or prescribed fires. All fire personnel will be reminded of the "18 Situations That Shout Watch Out" and will be expected to comply with the "10 Standard Fire Orders".
- Appropriate regulatory and/or enforcement agencies will be notified prior to any prescribed fires to assist in safely managing pedestrian, equestrian or vehicular traffic. Warning signs will be posted along roads and trails as necessary.

2.4.9 *Cultural Resources*

Archeological and historic resources found within the Park are irreplaceable. Therefore these sites and structures must receive special attention. Guidelines from NPS-28 and other legal mandates would be followed to protect these resources from fire.

The following measures would be undertaken to help mitigate the impacts of fire suppression and rehabilitation on cultural resources:

- Surveys will be conducted prior to prescribed fires for structural remains, archeological site and other cultural resources.
- Resource base maps showing archeological and historical site locations will be given to archeologists and fire bosses on the firelines.
- When numerous cultural resources are threatened by a fire, archeologists will be present to help mitigate the impacts of fire suppression and rehabilitation on cultural resources.

- Priority will be given to monitoring heavy equipment, especially bulldozers and graders, through all aspects of the suppression and rehabilitation efforts.
- Archeologists serving on a fireline as technical specialists must hold a current red card to perform their specific advisory duties.
- Line archeologists will be equipped with appropriate standard firefighting safety equipment.
- Special flagging will be used to identify archeological and historical sites.
- A photographic record will be kept of all archeological materials uncovered during fire management and rehabilitation activities, and both updated Arkansas and NPS site forms will be filled out to document and assess exposed and discovered sites.
- The Cultural Resource Management Specialist will coordinate all activities of line archeologists with fire bosses.
- If Native American human remains and/or objects are found during fire operations, the site will be evaluated by staff or regional archaeologists in accordance with Sec. 3, Native American Graves Protection and Repatriation Act (NAGPRA).
- Personnel taking part in suppression as well as prescribed fires will be briefed on the potential for disturbance of such resources.
- Any and all control actions undertaken will minimize the impact on such resources; wet line, foam and leaf blowers are the preferred minimum impact suppression techniques.
- No construction of handlines will occur in conjunction with prescribed fire.

In addition, fire management staff would keep the Park's Cultural Resource Management Specialist informed as to upcoming prescribed fire and suppression activities. The Cultural Resource Management Specialist, in turn, will inform and consult with the Arkansas SHPO, and if necessary, the Advisory Council on Historic Preservation (ACHP), on forthcoming projects and activities, such as prescribed fires for hazard fuel reduction in the vicinity of historic properties, to ensure compliance with Section 106 of the NHPA.

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 and key resources. Chapter 3 discusses the environmental consequences of the proposed alternatives in detail.

Table 2-2 Comparison of Alternatives’ Responses to Project Need, Objectives, Important Issues, and Key Resources

	Alternative 1 - No Action Alternative (Full Suppression)	Alternative 2 - Proposed Action (Prescribed Fire)
Project Objectives		
Protection of recharge zone, hot springs, and historic structures	This alternative would protect the recharge zone for the aquifer feeding water to the hot springs; it would also protect historic structures, although less successfully than Alternatives 2.	This alternative would protect the recharge zone for the aquifer feeding water to the hot springs; it would also protect historic structures and other cultural resources better than any of the other alternatives.
Reduces the fire danger to the park and adjacent communities	Yes, reduced fire danger to the park and adjacent communities. This alternative provides less fire danger reduction than the Proposed Action Alternative.	Yes, reduced fire danger to the park and adjacent communities and neighbors in the City of Hot Springs. This alternative provides fire danger reduction similar to that provided under the No Action Alternative.
Important Issues		
Potential escape of prescribed fire	No potential for escape of prescribed fire since there would be not be any prescribed fires.	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.
Smoke into the surrounding community	Since this alternative suppresses all wildfires and does not utilize prescribed fire, in most years smoke generated would be less. However, decades of suppression would likely lead to infrequent but more severe fires that generate much greater amounts of smoke that could affect city residents and businesses.	In any given year, the Proposed Action could generate more smoke than in Alternative 1, though care would be taken by fire managers to minimize smoke intrusion into the surrounding community.
Impact Topics		
Geology and Soils	Minor, negative, long-term, localized, impacts - soil erosion and compaction resulting from thinning activities; potential for high-severity fire in the future with adverse soil impacts; any impact on recharge of aquifer and flow of water to hot springs highly unlikely.	Minor, negative and positive, long-term, local impacts - soil erosion resulting from prescribed fires and thinning activities; benefits to soil development and soil nutrient levels; reduced potential for erosion from wildfires; any impact on recharge of aquifer and flow of water to hot springs highly unlikely.
Water Resources	Minor, negative, short-term, regional impacts – minimal erosion, sedimentation and turbidity to surface waters in most years; infrequent, high-severity fires will lead to impacts on water quality and increased flow rates during storm events.	Minor, negative, short-term, regional impacts to surface water resources from erosion, sedimentation and turbidity; reduced potential of erosion and increased flow rates from wildfires.

	Alternative 1 - No Action Alternative (Full Suppression)	Alternative 2 - Proposed Action (Prescribed Fire)
Vegetation	Long-term, negative, moderate, local, impacts – vegetation degraded as composition and structure shift toward denser understory and unnatural abundance of shade-tolerant and fire-intolerant species; fuel loadings increase until large, intense fire consumes them.	Long-term, positive, moderate, local, impacts – Fire-dependent vegetation maintained; historic forest composition and structure and fuel loadings begin to return.
Wildlife	Minor, negative, long-term, local impacts - complete absence of fire would cause deterioration of wildlife habitat.	Minor, negative, short-term, local impacts, but minor positive, long-term, local impacts - prescribed fires and thinning activities would temporarily displace and kill individuals of some wildlife species; overall wildlife habitat quality improved in the long-term with restoration of historic fire regime.
Rare, Threatened and Endangered Species	Negligible impacts –habitat changes within park will generally be unfavorable to most native organisms, including rare and T&E species. No Federally listed species are known to occur within the Park.	Negligible impacts - prescribed fires and thinning activities unlikely to affect T&E species directly, since none are known to occur directly within the park; may be minor effects of smoke from prescribed fires drifting onto adjacent areas with listed species.
Air Quality	Negligible impacts, except in instances of severe wildfires- reduction in air quality and visibility resulting from wildfires, and potential impacts to sensitive smoke receptors.	Minor, negative, short-term, regional impacts – reduction in air quality and visibility resulting from wildfires and prescribed fires, and potential impacts to sensitive smoke receptors.
Visitor Use and Experience (including Park Operations)	Minor, negative, short-term, local impacts - trail closures and limited access, presence of work crews in the vista during thinning and wildfire suppression activities; not likely to be any impact on visitors to Bathhouse Row.	Minor, short-term negative, local, and minor positive, long-term impacts - trail closures and limited access, presence of work crews during thinning and wildfire suppression activities; not likely to be any impact on visitors to Bathhouse Row; will allow trail users to experience a more natural landscape.
Human Health & Safety	Minor, negative, short-term, regional impacts- smoke and injuries from wildfires and their suppression; safety risk from increased hazard fuel accumulation in the absence of prescribed fire	Minor, negative, short-term, regional impacts – smoke and injuries from wildfires, wildfire suppression and prescribed fires; human health and safety improved by reducing hazard fuels; potential for injury from thinning activities.
Cultural Resources	Minor, negative, permanent, local impacts to historic and archeological resources, and minor negative, long-term, local impacts to cultural landscapes - direct damage from wildfires, and soil disturbance from wildfire suppression; potential for impacts to un-recorded sites.	Minor, negative, permanent, local impacts to historic and archeological resources, and minor, positive, long-term, local impacts to cultural landscapes - direct damage from wildfires, and soil disturbance from wildfire suppression; potential for impacts to un-recorded sites.

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. Impacts are assessed in terms of intensity, duration, extent, whether they are positive or negative. All impacts are considered direct unless otherwise specified.

Unless otherwise noted, the information in this chapter comes from published and unpublished sources at Hot Springs National Park, including its 1986 *General Management Plan / Development Concept Plan*, draft Resources Management Plan, official map and guide (NPS, 2000), a GIS database maintained for the park by the regional NPS office in Omaha, NE, and information obtained from park officials and staff at a meeting in November, 2001.

Hot Springs National Park is located in close proximity to the City of Hot Springs, Arkansas, approximately 55 miles southwest of Little Rock. Access is provided by U.S. 270, U.S. 70 and Arkansas 7. The park is in the Zig Zag Mountains on the eastern edge of the Ouachita Range.

The park's vegetation, thermal waters, cold water springs, bathhouses and associated cultural features, foot trails, prehistoric and historic novaculite quarries, and general physiography combine to form an area of approximately 5,500 acres of resource preservation and interpretation that is under the exclusive jurisdiction of the Federal government. Hundreds of acres fall within the park boundary but are not Federally-owned. The City of Hot Springs, with an approximate population of 33,000, lies immediately outside the park and exerts a significant influence on the Park.

Hot Springs National Park is located in Garland County, with population of approximately 90,000. The county population grew by 20% between 1990 and 2000, compared to an overall growth rate of 13.7% for the state of Arkansas. The non-white population of the county was 11.1% of the total, lower than the 20% non-white population for the state as a whole. Of the county's non-white population, 7.8% was African American, 0.6% American Indian, 0.5% Asian, and 2.2% some other race or two or more races (U.S. Census Bureau, 2001). The percent of individuals below the poverty line was 16.3%, slightly less than for the state as a whole.

Recreation and tourism have always been mainstays of the county's economy, along with livestock production and logging (Garland County, 2001). In addition to the National Park, other area attractions include the Hot Springs Mountain Tower, Lake Ouachita and Lake Catherine State Parks, Lake Hamilton, and Charlton Recreation Area. The city of Hot Springs offers live thoroughbred racing from February through April and simulcasting from other race tracks, from May through the fall each year. The town also offers monthly Gallery Walks, featuring exhibits and art shows from some 25 galleries.

The climate in the area is typical of the southeastern United States. Spring and fall temperatures are moderate, with periods of high humidity. Summers are very hot and humid. Winter

temperatures can range from the 20's to the 60's with variable humidity. Average highs range from 50° F in January to 93° F in July. Average lows range from 28° F in January to 78° F in July. Record temperatures range from -5° F to 115° F. Frequent and sometimes violent thunderstorms occur during the summer months. "Dry" lightning is relatively uncommon. General circulation is from the southwest bringing moist air from the Gulf of Mexico.

Rainfall averages approximately 57 inches annually; March, April, November and December are the wettest months and January and August the driest. Snowfall has been recorded during the period from November through April. The record snowfall is 11 inches. Ice storms have been recorded several times in the last 10 years, including a large one in December 2000 that knocked down a large number of trees and limbs. These storms affect fuel quantity and arrangement.

Fall normally lasts from early October until late November and is characterized by cool nights and warm days. Killing frosts occur in October with hard freezes common in November. Freezing and subsequent dehydration of perennials and grasses combined with the dropping of deciduous foliage creates an abundance of light flashy fuels. Because the average rain in November and December is five inches or greater, dry fuels do not become an issue until January and February.

3.1 GEOLOGY AND SOILS

3.1.1 *Affected Environment*

The Ouachita Mountains are a southern extension of the Ozark Plateau, which forms the only major topographic relief for a vast area of the Midwestern and south-central United States. The topography was formed in late Paleozoic times by tremendous geological forces that acted to uplift, fold, fault, fracture, and harden inland seabed sediments. Subsequent erosion has led to the formation of the present ridge and valley landscape. The narrow steep ridges of the Zig Zag Mountains, the subrange that dominates here, are capped with novaculite rock outcrops. These outcrops are unique to the Ouachita Mountains, and the finely grained structure of the novaculite is known for its superior quality as a natural whetstone.

Pores and fractures in the Bigfork Chert and Arkansas Novaculite absorb rainwater and conduct the water deep into underlying aquifers, where it is heated by the increasingly warmer rocks (i.e. the "geothermal gradient") at great depths. Minerals are dissolved out of rock formations. Eventually, via faults and joints, the water makes its way back to the surface at the lower west slope of Hot Springs Mountain.

Information on every specific soil type, series, and association in the Park is not readily available. However, as a general rule, soils on mountain slopes tend to be rockier, thinner, and less fertile than soils on flatter terrain. According to the 1980 FMP for Hot Springs National Park, soils in the Park tend to be of the "Carnasaw-Townely-Pirum type." The forest canopy, understory, duff and litter layers, and roots all help anchor soil and protect it from being dislodged and eroded by raindrops, sheet and gully erosion. However, if these protective layers are disturbed or removed, soils can be exposed to the kinetic energy of moving water and transported away. Steeper slopes are more subject to erosion.

3.1.2 *Environmental Consequences*

Geology and soils impacts were qualitatively assessed using landscape and soil characteristics, literature reviews, and mitigation measures.

3.1.2.1 Alternative 1 – No Action (Full Suppression and No Prescribed Fire)

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

Minor and localized soil compaction and erosion would occur from thinning activities as vehicle use would be restricted to existing roads. During suppression efforts, fire line construction would result in soil disturbance and could lead to increased erosion, especially in steeply sloped areas within the park. 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.

In this alternative, the benefits accruing to soils from prescribed fire would not occur. Also, due to the potential for intense wildfires under this alternative (from the fuels buildup that suppression results in over time), soils would be potentially more vulnerable to erosion as they become exposed during and after these larger wildfires when protective vegetative cover is burned off. Soils on steeper terrain would be most vulnerable to erosion. Severe fires that burn completely to underlying mineral soils on steep slopes can lead sharply accelerated soil erosion; losses exceeding 200 tons per acre have been recorded (Stanturf et al., 2001).

Under this alternative impacts to soils and geology would generally be minor, negative, long-term and localized. In the event of a severe wildfire, the impacts would be moderate.

3.1.2.2 Alternative 2 – Proposed Action (Full Suppression with Prescribed Fire)

General soil impacts related to suppression activities and mechanical treatments under Alternative 2 would be similar to those described under the No Action Alternative. However, the reduction in hazard fuels associated with this alternative would reduce the potential for adverse impacts associated with wildfires.

Prescribed fire would release nutrients into the soil and the fertilization effects of ash would provide a source of plant nutrients. In addition to increasing nutrient levels in the soils, raising pH, and increasing minerals and salt amounts in the soil, the ash and charcoal residue resulting from incomplete combustion would aid in soil buildup and soil enrichment by being added as organic matter to the soil profile. The added material would work 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, mycorrhiza, and roots (Vogl, 1979; Wright and Bailey, 1980).

Under this alternative impacts to soils and geology would be minor, negative and positive, long-term and local. In the event of a severe wildfire, the impacts would be moderate.

Conclusion

Impacts to geology and soils would be similar under both alternatives: minor, long-term, negative and localized. Alternative 2 would also include positive impacts associated with increased nutrient levels associated with prescribed fire, and reduced potential for negative impacts associated with wildfire suppression.

The implementation of either 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 park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's General Management Plan or other Park Service planning documents.

3.2 WATER RESOURCES

3.2.1 *Affected Environment*

The natural thermal springs are the primary resource of Hot Springs National Park. The presence of the hot springs is a result of the unique geology of the area in combination with the present topography. The water is geothermally heated at an unusually shallow depth of several thousand feet. The water then rises through faults in the Hot Springs sandstone formation to emerge from the thermal springs. Through radiocarbon dating, this process has been determined to take over 4,000 years. In relation to the springs' function, park lands are viewed as two interrelated units: the discharge zone and the recharge zone.

The discharge zone is a narrow strip about a quarter mile long at the foot of Hot Springs Mountain where the thermal water emerges from fractures in the underlying sandstone formation. This area has been the focus of human use and intensive development over the years and is now the site of Bathhouse Row and downtown Hot Springs. The springs themselves are largely concealed from modern visitors except for three display areas along the row. The rest of the springs were capped before 1901 to prevent contamination. Today the spring water is diverted into the park's extensive thermal water distribution system.

The recharge zone includes the highly permeable Bigfork cherts and the Arkansas novaculite formation. The largest outcrops of these formations generally occur on the mountain slopes and narrow ridges above 700 feet in elevation. When plotted on a map, they form long ellipses around the valleys drained by Hot Springs and Gulpha creeks in the park, and they extend well beyond the park boundary to the north and east into the upper basin of the South Fork Saline

River. Scientific studies indicate that perhaps 50 to 75 percent of the recharge zone is within the present park boundary and encompasses much of the mountain lands area of the park. (Petersen and Mott, Technical Report, NPS/NRWRD/NRTR 2002-301) However, it appears possible that the hydrologic system could be disrupted by the wells within any portion of the system.

The water quality of all public drinking water (including the cold water springs available for public consumption) is sampled on a regular basis by the Public Health Officer at the NPS Midwest Regional Office to make sure that it meets drinking water standards.

A number of surface streams and creeks drain the mountain slopes in the park. Prominent among them are Whittington Creek and Gulpha Creek.

3.2.2 Environmental Consequences

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

3.2.2.1 Alternative 1 – No Action (Full Suppression and No Prescribed Fire)

Proposed activities with the potential to impact water resources include building fire lines, use of fire retardants and foam suppressants, thinning, and ash.

The two principal impacts to water quality stem from: 1) erosion-induced suspended sediments, turbidity, and sedimentation, and 2) toxic effects from fire retardants and foam suppressants. In addition, intense fires may introduce large quantities of organic material (ash) into aquatic systems, blown in by wind or transported by runoff.

Increased soil erosion can result from loss of vegetative cover during a fire as well as from activities of ground crews engaged in suppression activities and mechanical thinning. These could lead to some turbidity and sedimentation of surface water resources in the park, including Whittington Creek and Gulpha Creek. Turbidity and sedimentation can alter the hydrologic regime of surface waters and adversely impact aquatic habitats, invertebrates and fish. Diligent adherence to Minimum Impact Suppression Tactics (MIST) would reduce water quality problems from suppression efforts. However, a large, intense fire – which has a small but non-zero possibility of occurring under this alternative – would likely result in short-term, localized, moderate adverse impacts on water quality from erosion, turbidity and sedimentation (Stanturf et al., 2001).

The use of fire retardants and/or foams could potentially cause temporary to short-term moderate impacts to water quality and aquatic life in local stream if misapplied or mishandled (USDA Forest Service, 2000a). Retardants contain ammonia and phosphate or sulfate ions, which can change the chemistry of a water body, thus making it temporarily lethal to fish and other aquatic organisms; the principal toxic component of retardant chemicals in aquatic systems is ammonia (Adams and Simmons, 1999). 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 would 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 Forest Service, 2001).

The USEPA views the use of retardants and suppressants as a necessary tradeoff in order to prevent the greater destruction of aquatic ecosystems from fire-caused silting, suspended solids and pH changes, than the possible loss of fish from an inadvertent retardant drop into a water body (USDA Forest Service, 2000a). Fire retardants and foams are neither subject to Point Source Regulations nor the National Pollution Discharge Elimination System (NPDES) procedures under the Federal Clean Water Act. Nevertheless, scientific studies state unequivocally that direct application of fire retardant to waterways should be avoided.

In most years, Alternative 1 would not lead to any substantial change in the hydrographs of streams draining the park; that is, it would not result in large pulses of water delivered to these streams during storm events from somewhat greater runoff on burned or disturbed ground surfaces. However, if the fuel loads that are allowed to accumulate under this alternative are eventually burned, the more severe fire that would result could cause short-term but potentially sharp increases in the hydrograph peak, that is, greater water flows carrying more sediments. The possibility of flooding would be greater. Such potentially severe episodes would be quite infrequent, perhaps once or twice in a century.

In a typical year, implementing Alternative 1 would produce localized, minor impacts on waters in and adjacent to the park. Impacts from any one wildfire or suppression effort on water quality would tend to be short-term, localized and minor in intensity. Since no prescribed fires would be permitted, there would be less impact to water quality from loss of vegetative cover and subsequent erosion, runoff, and turbidity. However, greater quantities of fire retardants and suppressants would be used in this alternative, especially during occasional large wildfire suppression efforts, increasing the risk of temporary toxic impacts to water quality and aquatic life.

Effects of this alternative would likely be confined to surface waters; groundwater resources of the park, including the recharge of the aquifer that supplies water to the hot springs, would be unaffected. This is because this alternative would, in general, maintain the forest and ground cover, over the long term, that facilitates infiltration of rainfall into the soil and its subsequent percolation to greater subterranean depths and into the aquifer.

Impacts to water resources would generally be minor, short-term, negative, and regional for most years. In the event of a severe wildfire, impacts could be moderate.

3.2.2.2 Alternative 2 – Proposed Action (Full Suppression with Prescribed Fire)

General water resources impacts under Alternative 2 would be similar to those described under the No Action Alternative. However, the reduction in hazard fuels associated with this alternative would reduce the potential for adverse impacts associated with wildfires.

From year to year, given the possible application of prescribed fire in selected sites around the park, there may be slightly greater erosion, turbidity sedimentation, but if the prescribed fires are managed properly, these effects would be negligible to minor at most (Stanturf et al., 2001).

Impacts to water resources would be minor, short-term, negative, and regional for most years. In the event of a severe wildfire, impacts could be moderate.

Conclusion

Impacts under both alternatives would be similar: minor, short-term, negative, and regional. The potential for impacts of severe wildfires and their suppression would be reduced under Alternative 2.

The implementation of either 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 park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's General Management Plan or other Park Service planning documents.

3.3 VEGETATION

3.3.1 *Affected Environment*

The area around the Park supports mixed stands of oak and hickory interspersed with shortleaf pine on the more exposed slopes and ridgetops. The forest understory contains a diversity of shrubs, forbs and graminoids.

Most of the park supports dense forest cover, including a 150-acre stand of old-growth shortleaf pine (*Pinus echinata*) on the north slope of Sugarloaf Mountain, which is registered under the Arkansas Natural Heritage Program. Even though considerable acreage in the park has been under federal control since 1832, prohibitions on timber cutting were not implemented until the area came under the jurisdiction of the National Park Service in 1916. Most of the lands acquired since 1972 have been disturbed by human development and are in need of vegetative restoration. The total affected area is estimated to approach 250 acres. Much of this land has already reverted to a wooded state.

The park also has major problems with infestation by non-native plant species, as a result of its long history of ground disturbance related to construction of roads and other facilities. At this time, the park has lacked the resources and funding to mount an intensive treatment campaign against invasive plants. The three noxious plant species of primary concern at the Park are kudzu, waxleaf privet, and sericea lespedza.

1. **Kudzu** (*Pueraria montana* var. *lobata*)

Kudzu is a non-native opportunistic vine or liana that has proliferated in the southeast United States. Its habit of spreading and climbing over other trees and plants often kills much of the vegetation, increasing the dead fuel load and possibly promoting greater fire

intensity and severity. Hot Springs National Park is starting to experience significant impacts from Kudzu, but currently does not have the resources or funding to mount and effective control program.

2. **Waxleaf privet** (*Ligustrum japonicum* var *texanum*)

Waxleaf privet is an exotic large shrub that grows well in full sunlight or wooded areas. It has the potential to invade and completely replace native understory plants. Hot Springs National Park has significant areas impacted by privet, but currently does not have the resources or funding to mount and effective control program.

3. **Sericea lespedeza** (*Lespedeza cuneata*)

Sericea was first brought to the United States from Japan in the 1890s. It is a legume, but furnishes very little nitrogen to surrounding plants. It is an aggressive colonizer of disturbed sites, and will often reduce or eliminate competing vegetation, including native plant species found at Hot Springs National Park.

Like forest communities everywhere, the Park's forests are subject to natural disturbances as well. A severe attack by southern pine beetles in 1986 and a powerful ice storm in December 2000 caused major damage to trees and substantial mortality, adding significantly to fuel loads over large areas.

3.3.2 *Environmental Consequences*

Impacts to vegetation were qualitatively assessed by means of a literature review of forest and fire ecology in the region, consultation with foresters, botanists and fire specialists.

3.3.2.1 Alternative 1 – No Action (Full Suppression and No Prescribed Fire)

Based on wide experience in the region's forests (Stanturf et al., 2001), a policy of near-total fire exclusion at Hot Springs National Park would result in a reduction of shade-intolerant tree species, a loss of the herbaceous and shrub understory, and a gradual accumulation of hazard fuels.

Over the mid- to long-term, under the No Action Alternative, the buildup of dangerous fuels in the form of highly flammable litter and/or an unnaturally dense midstory with ladder fuels that can carry a surface fire into the forest canopy, would likely change the role of fire from that of stand management to stand replacement (Hunter, 1990). Thus, over time, this alternative could increase the very hazard that it aims to prevent.

While the full suppression strategy, coupled with no prescribed fires, may provide short-term protection (even for a number of decades) to the forests, the continual building up of hazard fuels would increase the likelihood of a stand replacement fires. The 150 acre stand of shortleaf pine on Sugarloaf Mountain could similarly be impacted, without mitigation through mechanical treatment.

Exotic species would continue to spread. Soil disturbance associated with the construction of fire lines and thinning treatments would be susceptible to noxious weed infestation. Wildfires may topkill kudzu (Rader and Harrington 1999), privet (Faulkner et al. 1989) and sericea lespedeza, but these species will likely resprout from underground parts.

Overall, a program of full suppression, which seeks to exclude a natural force that helps shapes plant community composition and structure, and to which elements of the community have become adapted, would have local moderate, long-term, adverse impacts on the Park's vegetation communities.

3.3.2.2 Alternative 2 – Proposed Action (Full Suppression with Prescribed Fire)

Implementation of Alternative 2 would have a generally positive impact on the park's vegetation, by allowing for the utilization of prescribed fire to mimic more natural fire return intervals and thus simulate the natural role of wildland fires in this fire-adapted landscape. Native fire-adapted and fire-dependant plant species would flourish, soils would be rejuvenated with nutrients on a regular basis, which will encourage plant growth, and dense undergrowth would be controlled. Larger trees would generally not be damaged by the high-frequency, low-intensity fire regime that would be established under this alternative. However, even relatively low-intensity prescribed fires can kill den trees, snags, and fruit trees on occasion (Hunter, 1990).

Suppression activities that resulted in soil disturbance (fire lines) would make those disturbed areas more susceptible to noxious weed infestation. However, the reduction in hazard fuels associated with this alternative would reduce the potential for adverse impacts associated with wildfires. Disturbed areas would be seeded with native grasses if necessary.

Alternative 2 could be moderately beneficial in controlling the Park's worst noxious weeds, if used in conjunction with other management actions. While kudzu's physiology makes it extremely resistant to damage by fire (Rader and Harrington 1999), effective control of its spread may be accomplished using a combination of prescribed fires with herbicide treatments. Waxleaf privet has fairly thin bark and can be top-killed with fire (Faulkner et al. 1989). A combination of fire, mowing, and herbicide treatment offers the most effective control of sericea lespedeza.

At the same time, fuel management, using both mechanical means and prescribed fire, can reduce the risk to the cultural and historic resources and NPS infrastructure on the Park. Implementation of this alternative would achieve both GMP and RMP objectives of the Park.

Under this alternative, there would be long-term, moderate, positive, local impacts to the vegetation.

Conclusion

Impacts under both alternatives would be moderate, long-term, and local. Under Alternative 1 the impacts would be negative, while under Alternative 2 they would be positive.

The implementation of either 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 park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's GMP or other NPS planning documents.

3.4 WILDLIFE

3.4.1 *Affected Environment*

The park currently lacks a thorough inventory of its fauna. In the absence of such an inventory, mammals within the park are assumed to be typical of the region, consisting mostly of rodents (e.g. gray squirrel, mice, voles) bats, and small mammals such as the cottontail rabbit, skunk, opossum, raccoon, and fox. Because of the region's mild climate and good forest habitat, bird species are varied and plentiful, especially those species associated with southern forest habitat. Aquatic resources are limited to portions of several small creeks. Amphibians and reptiles exist in some forested areas, streams, and ponds.

3.4.2 *Environmental Consequences*

Impacts to wildlife from the alternative FMP's were qualitatively assessed by means of a literature review of the effects of fire on wildlife habitat, consultation with biologists, mitigation measures, and professional judgment.

Wildland fires, or the absence thereof, primarily affect wildlife indirectly rather than directly, that is, through effects on habitat, rather than direct mortality or temporary displacement. Therefore, the bulk of the discussion below focuses on habitat rather than animals per se.

3.4.2.1 Alternative 1 – No Action (Full Suppression and No Prescribed Fire)

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

Constructing fire lines, mechanical thinning, and the use of foam suppressants and fire retardants would have temporary or short-term adverse effects on wildlife. There would undoubtedly be some direct mortality from fire, but this would be short-term, and populations would quickly recover. Impacts could also include disrupting feeding or breeding from noise and human presence, but these would be negligible.

Increased soil erosion associated with fire management activities and wildfires could lead to some turbidity and sedimentation of surface water resources in the park, including Whittington Creek and Gulpha Creek adversely impacting aquatic habitats, invertebrates and fish. The use of fire retardants and/or foams could potentially cause temporary to short-term moderate impacts to water quality and aquatic life in local stream if misapplied or mishandled (USDA Forest Service, 2000a). Retardants contain ammonia and phosphate or sulfate ions, which can change the

chemistry of a water body, thus making it temporarily lethal to fish and other aquatic organisms; the principal toxic component of retardant chemicals in aquatic systems is ammonia (Adams and Simmons, 1999). Foams contain detergents that can interfere with the ability of fish gills to absorb oxygen.

But in the context of the park as a whole, these impacts are likely to be minor. By far the most important impact of this alternative relates not to what it does, but what it doesn't do – allow fire as a natural force to operate in an ecosystem that evolved with it -- and the detrimental effects on wildlife habitat this causes.

Over the long-term, the exclusion of fire from habitats at Hot Springs NP would tend to lead to a decline in the quantity and quality of habitat for most native wildlife species (Smith, 2000). It would also lead to increased fuels over time and could eventually result in more intense and severe fires, despite suppression efforts. Such a fire regime would not help restore and maintain the forest's native diverse plant and wildlife habitats, resulting in an overall deterioration in the quality of that habitat for most species of wildlife native to the region.

Impacts to wildlife from this alternative would be minor, negative, short-term long-term and local.

3.4.2.2 Alternative 2 – Proposed Action (Full Suppression with Prescribed Fire)

Proposed activities with the potential to impact wildlife include building fire lines, fire retardant use associated with suppression activities, mechanical thinning or removal, and prescribed fires. Impacts associated with suppression and mechanical fuel reduction are similar to those above. However, the reduction in hazard fuels associated with this alternative would reduce the potential for adverse impacts associated with wildfires.

Habitat conditions for wildlife species that inhabit Hot Springs National Park would be likely to improve somewhat with the use of prescribed fire as part of an effort at restoration of the historic high-frequency, low-intensity fire regime characteristic of this area prior to the twentieth century. Such a fire regime would help restore and enhance the variety and diversity of native plant and wildlife habitats. Populations of animal species native to the area are adapted to not only survive, but flourish, when the pattern of fire frequency, size, and severity approximates those of the pre-settlement era (Smith, 2000).

Nutrients released to plants through the fertilization effects of ash after a prescribed fire would provide an important source of nutrition for wildlife in the area. In the aftermath of a fire, for a season or more, plant growth tends to be more nutritious than that of unburned areas, containing more protein and nutrients and less lignin and crude fiber (Hunter, 1990). While some trees (including fruit and mast 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 in the mortality of individuals. The loss of individual members of a given species, however, would not

jeopardize the viability of the populations on and adjacent to the park. Animal species are adapted to survive the natural patterns of fire as it would have occurred in their habitat. Therefore, a pre-settlement fire regime would minimize impacts to fauna habitat. Some species prefer the forage and browse that would emerge after fires; still other wildlife may actually be dependent upon the habitat conditions created by fires (Hunter, 1990).

Overall, then, to the extent that it utilizes prescribed fire to restore some semblance of the area’s pre-settlement fire regime, this alternative will improve wildlife habitat in the park, and thus native wildlife populations.

Directs impacts to wildlife from this alternative would be minor, negative, short-term and local, but indirect improvements to habitat from prescribed fire would be minor, positive, long-term and local.

Conclusion

Under either alternative, impacts to wildlife would be minor, negative, short-term and local. Alternative 1 would see a gradual decline in wildlife habitat resulting in minor, negative, long-term, impacts, whereas Alternative 2 would see a restoration of historic vegetation, thus resulting in minor, long-term, positive impacts.

Implementation of either alternative would not impair wildlife resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park’s GMP or other NPS planning documents.

3.5 RARE, THREATENED AND ENDANGERED SPECIES

3.5.1 Affected Environment

No Federally-listed plants are known to occur at Hot Springs National Park (Dikeman, 2001). However, there are several species and natural communities that are considered “Inventory Elements” on the State of Arkansas’s list. Inventory Elements are those for which the Arkansas Natural Heritage Commission is currently conducting active inventory work, and for which there is conservation concern. Proactive management may keep such species off the Federal Endangered Species list (Dikeman, 2001.) The following are state Inventory Elements plants and plant communities found on Hot Springs National Park:

<u>Scientific Name</u>	<u>Common Name</u>	<u>Status</u>
<i>Phormidium treleasei</i>	a blue-green alga	State Inventory
<i>Castanea pumila</i> var. <i>ozarkensis</i>	Ozark chinquapin	State Inventory
<i>Galium arkansanum</i> var. <i>pubiflorum</i>	a bedstraw	State Inventory
<i>Streptanthus obtusiolius</i>	a twistflower	State Inventory
<u>Plant communities</u>		
Novaculite glade-outcrop	-	State Inventory
Xeric Shortleaf Pine-Oak Forest	-	State Inventory

The Ozark chinquapin grows in oak-pine and oak-hickory forests on relatively dry, acidic soils on ridge tops and upper slopes adjacent to ravines (ONH, 1999). It is endemic to the Ozark Plateau region of Arkansas, Missouri and Oklahoma. Nowadays, this variety of chinquapin is threatened by the same chestnut blight (caused by the fungus *Endothia parasitica* brought to the U.S. in 1904) which decimated the American chestnut in the Appalachians.

No Federally-listed animal species are found on Hot Springs National Park (Dikeman, 2001). Two Federally listed species are found on areas adjacent to the park: the bald eagle, *Haliaeetus leucocephalus* (Threatened), and the red-cockaded woodpecker, *Picoides borealis* (Endangered).

- Bald eagle – The bald eagle was listed by the USFWS in the 1970’s as a result of drastically declining numbers from habitat destruction, poaching, but primarily pesticide poisoning, which thinned eggshells and decimated the species’ reproduction. Since the banning of DDT and other organochlorine insecticides in the 1970’s and 1980’s, this species has been making a gradual comeback throughout North America, and may eventually be de-listed. This raptor prefers feeding on fish (although it will eat waterfowl and other birds) and is generally associated with fairly large water bodies (lakes, large ponds, and rivers).
- Red-cockaded woodpecker – The red-cockaded woodpecker roosts and nests in cavities of large, live pine trees in the Southeast. They are endangered because open forests with large, old pine trees have largely been replaced by forests with younger, smaller trees. Fire suppression has also contributed to their demise by excluding the periodic fires that historically kept the brushy understory in check and kept pinewoods open (TPW, 1999). It was added to the endangered species list in 1970.

3.5.2 Environmental Consequences

Impacts to rare and Threatened and Endangered species from the alternative FMP’s were qualitatively assessed by means of a literature review of the effects of fire on these species, consultation with biologists and agencies, and professional judgment.

3.5.2.1 Alternative 1 – No Action (Full Suppression and No Prescribed Fire)

Over the long term, the absence of prescribed fire and the attempted suppression of all wildfires within habitats at Hot Springs National Park would lead to “unnatural” changes in plant community structure and species composition. In general, these changes would probably not be advantageous for native species of plants and animals that are adapted to or dependent on the historic fire regime of the area.

Little is known of the effects of fires on the individual plant species. Chinquapins are a fire adapted species. They may be topkilled by a fire, particularly smaller individuals, but they sprout vigorously following the fire (Silker 1957). Prescribed fires would have minimal impact on the population. Individuals of this species would be avoided in mechanical treatments.

Moreover, the excessive increase in fuels and would eventually result in more intense and severe fires (i.e. a low-frequency, high-intensity fire regime), in spite of concerted suppression efforts. Such a distorted fire regime would not help restore and maintain the forest's native diverse plant and wildlife habitats. Overall, therefore, Alternative 1 would most likely result in a deterioration of the habitat conditions preferred by most rare and threatened and endangered species at the park.

However, since there are no known Federally-listed species within the park, and just a few species on the statewide inventory, effects of this alternative on T & E species would likely be minor. While the red-cockaded woodpecker, which depends on open stands of old-growth pine, does not apparently occur in the park at present, implementation of Alternative 1 would probably preclude this species from ever expanding into the park.

Under this alternative, impacts to rare and Threatened and Endangered species would likely be negligible.

3.5.2.2 Alternative 2 – Proposed Action (Full Suppression with Prescribed Fire)

None of the Federally-listed species known to occur on adjacent lands is likely to be adversely affected by the suppression efforts, mechanical thinning, and prescribed fire associated with this alternative. Conceivably, smoke from prescribed fires could temporarily cause bald eagles and red-cockaded woodpeckers to move away toward cleaner air, but this effect would be transitory. The possibility of prescribed fire escaping the park and causing direct or indirect harm to either of species is negligible.

Animal species are adapted to survive the natural patterns of fire as it would have occurred in their habitat. A number of plant species are even fire-dependent, so that to the extent fire is reintroduced into the landscape, this tends to be beneficial. To the degree fire continues to be excluded, this tends to be harmful (Smith, 2000). Thus, attempting to re-establish the historic fire regime should largely benefit sensitive and listed species (Stanturf et al., 2001). The Ozark chinquapin is a probable beneficiary of prescribed fires (Silker, 1957; Johnson 1987). The red-cockaded woodpecker, which is known to occur on adjacent lands, could also be a beneficiary over the long term.

Overall, the prescribed fires permitted under Alternative 2 would not have serious negative consequences for populations of native plants and animals, including those that are threatened, endangered or otherwise listed. This is not to say that prescribed fires, and to a smaller extent, fire suppression activities such as line-clearing, cannot cause temporary displacement or even direct mortality of listed species, and for this reason, the NPS needs to be proactive in averting these impacts.

The Arkansas Field Office of the USFWS has compiled a list of recommendations with regard to avoiding adverse effects on threatened and endangered species from fire management activities (Dikeman, 2002). The NPS will consult and coordinate with the USFWS to ensure that prescribed fire and other fire activities will minimize detrimental effects and maximize benefits to all known listed species in the park.

The implementation of the proposed action would not jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of critical habitat. Fire management operations will consider appropriate actions to identify and protect from adverse effects any rare, threatened or endangered species subsequently located within the unit.

Under this alternative, impacts to rare and Threatened and Endangered species would likely be negligible.

Conclusion

Impacts to rare and Threatened and Engandered Species under either alternative would likely be negligible.

Implementation of all alternatives would not impair rare, or Threatened and Endangered Species or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's General Management Plan or other Park Service planning documents.

3.6 AIR QUALITY

3.6.1 Affected Environment

Under the terms of the 1990 Clean Air Act amendments, the Park 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). The area of Arkansas in which Hot Springs NP is located is in attainment for each of the NAAQS (Davis, 2002).

The State of Arkansas has a ban on open burning. However, exemptions are made for "...controlled fires used for purposes of forest and wildlife management, provided that such fires are used and burned when winds are blowing away from population areas which might be affected" (Arkansas Pollution Control and Ecology Commission, 1999). The state does not require the National Park Service to apply for a permit or even provide notification for prescribed fires (Davis, 2002).

The park surrounds most of the city of Hot Springs, generally at a higher elevation increasing the possibility of smoke affecting the city. Moreover, the park is located along three major

highways (U.S. 70, U.S. 270 and Arkansas 7). Due to these concerns, both air quality and smoke management must be considered in developing prescribed fire plans.

3.6.2 *Environmental Consequences*

Impacts to air quality were qualitatively assessed by means of a review of the literature and pertinent laws, guidance and regulations, consultation with experts and regulators, professional judgment, and experience with comparable actions.

The combustion of vegetation produces various chemical compounds. These compounds include nitrogen oxides (NO_x), organic compounds, carbon monoxide, and particulate matter or small particles (PM). The pollutants that affect visibility that derive from wildland fires are PM₁₀, PM_{2.5}, nitrates, ozone, organic carbon, and elemental carbon. Ozone, a measurable constituent of “smog” or haze, is not produced by fires, but as a byproduct of the chemical reaction

Other combustion products (NO_x and volatile organic compounds or VOC’s). About 90 percent of smoke particles from wildland and prescribed fires are PM₁₀ and about 70 % are PM_{2.5} (MNICS, 2001).

Smoke consists of dispersed airborne solids and liquid particles (aerosols), collectively referred to as 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.

Some concern around the country has been expressed about one toxic pollutant in particular that is released in trace amounts by forest fires into the air – dioxin (Gossman Consulting, no date). Dioxins are a family of chemical compounds that scientific studies have shown can cause a number of adverse health effects (USDA FSIS, 1999). Among other things, dioxins are known endocrine disruptors (EMS, 2001); in humans, heart disease, cancer, and increased risk of diabetes have also been linked to dioxin (NIEHS, 2001). Dioxins deposited in the environment can be taken up by plants and then animals and aquatic organisms, growing more concentrated as they ascend the food chain (a phenomenon known as “biomagnification”) so that animals, especially carnivores, have higher concentrations than herbivores, plants, water, soil, or sediments. Within animals, dioxins tend to accumulate in fat. Food accounts for 95 percent of human exposure to dioxin (TRI, no date). However, levels of dioxin in food have been cut in half in recent years as a result of growing awareness and regulation.

The Park’s prescribed fire program under the proposed FMP is small enough that dioxin emissions would be negligible. The presence of dioxins and other synthetic organic chemicals and heavy metals released by human activity near and far into the park environment is certainly a source of concern and merits long-term monitoring. However, at present, there is no research at present that would indicate that dioxin concentrations in the Park environment are high enough to be having a detrimental effect on wildlife populations or nearby human residents.

One of the main factors determining the degree of air pollution from wildland fires is smoke dispersion. Smoke dispersion is a function of ventilation, which refers to the process within the atmosphere that mixes and transports smoke away from its source. Ventilation is a function of stability, mixing height, and transport winds. Mixing height is defined as the upper limit of a mixed layer in unstable air, in which upward and downward exchange of air occurs. The transport wind is the arithmetic average (speed and direction) of wind in the mixing layer.

3.6.2.1 Alternative 1 – No Action (Full Suppression and No Prescribed Fire)

Under Alternative 1, air quality impacts from wildland fires would be reduced by suppression efforts. Also, without prescribed fires the smoke normally generated by these would be avoided. Thus, in a typical year, this alternative would generate few emissions. However, Alternative 1 would lead to greater quantities of fuels accumulating over a longer interval, which would ultimately result in larger (but much less frequent) wildfires. At these times, much greater amounts of smoke will be generated, probably large enough to exceed the NAAQS for at least particulate matter, with a consequent temporary impairment of the Park's air quality. Also, the residents, visitors and businesses in the City of Hot Springs would be inconvenienced and perhaps even harmed by thick smoke and particulates from a major wildfire in the park.

Impacts to air quality would also result from vehicles and machinery used for fire suppression and mechanical treatments, although these would be negligible,

Under this alternative impacts would be generally be negligible. In the rare event of a severe wildfire the impacts would be moderate, negative, short-term and regional.

3.6.2.2 Alternative 2 – Proposed Action (Full Suppression with Prescribed Fire)

Under wildland fire conditions there will be times when visibility of the park's landscape vistas will be temporarily impacted and the City of Hot Springs may be smoked in. However, the reduction in hazard fuels associated with this alternative would reduce the potential for adverse impacts associated with wildfires.

While there is the potential for smoke impacts with prescribed fire, every effort will be made to conduct prescribed fire operations with a goal of avoiding impacts on sensitive targets downwind from the operation. Spot weather forecasts and on site weather observations can help the prescribed burn boss determine if a fire should be ignited. Careful observation of fuel moisture and other fire behavior factors can also assist in mitigating smoke problems. Other management actions including mop-up of heavy fuels can also reduce smoke production. All state air quality regulations will be observed on prescribed fires.

Impacts to air quality would also result from vehicles and machinery used for prescribed fire to wildfire suppression and mechanical treatments.

The following are the management guidelines for all phases of the prescribed fire management program.

- No prescribed fires will be ignited during air pollution alerts, temperatures inversions or when a burn ban has been established by any local government.
- Prescribed fires will be conducted only when conditions result in rapid smoke dispersal.
- Firing techniques to lower smoke production will be utilized, when feasible
- Timing of prescribed fires will occur after 9:00 am with ignition ending before 4:00 pm.
- Smoke projection maps will be prepared to assist in projecting smoke dispersal patterns.
- Local police and fire agencies will be notified of any prescribed fire so they may provide any needed assistance with traffic flow if any problems with smoke dispersal occurs.
- Prescribed fires will be planned and conducted when proper wind flow will disperse smoke over unpopulated or low-density population areas.
- Federal Clean Air Act standards will not be violated by any prescribed fires.

Overall, Alternative 2 would have impacts on air quality ranging be minor, negative, short-term, and regional. In the rare event of a severe wildfire the impacts would be moderate, negative, short-term and regional.

Conclusion

Under both alternatives, impacts to air quality would be short-term and regional. In most years, impacts under Alternative 1 would be negligible, while they would be minor under Alternative 2 due to the use of prescribed fire. Occasional wildfires would cause moderate impacts under both alternatives, although the potential for these impacts should be reduced under Alternative 2.

The implementation of the Proposed Action (Alt. 2) would not impair air quality resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's GMP or other NPS planning documents.

3.7 VISITOR USE AND EXPERIENCE (INCLUDING PARK OPERATIONS)

3.7.1 *Affected Environment*

The Park is open to the visiting public 24 hours a day. Overnight facilities are available in the surrounding community and within the park at the Gulpha Gorge Campground. The park also has several developed picnic areas. The Park is primarily managed as an historic area but includes significant natural resources as well. Management of the two is integrated whenever possible to enhance both cultural and natural preservation and interpretation.

Visitors can visit historic Bathhouse Row, where the restored Fordyce Bathhouse functions as the Park's visitor center. Exhibits and films orient visitors to Hot Springs and tell the story of thermal water bathing. Historic Buckstaff Bathhouse offers the opportunity for visitors to bathe in the hot

spring water. Traditional bathhouses are also available at four nearby hotels and a hospital within walking distance of the visitor center. Cold spring water for drinking is dispensed at jug fountains; residents and visitors can be seen filling their drinking jugs all day long. During the summer an expanded schedule of interpretive activities includes walks that describe the human and natural history of the park. The Park has some 30 miles of hiking trails on Hot Springs Mountain, North Mountain, Sugarloaf Mountain and West Mountain, and the mild climate makes outdoor recreation possible for much of the year (NPS, 2000).

The park headquarters and administration building is located at the corner of Reserve Avenue and Central Avenue, right at the end of Bathhouse Row.

3.7.2 Environmental Consequences

Recreation impacts were qualitatively assessed in light of the intensity, duration and extent 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.

3.7.2.1 Alternative 1 – No Action (Full Suppression and No Prescribed Fire)

There would be some short-term reduction in scenic quality and visitor use during and immediately following any thinning or wildfire suppression activities from the presence of engines and thinning or fire crews. Short-term reduction in scenic quality, however, would be minor because fire management activities would involve only short-term presence of vehicles and people, and stumps would be cut flush with the ground. Visitors would be restricted from areas near the fire. Smoke accumulation is a concern and would generally not last for more than several days.

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 wildfires that could affect visitor use and experience, and park operations.

With the assistance of fire management personnel from Buffalo National River and other NPS units in the region, park operations would not be affected under this alternative. In the event of a fire within or adjacent to the park, park operations could be temporarily affected depending on the severity of the fire and situation at hand as visitors and non-essential park personnel were evacuated to off-site and safe locations.

Impacts under this alternative would be minor, short-term, negative and localized.

3.7.2.2 Alternative 2 – Proposed Action (Full Suppression with Prescribed Fire)

Impacts to visitor use and experience and park operations from wildfires and wildfire suppression would be similar to those described under Alternative 1. However, the reduction in

hazard fuels associated with this alternative would reduce the potential for adverse impacts associated with wildfires.

There would be some short-term reduction in scenic quality and visitor use during and immediately following any thinning and prescribed fire activities from the presence of engines and thinning or fire crews. Short-term reduction in scenic quality, 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.

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 those locations where crews were conducting mechanical thinning or removal, prescribed fire, and suppression activities would be restricted. Since prescribed fires would generally not be ignited during the summer months of peak park visitation, and since only a small portion of the park would be subjected to treatment at any one time, prescribed fire and mechanical thinning and removal activities on the surface of the park would not significantly impact the visitor use and experience. Over the long run, the visitor experience would probably be enhanced modestly under the Proposed Action by enhancing the health and integrity of the park's forests. In addition, public education about the role of fire at Hot Springs National Park and the positive effects it has on the park's vegetation and wildlife would benefit the visitor experience. While the park's educational program for fire management continues to evolve, prescribed fire fact sheets, guided tours to areas that have experienced prescribed fire and visitation during prescribed fire activities are some methods that would help educate visitors and local residents alike. 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 this interpretive program.

With the assistance of fire management personnel from Buffalo National River and other NPS units in the region, park operations would not be affected under this alternative. In the event of a fire within or adjacent to the park, park operations could be temporarily affected depending on the severity of the fire and situation at hand as visitors and non-essential park personnel were evacuated to off-site and safe locations.

Direct impacts under this alternative would be minor, short-term, negative and localized; indirect impacts would be minor, long-term positive and localized.

Conclusion

Impacts under both alternatives would be minor, short-term, negative and localized. The impacts would be slightly greater under Alternative 2 than Alternative 1, but this would be offset by minor long-term positive localized impacts due positive impacts on the vegetation from prescribed fire.

3.8 HUMAN HEALTH AND SAFETY

3.8.1 *Affected Environment*

As hazards exist in both wildfires and prescribed fires, safety is always the highest priority. Smoke from wildfires and prescribed fires has the potential to impact the city of Hot Springs and the extensive residential development located near the park. Smoke on roads in and adjacent to the Park is of concern. Smoke from sources on and off the unit can be a safety issue to the visiting public. The flaming front of a fire can potentially put unsuspecting members of the visiting public at risk. For this reason, areas affected by wildland fire will be closed to the public. There is always a risk that curious park visitors will actually approach a fire rather than flee it. Adjacent and nearby landowners will be notified when fire, particularly wildfire, is a threat to off-unit residential areas.

3.8.2 *Environmental Consequences*

Human health and 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.

3.8.2.1 Alternative 1 – No Action (Full Suppression and No Prescribed Fire)

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

Accidental spills of fire retardants and foams could 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 qualifications, 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 (PM_{2.5}), and total suspended particulates (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).

In the event of potentially hazardous fires within the park, the park superintendent and chief ranger would coordinate public notification efforts within and outside the park. The extent of public notice would depend on the specific fire situation. In every case, ensuring visitor and park staff safety would take priority over other activities.

Use restrictions applied to areas of wildfires would minimize or eliminate public human health & safety concerns resulting from smoke exposure and fire injuries. The exclusion of prescribed fire to reduce ground fuels would eliminate the possibility of an out-of-prescription fire or fire escape. In the long-term, however, fuels buildup in the absence of prescribed fire would result in more intense and severe wildfires that could be more difficult to suppress, and therefore have a greater likelihood of presenting problems for human health and safety.

Under this alternative, impacts to human safety would be minor, negative, short-term and regional.

3.8.2.2 Alternative 2 – Proposed Action (Full Suppression with Prescribed Fire)

The general impacts to human health and safety associated with wildfires, wildfire suppression and mechanical thinning under Alternative 2 would be similar to those described under the No Action Alternative. There would be additional impact associated with the use of prescribed fire.

Prior to the ignition of any prescribed fire in the park, all the parameters of the existing and approved prescribed fire plan would be met to ensure a safe and effective prescribed fire. Safety briefings will be conducted for NPS personnel prior to any participation in wildland suppression or prescribed fires. All fire personnel will be reminded of the "18 Situations That Shout Watch Out" and will be expected to comply with the "10 Standard Fire Orders". In addition, staff would prepare brochures for the public that advise them of the time and extent of the proposed fire and educate them about the role of fire in the forests of the Ozarks. In the event of potentially hazardous fires within the park, the park superintendent and chief ranger would coordinate public notification efforts within and outside the park. The extent of public notice

would depend on the specific fire situation. In every case, ensuring visitor and park staff safety would take priority over other activities.

When using prescribed fire, mitigation measures, such as construction of fire lines, the presence of engines, and strict adherence to prescribed plans, would minimize the potential for an out-of-prescription fire or escape. Elements of the prescribed fire plan that relate to ensuring a safe fire 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).

Under this alternative, impacts to human safety would be minor, negative, short-term and regional.

Conclusions

Impacts under the two alternatives would be similar. In the average year there would be greater potential impacts under Alternative 2 from exposure to smoke and injuring during prescribed fires. However, this alternative would reduce hazard fuels and reduce the potential for severe wildfires and associated health impacts.

3.9 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.

3.9.1 *Affected Environment*

The cultural resources at the Park include historic structures, archeological sites and cultural landscapes.

Historic structures include the eight historic bathhouses discussed in Chapter 1 that comprise the Bathhouse Row Historic Landmark District. Fires have occurred in the past on Bathhouse Row, and have occurred in the last 10 years in structures directly across Central Avenue from the Row. The Fordyce-Ricks Estate, an inholding, is on the National Register of Historic Places, but the park owns several features contributing to the estate's significance. Dozens of other Register-eligible historic structures exist within park boundaries. Many are park-owned, and some are not. According to historic guidelines, properties eligible for listing are to receive the same level of protection as those already listed.

Some of the historic structures are made primarily of wood. The central feature of the Fordyce-Ricks Estate is a multi-storey log house, and several of its ancillary structures are wood frame. The former ranger's cabin at Gulpha Gorge Campground is partially sheathed in wood. Even a few of the structures on Bathhouse Row contain wood on the exterior, as well as historic wood lath on the inside, as well as other construction features that would assuredly burn under extreme conditions. Other brick or stucco or stone structures have sufficient wood components to make them vulnerable, such as the duplexes and the Medical Director's Residence (the latter, for instance, contains hardwood floors, doors, windows, and trim; wood lathing for plaster; and roof supports of resin-rich pine) on Reserve Street, the Maintenance Complex on Whittington Street, and various pavilions and smaller structures scattered throughout the park (such as historic trail shelters with exposed timbers).

Historic but non-archeological masonry works not specifically included in the historic landmark district include stone walls, overlooks, trail shelters, and gutters along West Mountain, North Mountain, and Hot Springs Mountain roads; a stone storm-water culvert down the west face of Hot Springs Mountain; bridges on Hot Springs Mountain trails; the retaining wall along Gulpha Creek in the park campground, along with the ranger station and the former ranger's cabin there; bridges in Whittington Park; several stretches of wall below the current Grand Promenade that flanked or supported the old park service road in the 1890s; a pumphouse near the Hot Springs Mountain observatory; brick reservoirs on the west face of Hot Springs Mountain; and the creek arch under Bathhouse Row. Most of these features would not be significantly threatened by fire itself, but they could easily be damaged by heavy fire-fighting equipment such as bulldozers.

There is a diverse collection of 30 state-registered archaeological sites located within the park boundaries (HOSP, no date). At least one of these is known to be eligible for listing on the National Register of Historic Places. A few of these happen to be located within the Bathhouse Row National Historic Landmark District, although they were not yet officially registered as archeological sites at the time the landmark district's boundaries were approved in 1987. A parkwide archeological survey is to begin in 2008, with funding from the National Park Service's Systemwide Archeological Inventory Program. Known site types in the park are: lithic scatters; historic residential sites; historic commercial sites; historic spa-related sites (a sizable subset of the latter); isolated historic trash dumps; historic mining sites; historic trash areas possibly associated with transients' use of park lands; historic novaculite quarries; prehistoric novaculite quarries; historic cemeteries.

A cultural landscape study is currently underway and expected to be completed in 2006. A number of cultural landscapes have been tentatively identified: Arlington Lawn, Bathhouse Row/Magnolia Promenade, Gulpha Gorge Campground, Whittington Park and the recreational drives/overlooks on the surrounding mountains.

3.9.2 Environmental Consequences

Impacts to cultural resources were assessed qualitatively by examining literature on the impact of wildfires, prescribed fires, wildfire suppression, and thinning on cultural resources and by discussions with archaeologists and cultural resource authorities.

Management and protection of cultural resources within the Federal Wildland Fire Management Program is a complex process (Gleeson and Jones, 2000). At present, Federal land managers, including the NPS, USFS, BIA, BLM and USFWS, are working jointly to develop a comprehensive management strategy and Programmatic Agreement that is consistent with Section 106 of the Historic Preservation Act. The goal is to protect historic sites, structures, landscapes and traditional cultural sites while meeting fire management objectives.

The effects of fire on cultural resources are still not well understood or documented. To date, much of the literature on the subject is anecdotal and qualitative (Gleeson and Jones, 2000), rather than based on controlled scientific studies. For example, post-fire observations are often unable to distinguish between damage to archaeological resources caused by the fire itself from damage that was pre-existing. Thus, the following discussion of potential impacts of fire and fire management on cultural resources is of necessity general and somewhat speculative.

3.9.2.1 Alternative 1 – No Action (Full Suppression and No Prescribed Fire)

Proposed activities with the potential to impact cultural resources include building fire lines and thinning, and direct impacts from wildfires.

Protection of historic structures will require structural fire operation knowledge. The City of Hot Springs Fire Department will be the primary suppression force involved on Bathhouse Row and other areas with historic structures that can be easily accessed by road. At-risk historic structures are also found deeper into the park, and if possible these will be noted and protected during wildland suppression and prescribed fire operations, regardless of construction type.

The vulnerability of subsurface archaeological resources and artifacts to fire depends not only on the nature of the materials themselves but on the intensity of the fire and their depth in the soil profile. Hotter surface fires penetrate more deeply into the subsurface and can potentially cause more damage. Glass bottles can be cracked or broken for example. On the other hand, ceramics or objects carved or chipped from stone are likely to be more resistant to fire and heat. Since fires regularly swept across the Ozark landscape for centuries prior to the era of fire exclusion in the 20th century, for a subsurface historic object or archaeological artifact to have survived into the 21st century, it must have already withstood at least several and sometimes many previous fires.

Cultural landscapes may be negatively or positively impacted by wildland fires. Due to their uncontrolled nature, impacts from wildfires and their suppression on cultural landscapes would likely be negative.

Clearing firelines associated with fire suppression can damage subsurface cultural and archaeological resources by exposing, crushing, or removing them.

Hot Springs National Park's archaeological and historical resources are limited and nonrenewable; many are fragile as well. When disturbed or removed from their context, the scientific information they could furnish is often lost forever. Precautions will be taken during fire suppression and prescribed fire activities in the park not to destroy or disturb important archeological and historical resources.

When a wildfire is reported in the park, efforts will be made to identify and protect, from damage, known sites. If Native American human remains and/or objects are found during fire operations, the site will be evaluated by staff or regional archaeologists in accordance with Sec. 3, Native American Grave Protection Resource Act (NAGPRA).

Fire management activities that disturb the ground in any way, such as fireline construction using hand tools or heavy equipment, will use paraprofessional and professional archeologists working in cooperation with firefighters and pre-burn preparation crews to prevent needless cultural resource destruction. During a wildfire the highest priorities are safety and controlling the blaze; therefore, if the fireline cannot be diverted, cultural resources may have to be sacrificed. In most cases, however, damage can be averted. During fire suppression, and rehabilitation activities, the following measures will be undertaken to help mitigate the impacts of fire suppression and rehabilitation on cultural resources:

- Resource base maps showing archeological and historical site locations will be given to archeologists and fire bosses on the firelines.
- When numerous cultural resources are threatened by a fire, archeologists will be present to help mitigate the impacts of fire suppression and rehabilitation on cultural resources.
- Priority will be given to monitoring heavy equipment, especially bulldozers and graders, through all aspects of the suppression and rehabilitation efforts.
- Archeologists serving on the fireline as technical specialists must hold a current red card to perform their specific advisory duties.
- Line archeologists will be equipped with appropriate standard firefighting safety equipment.
- Special flagging will be used to identify archeological and historical sites.
- A photographic record will be kept of all archeological materials uncovered during fire management and rehabilitation activities.
- The Cultural Resource Management Specialist will coordinate all activities of line archeologists with fire bosses.
- If Native American human remains and/or objects are found during fire operations, the site will be evaluated by staff or regional archaeologists in accordance with Sec. 3, Native American Graves Protection and Repatriation Act (NAGPRA).
- Personnel taking part in suppression will be briefed on the potential for disturbance of such resources.

- Any and all control actions undertaken will minimize the impact on such resources; wet line, foam and leaf blowers are the preferred minimum impact suppression techniques.

In addition, fire management staff will keep the Park's Cultural Resource Management Specialist informed as to suppression activities. The Cultural Resource Management Specialist, in turn, will inform and consult with the Arkansas SHPO, and if necessary, the Advisory Council on Historic Preservation (ACHP), on forthcoming projects and activities, such as prescribed fires for hazard fuel reduction in the vicinity of historic properties, to ensure compliance with Section 106 of the NHPA.

Known cultural sites that could be potentially affected during thinning, fire line construction and slash piling would be avoided to eliminate potential damage. 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.

Overall, however, Alternative 1 would have minor, negative, local permanent impacts on archaeological and historic resources in the park. Impacts to the cultural landscape would likely be minor, negative, local, and long term.

3.9.2.2 Alternative 2 – Proposed Action (Full Suppression with Prescribed Fire)

Activities with the potential to impact cultural resources include wildfires, wildfire suppression, thinning, and prescribed fire.

Impacts from wildfires, wildfire suppression and mechanical treatments would be similar to those described for Alternative 1. However, the reduction in hazard fuels associated with this alternative would reduce the potential for adverse impacts associated with wildfires.

Impacts from prescribed fire would be minimized through mitigation. Known cultural sites that could be potentially affected would be avoided to eliminate potential damage. 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) 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 fire temperatures. Back burning may also take place around the site to reduce fuel loading. Low temperature burning over chipped stone scatters does not require additional protective measures. Low temperature burning is considered to have no adverse effect on these cultural resource sites.

Other mitigation for prescribed fire would include:

- Resource base maps showing archeological and historical site locations will be given to archeologists and burn boss
- If Native American human remains and/or objects are found during fire operations, the site will be evaluated by staff or regional archeologists in accordance with Sec. 3, Native American Graves Protection and Repatriation Act (NAGPRA).
- No construction of handlines will occur.

Prescribed fire may be used to enhance a cultural landscape. In the event that cultural landscapes are considered for prescribed fire, cultural landscape objectives will be included in the prescribed fire plan to ensure that impacts will be positive.

Overall, however, Alternative 2 would have minor, negative, local permanent impacts on archaeological and historic resources in the park. Impacts to the cultural landscape would likely be minor, positive or negative, local, and long term.

Conclusion

Impacts to historic and archeological resources under both alternatives would likely be minor, negative permanent and local. Impacts to cultural landscapes would be minor, negative, long-term, and local under Alternative 1, but may be positive under Alternative 2.

Implementation of either alternative would not impair cultural resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's GMP or other National Park Service planning documents.

3.10 CUMULATIVE EFFECTS

The cumulative effects analysis 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 park and areas adjacent to the park. The cumulative effects described in Table 3-1.

Table 3-1: Cumulative Effects

Resource	Past and Present Actions	Proposed Actions	Future Actions	Cumulative Effects
Geology and Soils	Adverse soil impacts (soil erosion or loss) from past timber practices, road building, agriculture, and residential development in surrounding areas, past wildland fires and suppression efforts; beneficial soil impacts from past wildland fires (increase in soil nutrients).	Prescribed fire, thinning and wildfire suppression 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 increase in soil nutrients).	Adverse soil impacts (soil erosion or loss) would continue from timber practices, agriculture and residential construction and development in surrounding areas; beneficial soil impacts from past wildland fires (increase in soil nutrients).	Soils inside of the park would improve over time with soil development and increased soil nutrients from prescribed fires; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action Alternative would contribute the most to soil cumulative impacts, while the No Action Alternative would contribute the least.
Water Resources	Regional water quality degraded to some extent by non-point sources like logging, agriculture, and construction activities near the park; since park itself is upstream of most developments, it is relatively unaffected; aquifer recharge appears unaffected to date.	Thinning, prescribed fire, wildfires, and wildfire suppression activities would have minor impacts on surface waters.	Continued agricultural and forestry activities in region, as well as increased construction and development; overall increase in number of non-point sources of pollution and runoff.	Minor effect on water resources; Fire Management Plan would not result in significant cumulative impacts; and the Proposed Action would contribute the most to water resource cumulative impacts, while the No Action Alternative would contribute the least.
Vegetation	Natural fuel loading increased in absence of historic low-severity, high-frequency fire regime over most of 20 th century; Dec. 2000 ice storm added significantly to present fuel loads; vegetation community composition and structure altered; native plant habitat and diversity declined; logging, mining and agriculture have all taken their toll on native vegetation; increased infestation of noxious weeds.	Mechanical treatments and prescribed fire would reduce hazard fuel loadings; native fire-adapted and fire-dependent grass and forb species would be favored; forest stand structure in some areas would return to approximate historic conditions.	Future noxious weeds treatments could continue to control their spread; future climate change may lead to shift in precipitation patterns and rising temperatures, thus shifting biomes to the north.	Reduced fuel loadings would pose less fire danger; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action would contribute the most to vegetation cumulative impacts (in a beneficial way), while No Action Alternative would contribute the least.

Resource	Past and Present Actions	Proposed Actions	Future Actions	Cumulative Effects
Wildlife	Fire suppression efforts within the park, timbering and agricultural activities, and residential construction and other development on adjacent and nearby private lands have generally degraded wildlife habitat and diversity, with some exceptions; large fauna eliminated by earlier settlers.	Thinning, mechanical removal and prescribed fire would result in minor, short-term disturbance with minimal loss of wildlife; improved habitat and increased wildlife diversity with restoration of approximate historic fire regime.	Future noxious weeds treatments would continue to control their spread and improve wildlife habitat; future climate change may lead to shift in precipitation patterns and rising temperatures, thus shifting biomes, and wildlife habitats, to the north.	Wildlife habitat and diversity increases; Fire Management Plan does not result in significant cumulative impacts; the Proposed Action would contribute the most to wildlife cumulative impacts (largely beneficial), while No Action Alternative would contribute the least.
Threatened and Endangered Species	Fire suppression efforts within the park, forestry & agricultural activities and residential construction and other development on adjacent national forest and private lands have generally degraded habitat for threatened and endangered species in the area; spread of toxins, diseases and invasive species has harmed certain native plants and animals.	Thinning, mechanical removal and prescribed fire would result in minor, short-term disturbance with minimal losses to listed species of plants and animals; somewhat improved habitat for T & E species in general with restoration of approximate historic fire regime.	Future noxious weeds treatments would continue to control their spread and improve wildlife habitat in general, and T & E habitat in particular; future climate change may lead to shift in precipitation patterns and rising temperatures, thus shifting biomes, and wildlife habitats, including those of some T & E species, to the north.	Although listed Federal species do not appear to be present in the park proper, they do occur nearby and several state-sensitive species do occur at the Park. Overall cumulative effects on these listed species would thus be minimal from any alternative. Still, FMP would increase overall wildlife habitat and diversity; Fire Management Plan does not result in significant cumulative impacts; the Proposed Action would contribute the most to wildlife cumulative impacts (largely beneficial), while No Action Alt. would contribute the least.
Air Quality	Industry, autos, wildland fires and agricultural practices outside the park emit pollutants and particulate matter; automobiles; City of Hot Springs sits in valley and is susceptible to air pollution.	Emissions from wildland fires (including prescribed fires) would result in minor, short-term air quality and visibility impacts.	Future wildland fires would contribute to temporary deterioration in air quality and visibility; in addition, industrial and vehicular emissions sources in region will increase, though increase in overall emissions will be offset by improvements in technology and higher standards.	Class II air quality standards would not be violated in general, but there could be temporary problems for city from smoke; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action would contribute the most to air quality cumulative impacts, while Alternative 1 would contribute the least (in most years).

Resource	Past and Present Actions	Proposed Actions	Future Actions	Cumulative Effects
<p>Visitor Use and Experience (including Park Operations)</p>	<p>Establishment of the park, improved roads, airport, and trails provided access for bathhouses and other recreation opportunities; increased population growth results in potential for increased visitation.</p>	<p>Minor adverse visitor use and experience impacts resulting from mechanical treatments, wildfires, prescribed fire; long-term minor improvement in visitor experience by restoring forests to healthier condition.</p>	<p>Increased recreation use from national, regional and local population growth and rising number of tourist and visitor destinations in the area.</p>	<p>Long-term enhancement of recreation and educational experience more than offsets short-term recreation inconveniences from fuel treatments, closures, and smoke; Fire Management Plan would not result in significant adverse cumulative impacts; the Proposed Action would contribute the most to visitor use and experience cumulative impacts.</p>
<p>Human Health & Safety</p>	<p>Past suppression efforts protected park staff and visitors, but caused an accumulation of hazard fuels.</p>	<p>Suppression activities to continue; mechanical thinning and prescribed fire might result in very minor impacts; long-term improvement in human health & safety with reduction in fuels</p>	<p>No future actions that would impact human health and safety are apparent.</p>	<p>Human health and safety would improve over time with thinning and prescribed fire activities; Fire Management Plan would not result in significant cumulative impacts; Proposed Action Alternative would contribute the most to positive human health and safety cumulative impacts, while Alternative 1 would contribute somewhat less.</p>
<p>Cultural Resources</p>	<p>Earlier logging, mining, and agriculture impacted cultural resources; establishment of the park helped protect cultural resources; past suppression efforts may have impacted un-recorded sites.</p>	<p>Fuel treatments, prescribed fire and wildfire suppression could result in impacts to undiscovered sites; enhanced cultural landscape.</p>	<p>No future actions that would impact cultural resources are apparent.</p>	<p>Cultural resources continue to be discovered and protected; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action would contribute the most to cultural resources cumulative impacts, while No Action Alternative would contribute the least.</p>

Consultation and Coordination

List of Preparers

Leon Kolankiewicz, Project Manager, Mangi Environmental Group
Rachel Shaw, Environmental Analyst, Mangi Environmental Group
Debra Wenner, Geographic Information Systems (GIS) Analyst, Mangi Environmental Group
Rebecca Whitney, Geographic Information Systems (GIS) Analyst, Mangi Environmental Group

Persons, Organizations, and Agencies Consulted

Mark Blaeuer, Cultural Management Specialist, Hot Springs National Park
Tony Davis, Branch Manager, State of Arkansas, Department of Environmental Quality, Air
Division, Planning & Air Quality Analysis Branch
Jim DeCoster, Fire Ecologist, National Park Service, Midwest Regional Office
Hayley Dikeman, Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Ecological
Services, Arkansas Field Office
Gal Gale, Fire and Natural Resource Consultant, Wisconsin
Kathie Hansen, GIS Specialist, National Park Service, Midwest Regional Office
Rob Klein, Former Fire Ecologist, National Park Service, Ozark Scenic Riverways
Jim Mattingly, Former Fire Management Officer, National Park Service, Arkansas Area Park
Group
Dale Moss, Assistant Superintendent, Hot Springs National Park
Steve Rudd, Resource Management Program Manager, Hot Springs National Park
John Schomaker, Natural Resources Planner, U.S. Department of the Interior, Fish and Wildlife
Service, Region 3
Dennis Stock, Fire Coordinator/Law Enforcement, Hot Springs National Park

Persons, Organizations, and Agencies Who Received This Environmental Assessment

TBD

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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