WIND CAVE NATIONAL PARK
DRAFT FIRE MANAGEMENT PLAN

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WIND CAVE NATIONAL PARK FIRE MANAGEMENT PLAN

United States Department of the Interior
National Park Service
Wind Cave National Park
Hot Springs, South Dakota

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Summary

When approved this document will supersede the Wind Cave National Park Fire Management Plan approved in 1999. Major components include:

- updated policy for prescribed fires at Wind Cave National Park.
- implements current Director's Order #18 Wildland Fire Management. USDI, NPS. 12/31/03
- no unplanned ignition program.
- format changes under the direction of the April 1999 revision of NPS-18.
- reinforces updated 1995 Federal Wildland Fire Management Policy and Review.
- implements measures to fulfil directives in *Managing Impacts of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire Adapted Ecosystems – A Cohesive Strategy* (Babbitt and Glickman 2000).
- implements measures to fulfil directives in *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensivie Strategy Implementation Plan* (Western Governors Association, USDA-FS, USDI-BLM, and others 2002).

This plan is written to provide guidelines for appropriate suppression and prescribed fire programs at Wind Cave National Park. Prescribed fires may be used to reduce hazard fuels, restore the natural vitality and variability of ecosystems, remove or reduce alien species, or conduct research into fire effects.

The effects of fire control in causing changes to natural patterns of vegetation are considered one of many influences, along with logging and grazing, that altered pre-fire suppression ecosystems. The long range goals are to stabilize and/or establish ecosystems that approach pre-European settlement ecosystems that may have existed at Wind Cave National Park and management ignited prescribed fire is a principal tool to accomplish this.

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I. INTRODUCTION

A. REQUIREMENTS

The Wildland Fire Management Plan is an addendum to Wind Cave National Park's (the park) Resource Management Plan meeting requirements of the National Environmental Policy Act (NEPA, 42 U.S.C. §4321 *et seq.*) and the National Historic Preservation Act (NHPA, 16 U.S.C. §470 *et seq*.). It will serve as a detailed program of action, providing specific guidance and procedures for accomplishing wildland fire management objectives.

The Park is located on the southeastern flank of the Black Hills in southwestern South Dakota and represents a portion of the transition zone between the northern Great Plains grassland and the Rocky Mountain coniferous forest ecosystems.

The Park was established on January 9, 1903, becoming the eighth national park. At that time, it encompassed only 10,522 acres. Wind Cave National Park was originally established with an act of Congress to protect Wind Cave from commercial exploitation. Subsequent legislation influenced and changed the size and purpose of the Park to include the surface resource including natural prairie, large ungulate, i.e. bison, elk and pronghorn. Besides rare and significant sub-surface resources Wind Cave contains mixed-grass prairie, ponderosa pine and riparian ecosystems and forms a transition zone between eastern and western biomes. The diversity of habitat supports a large variety of plants and animals (including those that have been successfully restored).

This document is mandated by and complies with National Park Service (NPS) *Director's Order #18: Wildland Fire Management* (National Park Service 2003a), which outlines National Park Service (NPS) fire management policy and requires that "every park area with burnable vegetation must have a fire management plan approved by the Superintendent". More specific guidance is found in *Reference Manual 18* (National Park Service 1999). This plan also complies with the Service's policy guidance, the *Management Policies* (National Park Service 2001). The Organic Act of the National Park Service (16 U.S.C §1 *et seq.*) provides the primary authority for implementation of this plan.

This document also implements measures to fulfil directives in *Managing Impacts of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire Adapted Ecosystems – A Cohesive Strategy* (Babbitt and Glickman 2000) and *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensivie Strategy Implementation Plan* (Western Governors Association, USDA-FS, USDI-BLM, and others 2002).

Fire represents an ecological factor of significant importance in the development and structure of nearly every terrestrial ecosystem in North America and has been present in natural ecosystems since the origin of climate on earth (Wright and Bailey 1982). It has been well established that the Northern Great Plains ecosystem has historically experienced frequent, fast running, short duration fires. From the recorded accounts of early European explorers and settlers, fires were a common occurrence on the plains (Higgins 1986). Fires were often ignited by lightning activity during the late spring to early autumn season. The writings note that the plains were often on fire as a result of American Indian activities, i.e., to signal others, to herd game, to adjust the vegetative mix, to clear campsites, etc. Following the influx of European settlers in the mid-to-late 1800's, most human-caused prairie fires resulted from the carelessness of cowboys and cooks, rather than from the activity of American Indians (Wright and Bailey 1980).

As the increased role of fire in restoration and maintenance of ecosystems and problems of hazard fuel buildup become more important, fire management is assuming a role of greater importance in National Park Service management planning. This Fire Management Plan has been prepared to serve as a detailed program of action, which provides specific guidance and procedures for accomplishing park fire management objectives. The implementation of this plan will define levels of protection necessary to ensure safety, protection of facilities and resources; will minimize undesirable environmental impacts of fire management, and will define the appropriate use of fire to restore and perpetuate natural processes given current understanding of the complex relationships in natural ecosystems.

B. Enabling Legislation

Authorities for establishment and management of Wind Cave National Park are found in the following acts and laws:

- An act to establish the Wind Cave National Park, January 9, 1903 (32 Stat. 765-766);
- An act to establish the Wind Cave National Game Preserve, August 10, 1912.(37 Stat.268-293)
- An Act to extend the boundaries of Wind Cave National Park, South Dakota, approved March 4, 1931 (46 Stat. 1518) LSPublic Law 148, sect. 601, abolishing Wind Cave National Game Preserve, transferring all property to Wind Cave National Park, June 15, 1935.(49 Stat.378,383)
- Public Law 708 of August 9, 1946 (60 Stat. 970, 16 USC 141a) expanding the Park Boundaries from 11718 acres to 28059 acres.
- Public Law 95-625 (92 Stat. 3475), November 10, 1978, adding 228 acres to the southern end of the Park.

C. Other Authorities

The authority for FIREPRO funding (Normal Fire Year Programming) and all emergency fire accounts is found in the following authorities:

- Section 102 of the General Provisions of the Department of Interior's annual Appropriations Bill - provides the authority under which appropriated monies can be expended or transferred to fund expenditures arising from the emergency prevention and suppression of wildland fire.
- Public Law 101-121, Department of the Interior and Related Agencies Appropriation Act of 1990 - established the funding mechanism for normal year expenditures of funds for fire management purposes.
- 31 USC 665 (E) (1) (B) - provides the authority to exceed appropriations due to wildland fire management activities involving the safety of human life and protection of property.

Authorities for procurement and administrative activities necessary to support wildland fire suppression missions are contained in the Interagency Fire Business Management Handbook. Authorities to enter into agreements with other Federal bureaus and agencies; with state, county, and municipal governments; and with private companies, groups, corporations, and individuals are cited in National Park Service Agreements Handbook

(National Park Service 2002).

Authority for rendering emergency fire or rescue assistance outside the National Park System is the Act of August 8, 1953 (16 USC 1b(1)) and the Departmental Manual (910 DM).

Existing agreements pertaining to implementation of the fire management program are cited or included in appendix A. As a general rule, these agreements give guidance on mutial aid zones for wildland fire suppression activities and specify procedures for billing and payment between agencies for wildland fire management activities.

D. INTERAGENCY FIRE POLICY

Federal wildland fire policy is established in the *Federal Wildland Fire Management Policy & Program Review of 1995* (U.S. Department of the Interior 1995). This policy was reviewed following 2000 fire season (U.S. Department of the Interior and USDA Forest Service 2001). The 2001 Working Group found that the policy is generally sound, but recommended changes:

In summary, the Working Group finds and recommends that federal fire management activities and programs are to provide for firefighter and public safety, protect and enhance land management objectives and human welfare, integrate programs and disciplines, require interagency collaboration, emphasize the natural ecological role of fire, and contribute to ecosystem sustainability.

Recognizing the ecological role of fire and the goal of ecosystem sustainability in federal policy is a fundamental change in perception of fire in our society and its role in land management. Principal conclusions of the Working Group included:

- As a result of fire exclusion, the condition of fire-adapted ecosystems continues to deteriorate; the fire hazard situation in these areas is worse than previously understood.
- Changes and additions to the 1995 Federal Fire Policy are needed to address important issues of ecosystem sustainability, science, education, communication, and to provide for adequate program evaluation.

In addition, the review stated, "The 2001 Federal Fire Policy and its implementation are founded on the following guiding principles:"

- Firefighter and public safety is the first priority in every fire management activity.
- The role of wildland fire as an essential ecological process and natural change agent will be incorporated into the planning process.
- Fire management plans, programs, and activities support land and resource management plans and their implementation.
- Sound risk management is a foundation for all fire management activities.
- Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management objectives.
- Fire management plans and activities are based upon the best available science.
- Fire management plans and activities incorporate public health and environmental quality considerations.
- Federal, State, tribal, local, interagency, and international coordination and

cooperation are essential.
- Standardization of policies and procedures among federal agencies is an ongoing objective.

This plan is intended to follow these principles and incorporate them into all aspects of the Wind Cave National Park Fire Management Program.

Wildland fire is defined as any non-structure fire that occurs in the wildland, and includes wildfires, wildland fire use and prescribed fires. Wildfires are defined as "an unplanned wildland fire including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fires, and all other wildland fires where the purpose is to put the fire out" (NWCG2005). These fires can, but do not always, achieve burning intensities capable of causing loss of life, detrimental impacts upon natural resources, and damage to, or destruction of, man-made developments. With the implementation of this plan, managers will have a wide range of appropriate management responses to naturally ignited wildland fires, while all human-caused fires will be suppressed. Wildland fire use is defined as the application of appropriate management response to naturally-ignited fires to accomplish specific resource management objectives in pre-defined areas outlined in Fire Management Plans" (NWCG 2005) Prescribed fire is defined as "any fire ignited by management actions to meet specific objectives" (NWCG 2005). These fires are conducted under prescription, and on a predetermined area that will produce the intensity of heat and rate of spread required to accomplish specific management objectives.

Within the framework of management objectives and plans, overall negative wildland fire impacts will be held to the minimum possible giving full consideration to:

- Firefighter and public safety;
- An aggressive fire prevention program;
- The least expenditure of public funds for effective suppression;
- The methods of suppression least damaging to resources and the environment; and
- Integration of cooperative suppression actions by agencies of the DOI among themselves or with other qualified suppression organizations.

E. NATIONAL PARK SERVICE FIRE POLICY

National Park Service management policy directs each park to prepare a wildland fire management plan that is appropriate for that park's purpose and resources. Fire management in Wind Cave National Park is based upon this policy and the guidance found in DO-18, Fire Management Guidelines (National Park Service 1999). This guideline identifies fire as the most aggressive natural resources management tool employed by the National Park Service. This guideline also states that all wildland fires are classified as either wildfires or prescribed fires. Prescribed fires, naturally ignited or management ignited, may be authorized by an approved wildland fire management plan and can be of significant importance in achievement of the Park's resource management objectives.

DO-18 identifies considerations to be addressed by park fire management programs. These are:

- Protection of human life, both employee and public,
- Protection of facilities and cultural resources; and
- Perpetuation of natural resources and their associated processes.

F. Collaborative Process Used to Develop this Plan

This plan has been developed through a collaborative effort involving the park staff and the Northern Great Plains Fire Management Officer (NGPFMO) staff using the guidance of park documents including the General Managemnet Plan, Resource Management Plan, Vegetation Management Plan, various wildlife management plans, Statement for Management. Through the EA process public input including local VFD's and adjacent landowners has helped us refine the plan. The park will continue these collaborative opportunites as the FMP is adjusted over time.

G. NEPA and NHPA Compliance

This Fire Management Plan meets National Environmental Policy Act (NEPA) and National Historical Preservation Act (NHPA) requirements. The Park sent a letter regarding this Fire Management Plan to the South Dakota Historic Preservation Officer (SHPO) on February 8, 2005. The Park also contacted the U.S. Fish and Wildlife Service by telephone regarding this project on December 2, 2003. Both agencies deferred comment until publication of the Fire Management Plan and EA.

II. RELATIONSHIP TO LAND MANAGEMENT PLANNING AND FIRE POLICY

A. NPS MANAGEMENT POLICIES

NPS *Management Policies* (National Park Service 2001) provides the guidance for integration of fire into overall park management and resource management objectives.

Naturally ignited fire is a process that is part of many of the natural systems that are being sustained in parks. Human-ignited fires often cause the unnatural destruction of park natural resources. Wildland fire may contribute to or hinder the achievement of park management objectives. Therefore, park fire management programs will be designed to meet park resource management objectives while ensuring that firefighter and public safety are not compromised.

Each park with vegetation capable of burning will prepare a fire management plan and will address the need for adequate funding and staffing to support its fire management program. The plan will be designed to guide a program that responds to the Park's natural and cultural resource objectives; provides for safety considerations for park visitors, employees, neighbors, and developed facilities; and addresses potential impacts to public and private property adjacent to the Park. An environmental assessment developed in support of the plan will consider the effects on air quality, water quality, health and safety, and natural and cultural resource management objectives. Preparation of the plan and environmental assessment will include collaboration with adjacent communities, interest groups, state and federal agencies, and tribal governments.

Fire management activities within the Park will be implemented in accordance with the regulations and directions governing the protection of historic and cultural resources as outlined in the Department of Interior Manual Part 519 (519DM), Code of Federal Regulations (36 CFR 800), and *DO-28: Cultural Resource Management* (National Park Service 1998). National Historic Preservation Act of 1966 (16 U.S.C. §470 et seq.) section 106 clearance will be followed for any fire management activity that may affect historic structures or cultural/archeological resources. Other related policies that will be followed as required include the Archeology and Historic Preservation Act of 1974 (16 U.S.C. §469-469c-2) and the Archeological Resources Protection Act of 1979 (16 U.S.C. §470aa-470mm).

B. ESTABLISHMENT AND DESCRIPTION OF WIND CAVE NATIONAL PARK

Wind Cave National Park was established in January 1903 (32 Stat. 765-766, 16 USC 141-146) as a 10,532-acre area to protect Wind Cave and the underground resources of this unique site. It was the eighth national park and the first one created to protect a cave. The original legislation applied only to the cave and surface developments needed to manage and care for the cave (NPS 1994a).

The purpose of Wind Cave National Park has evolved from cave preservation to protection of both subsurface and surface ecosystems. In 1912, establishment of the Wind Cave National Game Preserve provided a permanent range for bison and "such other native American game animals as may be placed therein." Bison, elk and pronghorn had been extirpated from the area prior to establishment of Wind Cave National Park. Herds of bison and elk were re-established, as the need to preserve and protect big game species was realized. In 1935, Section 601 of Public Law 148 (49 Stat. 383, USC 141b) transferred management of the game preserve from the Department of Agriculture to Wind Cave National Park. In 1946, Public Law 708 (60 Stat. 970, 16 USC 141a) expanded the park to over 28,000 acres to maintain a viable population of a variety of big game, especially pronghorn. In 1978, Public Law 95-625 (92 Stat. 3475) added approximately 228 acres to the southern end of the park. The park currently encompasses 28,295 acres.

Based on park legislation and legislative history, the purpose of Wind Cave National Park (as identified in the park GMP) is to:

- Protect Wind Cave.
- Provide habitat for bison and other native game animals.
- Preserve and protect surface and subsurface resources.
- Preserve the flora, fauna, and natural processes of the mixed-grass prairie ecosystem.
- Provide services and facilities necessary and appropriate for public enjoyment and appreciation of the park's resources.

Wind Cave National Park is significant because:

- The special features of Wind Cave are acknowledged by speleologists around the world as being rare and significant, with it's length, complexity, and vertical levels making it one of the most complicated maze caves in the world.
- Wind Cave contains mixed-grass prairie, ponderosa pine, and riparian ecosystems, and forms a transition zone between eastern and western biomes, supporting a large variety of plants and animals, including those successfully restored after extirpation.
- The park provides access to geologic resources including the Madison aquifer and contains rare Quaternary deposits of regional significance.
- The human resources of the park go back at least 10,000 years and contain prehistoric and historic resources.
- Wind Cave is an important part of the region's tourism.
- Wind Cave is a designated Class I air quality area under the Clean Air Act.

C. GENERAL MANAGEMENT

Wind Cave Management has long recognized fire as "a natural part of the ecosystem." The General Management Plan recognizes the role of fire in the ecosystem and directs that prescribed fire be used to "perpetuate native plant and animal species and communities, to eradicate and minimize the opportunity for encroachment of exotic plant species, and to reduce hazardous fuel accumulations (National Park Service 1994).

1. Firefighter and public safety is the first priority in all fire management activities.
2. Provide for the safety of park visitors, neighbors, and employees during all phases of wildland fire management operations.
3. Suppress all unplanned fires in the Park.
4. Cooperate extensively with adjacent landowners through Memoranda of Understanding to facilitate safe and prompt suppression of wildfires.
5. Suppress all wildfires with minimum cost, environmental and cultural resource impacts.
6. Provide opportunities for public understanding of the wildland urban interface problem.

7. Suppress all unwanted and undesirable wildland fires regardless of ignition source to protect the public, private property, natural, cultural and historic resources of the Park.
8. Minimize adverse impact from fire suppression:
    a. Suppress unplanned fires commensurate with values at risk.
    b. Use minimum impact fire suppression techniques.
    c. Rehabilitate disturbed areas to protect natural, cultural, wilderness and scenic resources from adverse impacts attributable to fire suppression activities.
    d. Engender the understanding among park staff and firefighters about the impacts of fire suppression on sensitive park resources.
    e. Ensure that a resource advisor is present on all major suppression actions.

D. RESOURCE MANAGEMENT

The Draft Resource Management Plan (National Park Service 2003b) and the Draft Vegetation Management Plan (National Park Service 2005b) both recommend fire as a necessary tool "to meet the Park resource management objectives of restoring ecosystems and providing protection for developed areas and cultural resources." This fire management plan will establish guidelines for managing natural and prescribed fires to perpetuate natural ecosystems while recognizing the interest of adjacent landowners. Through that process, fire may continue to be considered a natural process important for maintaining the prairie ecosystem.

Prescribed fire may be used to address a variety of resource management objectives for the Park, including:

- Restore fire as a critical component of the ecosystem.
    1. Minimize the occurrence of unnaturally intense fires through reduction of hazard fuels by prescribed fire.
    2. Train park staff and cooperators to conduct safe, objective-oriented prescribed fires consistent with RM-18 requirements.
    3. Provide opportunities for public understanding of fire ecology principles, smoke management, and wildland fire program objectives.
    4. Monitor and evaluate the effectiveness of the prescribed fire program.
- Utilize prescribed fire to perpetuate native plant and animal species and communities, and to stimulate natural ecosystem processes. Some of the natural processes facilitated by fire include:
    1. Achieve conifer stands that are widely spaced with varied age/size class distributions (including seedling, sapling, pole, mature, old growth, and snags), with individual stands that have a savanna appearance of open ponderosa and grassland mosaics, in relative small patches. For the most part, trees within stands will have wide and random spacing, including forest regeneration with seedling areas that are thin and widely spaced. Some pockets of thick, dense conifer will be retained and small amounts of regeneration will occur along meadow/prairie edges, but these will be the exception.
    2. Shift vegetation composition from exotic plant species (examples include Japanese brome, smooth brome, Kentucky bluegrass, and Canada thistle) to native plant species.
    3. Promote hardwood regeneration within the Park. Currently 3-5% of the Park's land base is comprised of a deciduous forest complex. Most are decadent or

remain dormant and as a result nutritional quality and productivity have declined. Without the rejuvenating effects of fire, these communities will continue to deteriorate, which will also diminish their value to wildlife (elk, deer, songbirds, etc).

4. Restore aspen clones and allow them to withstand pine encroachment. Without disturbance through such means as fire, these early succession trees become more susceptible to insects, disease and are out-competed by pines.
5. Create more pine snags for use by cavity nesting, dependent species of wildlife. Known species at the Park that use dead trees or cavities include northern flying squirrel, various species of bats, northern saw-whet owl, black-backed woodpecker, Lewis' woodpecker, eastern and mountain bluebird, nuthatches, and American kestrel.
6. Reduce fuel buildup throughout the Park. Fire consumes branches, needles, and other materials that have accumulated on both the ground and in trees.
7. Restore and maintain the grassland and ponderosa pine community by impeding and reducing the extent of ponderosa pine encroachment. This also aids in the maintenance of the mosaic pattern of different plant communities associated with post fire stages.
8. Manage grasslands to increase suitable habitat for a wide variety of wildlife (examples include bison, elk, antelope, deer, butterflies, numerous birds, and small mammals) and encourages their distribution throughout the Park.
9. Improve the nutritional quality and palatability of vegetation for use by wildlife.
10. Vary the seral stages of vegetation communities across the landscape.

- To the extent practical, use fire as a tool to restore the ecosystem to the condition existing prior to settlement by Europeans. The primary factors interrupting natural ecosystem processes are fire suppression which began in the late 1800s and agricultural practices, which not only directly replaced native vegetation, but also served as a fire break, inhibiting the natural spread of fire across landscapes.
- Use fire as a tool to maintain cultural landscapes.

To meet some of these objectives the Park will need to adjust its prescribed fire strategies. Instead of burning areas of the Park every 8-10 years some areas may need to be burned in consecutive years to remove dead fuels created by previous fires and remove seedlings that come up in recently burned areas. To control certain species prescribed fires will need to be used during a variety of seasons. For example, undesirable cool season grasses are controlled by burning in the spring.

III. WILDLAND FIRE MANAGEMENT STRATEGIES

A. GENERAL MANAGEMENT CONSIDERATIONS

All human-caused and naturally caused wildlfires will be suppressed. Prescibed fire will be the tool to achieve management objectives. General wildland fire mangement will incorporate the 10-Year Comprehensive Stategy Implementation Plan as required by Congress in Public Law 106-291.

The goals of this plan are:

1. To promote firefighter and public safety;
2. This plan provides for the safety of park visitors, neighbors, and employees during all phases of fire management operations.
3. To restore and sustain natural ecosystems and reduce hazardous fuels;
4. This plan outlines the implementation and operational procedures for restoring the Park to its natural fire-adapted ecosystems and to maintain the balance of prairie and forest.
5. To promote fire prevention and the suppression of unintended ignitions;
6. This will be achieved through interagency cooperation with the Great Plains Interagency Dispatch Center, Custer State Park, Black Hills National Forest, Nebraska National Forest, and South Dakota State Department of Forestry. The Park will work with local fire departments and agencies to detect, prevent, and suppress wildland fires.
7. To promote cooperation and collaboration with park neighbors; and
8. Through the Rural Fire Assistance Program and other cooperative agreements the Park will maintain cooperation and provide assistance to local rural fire departments.
9. To minimize impacts of wildfire on park natural and cultural resources, park infrastructure, and adjacent lands, to the extent possible.

The projects and activities carried out under this implementation plan are in addition to other Federal, state and tribal forest and rangeland management activities. The implementation plan does not alter, diminish, or expand the existing jurisdiction, statutory and regulatory responsibilities and authorities or budget processes of participating Federal, State, and tribal agencies.

B. WILDLAND FIRE MANAGEMENT OPTIONS

The Park will use the specific strategies listed below to achieve the Park's fire management objectives. The policies of the NPS, as set forth in DO-18 and the Department of the Interior will be adhered to in implementation of these strategies.

1. Wildfires

The Park will make every effort to suppress all wildfires through initial attack actions. All available park and local fire fighting resources will be utilized as necessary to limit damage to values at risk, and prevent the spread of wildfires across park boundaries.

The Incident Commander of any wildfire is expected to combine tactics with sensitivity towards park resources and concern for safety of fire fighting personnel, park employees, park visitors and park neighbors threatened by the wildfire.

2. Prescribed Fire

Prescribed fires are intentionally ignited under predetermined weather and fuel moisture conditions that permit managers to exert substantial influence over the spread and intensity levels that the fire can achieve. These fires are ignited for purposes of accomplishing resource management objectives. All prescription parameters, ranges, and objectives are clearly stated in an individual project plan for each prescribed fire. This guidance is outlined in RM-18 Chapter 10.

3. Wildland Fire Use

Due to staff limitations, small land management area, rapid rates of spread, long response times, valuable resources, and values at risk on neighboring lands, this plan does not allow wildland fire use as a management option for the Park.

4. Non-Fire Applications

Mechanical treatments will be used to reduce fuels such as regeneration, hazard trees, and complete work preparation for prescribed fire.

C. DESCRIPTION OF FIRE MANAGEMENT UNIT

The Park will be managed as one fire management unit. This is done, as opposed to being divided into several units, because the following characteristics are similar throughout the Park: The climate, weather, topography, vegetation, elevation, air quality concerns, access, fire history, desired fire effects, fuel types, major fire regimes, and expected fire behavior.

Due to current forest density and fuel loads, the relatively small size of park, the fuel types, associated rates of fire spread, historic fire duration, park staffing, and budget limitations, this plan utilizes a combination of appropriate suppression responses and prescribed fire for resource objectives as fire management tools.

1. Physical and Biotic Characteristics

The following data is summarized from the existing Natural Resources Management Plan and General Management Plan written for the Park.

a. Location

Wind Cave National Park is situated on the southeastern flank of the Black Hills in southwestern South Dakota (Figures 1 and 2). The area is part of the transition zone between the northern Great Plains grassland and the Rocky Mountain coniferous forest ecosystems.

The Park is located ten miles north of the community of Hot Springs (population 4,500). The lands to the south and east of the Park are private and used mainly for dry-land ranching. The area adjacent to the north boundary is Custer State Park (73,000 acres). To the west is the Black Hills National Forest. The entire 28,295 acres of Wind Cave National Park lie within Custer County.

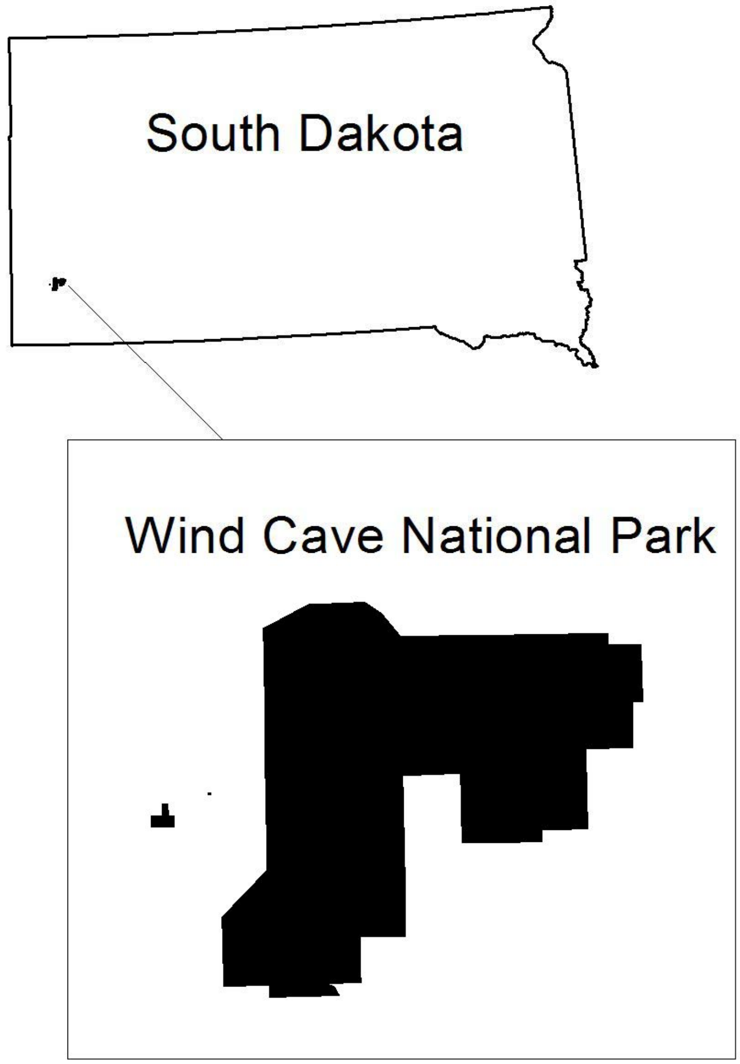

Figure 1. General Location of Wind Cave National Park.

b. Climate

Wind Cave National Park is in the northern plains climate zone. Annual temperatures range from winter lows of -30°F to summer highs of 100°F or higher. Although winter temperatures can be extreme, they are generally pleasant with extended periods of little or no snow on the ground and temperatures above zero. Summers are generally pleasant, with night temperatures in the 50s and 60s. Afternoon and evening thunderstorms occur frequently in the summer. The average annual precipitation is 18 inches, with winter storms providing less than one quarter of the total. Wind direction is predominantly from the northwest, but can have wide variations in direction due to local conditions within the Park (National Park Service 2005a). Wind Cave NP Climate Chart Appendix B

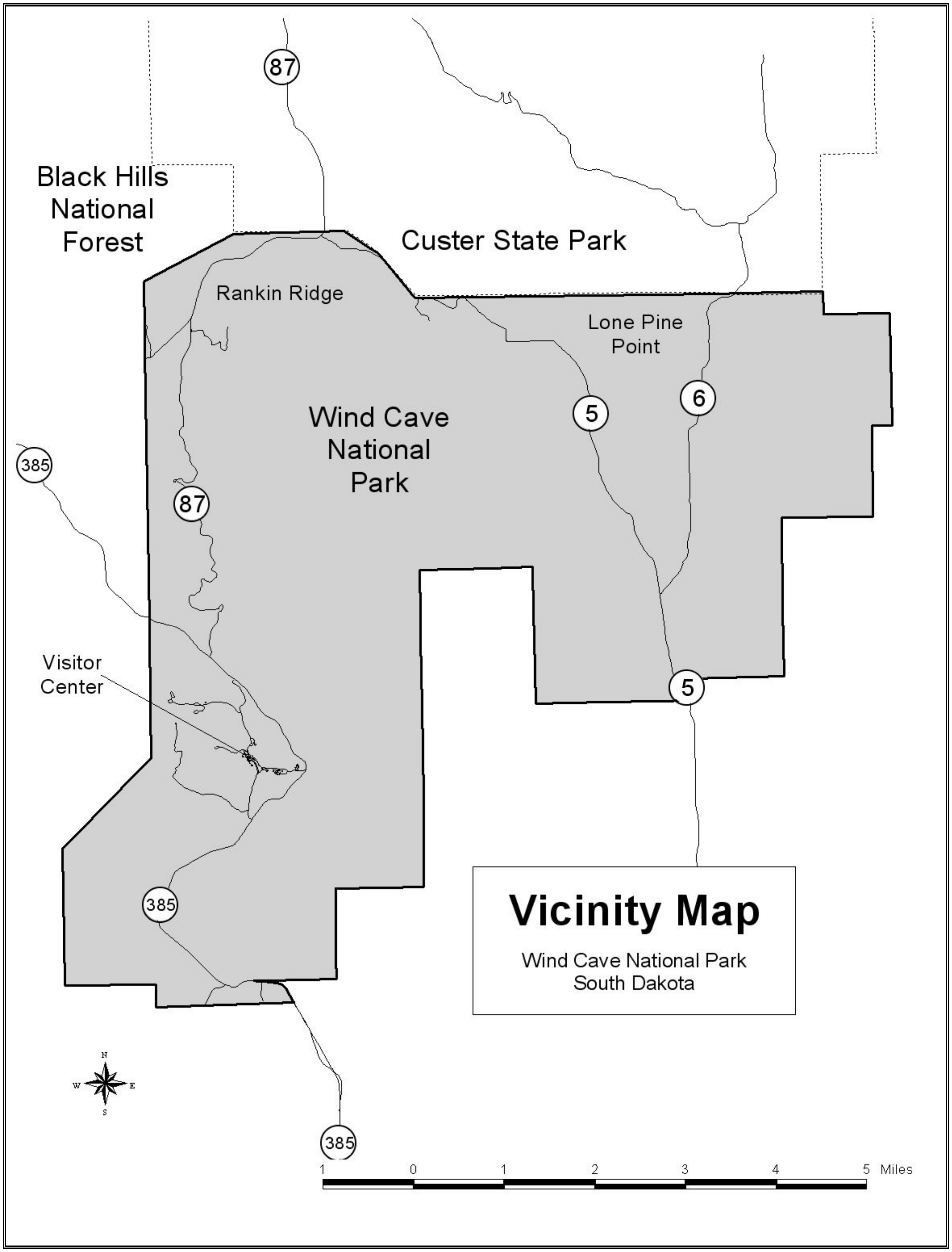

Figure 2. Wind Cave National Park Map.

c. *Topography, Geology, and Soils*

The Black Hills and associated uplands comprise a 4,000-square-mile region of mountainous topography, consisting of a core of crystalline rocks surrounded by upturned sedimentary rock strata called hogbacks. The topography varies from mountainous to flat plains but is predominantly rolling hills. Elevations within the Park range from a low of 3,560 feet to a high of 5,013 feet (Rankin Ridge). Igneous and metamorphic rocks form a hilly region of the northwestern corner of the Park. A good portion of the Park is in the Pennsylvannian-Jurrassic formation, which is composed mainly of sandstones and shales. A portion of the Park also extends into the Mississippian carbonates (mainly Pahasapa formation). Overlying the Pahasapa is the Minnelusa sandstone formation, which varies in thickness from 350 to 800 feet. This formation consists of a series of limestones, dolomites, sandstones, and shales from the Pennsylvannan and Permian ages (National Park Service 1994).

The mountainous areas of the Park are composed of igneous granite and mica schists. These mountains, which are part of the Southern Black Hills, were formed by uplift (National Park Service 1994).

Soils are primarily silty to loamy materials derived from underlying gypsiferous red shales. These shales are either weathered in place or transported by wind and water. The loams are generally weathered from sandstones thinly interbedded with shales. Some of the sandstones are calcareous but most are noncalcareous. Finely textured soils are formed from clayey formations and are scattered throughout the Park. On the rolling hills soils are deep cobbly loam or stony clay. On the steeper hillsides soils are generally thin and have clay loam and clay textured surfaces. Mountainous areas consist mostly of rock outcrop with some lithosols. The soils in the Park lie in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each type of soil is associated with a particular kind of landscape or with a segment of the landscape. In the eastern portion of the Park, some erosion is evident. Bank erosion is apparent along some of the road cuts (National Park Service 1994).

Wind Cave is named for the winds that blow in and out through its natural entrances. At present, the known cave is over 116 miles in length. Drops in atmospheric pressure cause air to move out of the cave while rising pressure allows air to flow into the cave. The cave is generally dry, containing little standing or flowing water, but there are several small lakes in the deepest point in the cave where the limestone intersects with the water table. Several smaller pools of perched water are present in various places throughout the cave, and many passages under surface drainages have dripping water. There are three small streamlets found in the cave, two in the Lake Section and one in the Southern Comfort Section.

Current thought is that the cave was dissolved by mixing water from three sources; water seeping down from the surface through porous sediment, water moving down-dip through the Madison aquifer, and upwelling warm water. Wind Cave's evolution or speleogenesis is unusual in that the water which dissolved the cave came from three directions, above, sides, and below, which created the multiple levels. Eventually the water table lowered, creating the air-filled cave (Palmer 2001).

Only two natural entrances to Wind Cave are known, the Natural Entrance and the Snake Pit Entrance. The Natural Entrance area has been heavily modified to accommodate entrance to the cave for tours to include the addition of a large entrance with stairs, historic door, and revolving doors. The Snake Pit entrance was modified by blasting during the 1970s to make it passable. Several small holes located near Wind Cave which blow air (blow holes), are also suspected openings into the cave.

Many strange and unique speleothems have developed in Wind Cave. The most striking and profuse is the "boxwork", a criss-crossing of calcite fins protruding from the walls and ceilings in many parts of the cave. According to Hill and Forti (1997), the best exposures of calcite boxwork in the world occur in the Black Hills and are "most remarkably in Wind Cave".

To date, over forty separate caves have been located in the Park. The backcountry caves in the Park vary from 15 to 4250 feet in length. Some of these caves have yet to be mapped or have their contents inventoried. The Park has potential for many more cave discoveries. Blowholes, karst features, and reports of blowing wells suggest that other major cave systems may be located in the Park.

d. Vegetation

A vegetation community mapping effort and a rare plant inventory were completed in 1999 (U.S. Geological Survey). The vegetation communities within the Park consist of three major types with approximately 63% prairie grassland, 29% forest, and 7% shrublands. These major types can be further divided into several plant communities or association types which include upland grasslands, riparian/wet meadows, shrublands, coniferous forests, hardwood forests, rocky outcrops/sparse vegetation, landscaped areas and other types..

Mixed-grass prairie is the dominant vegetation community and occurs in a mosaic with other communities, including ponderosa pine, shrubland, riparian and woodland communities. The mixed-grass prairie is dominated by mixed-grass species such as western wheatgrass (*Pascopyrum smithii*), little bluestem (*Schizachyrium scoparium*), and blue grama (*Bouteloua gracilis*). These species are interspersed with short grass species such as buffalo grass (*Buchloe dactyloides*) and tall grass species such as big bluestem (*Andropogon gerardii*), Indian ricegrass (*Oryzopsis hymenoides*) and switchgrass (*Panicum virgatum*). Threadleaf sedge is common to dry open prairies and rolling hills. A wide variety of forbs (wildflowers) and shrubs are interspersed throughout the Park.

Coniferous forest comprises 29% of the vegetation communities, with ponderosa pine dominating. In general, as elevation increases, ponderosa pine has a tendency to dominate north-facing slopes, but because of the lack of fire, ponderosa has encroached and dominates on all slope aspects in many locations. The forest understory is a mix of young ponderosa seedling and pole size trees and grass species.

Decidious trees grow along stream courses and canyon bottoms, and include green ash (*Fraxinus pennsylvanica*), boxelder (*Acer negundo*), bur oak (*Quercus macrocarpa*), plains cottonwood (*Populus deltoides*), American elm (*Ulmus americana*), and paper birch (*Betula papyrifera*).

In addition, the Park has approximately 7% of its lands in shrublands, these being dominated by mountain mohagany (*Cercocarpus montanus*), creeping juniper (*Juniperus horizontalis*), chokecherry (*Prunus virginiana*), and serviceberry (*Amelanchier alnifolia*).

No U.S. Fish and Wildlife Service or State of South Dakota listed threatened or endangered plant species occur within the Park.

An important vegetation management concern at Wind Cave National Park is the occurrence of exotic vegetation within the Park and on surrounding lands. Many exotic plants, both intentionally or accidentally introduced, have established in the Park and pose a threat to native vegetation. To date, over 100 species of exotic plants have been identified within park boundaries. Most noxious weed infestations occur in developed areas, along road edges, in prairie dog towns and in drainages. A comprehensive noxious weed survey was initiated during 2002 (Wind Cave National Park Resource Management unpublished report). A list of species found to date within the Park is found in Appendix C, but a brief listing includes, but is not limited to: Canada Thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), scotch thistle (*Onopordum acanthium*), spotted knapweed (*Centaurea maculosa*), common mullien (*Verbascum thapsus*), and field bindweed (*Convolvulus arvensis*).

e. Wildlife

The dominant wildlife species within the Park include: bison (*Bison bison*), elk (*Cervus elaphus*), pronghorn (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), and black-tailed prairie dogs (*Cynomys ludovicianus*). The Park enabling legislation specifically mentions the management of bison, elk, and pronghorn. Also present in the Park are the populations of mammalian carnivores such as coyote (*Canis latrans*), bobcat (*Felis rufus*), and mountain lion (*Felis concolor*), as well as reptiles, amphibians, birds including raptors such as burrowing owl (*Athene cunicularia*), long-eared owl (*Asio otus*), golden eagle (*Aquila chrysaetos*), prairie falcon (*Falco mexicanus*), and Cooper's hawk (*Accipiter cooperii*), and other small mammals such as numerous bat species. The Resource Management objective is to maintain or restore indigenous fauna and natural communities to achieve diversity and community structure which approximates that which would have been created by natural events and processes.

There are no known federally endangered species of fauna that are residents of the Park. Although the Park is within the historic range, the American burying beetle (*Nicrophorus americanus*) has not been documented within the Park. The bald eagle (*Haliaeetus leucocephalus*) is a migratory visitor to the Park.

As of the fall of 2004, 1,855 acres of black-tailed prairie dog colonies were identified within the Park. The black-footed ferret is an obligate species to prairie dogs, although no ferrets have been documented within the Park since the late 1970s.

A variety of neotripical migratory birds utilize the Park, however none have been identified as sensitive species.

f. Cultural Sites / Landscapes

Homesteading and ranching were once subsistance activities in what is now Wind Cave National Park. Land records for the area within the Park indicate that 83 land patents were filed and a possibility that an additional 13 were not filed, bringing the total sites to 96. These date from the early 1890s, but the majority were filed after 1912 when land size doubled from 160 to 320 acres. Land records also include information as to number of improvements and the amount of land cultivated (Western History Research 1992).

Information from these records indicate that 284 structures were constructed within the Park, including houses (59), barns (39), corrals (33), sheds (21), chicken houses (21), wells (19), granaries (12), and other structures (Western History Research 1992).

Homesteads normally required cultivation of at least 1/8th of the lands claimed, however many settlers in the Park area filed applications for reduction of cultivation claiming that the land was not fit for cultivation. Of the lands with cultivation (52 of 83), size of cultivation ranged from 4 to 60 acres, with an average of 18.9 acres cultivated (Western History Research 1992). Areas that were put under cultivation were plowed and seeded to grain, hay, and garden crops. In addition, timber was heavily cut in some areas for fence posts, mine timbers, building lumber, and firewood. Evidence of the sites often consists of some fragments of fence, rusting metal, broken fragments of porcelain, and perhaps a foundation.

Portions of several trails or wagon roads are reported to have crossed the Park including the Cheyenne and Black Hills Stage and Express Route; a spur of the Sydney, Nebraska to Deadwood, South Dakota, Route; and a portion of the Cold Brook Wagon Trail. Local history also suggests that Jedediah Smith traversed the Park. There have been no accurate surveys or assessments of these sites.

g. *Archeological Resources*

The Park's first attempt to determine the extent of archeological resources was the Sudderth Survey in 1963 (Sudderth 1964). Currently 76 archeological sites have been recorded. Nine of these are historic and 67 are prehistoric. The historic sites mainly relate to early homesteading activities in the area. The density of prehistoric sites suggests that this area was used extensively by prehistoric peoples throughout history. The prehistoric sites include tipi ring campsites; locations where people may have camped, gathered or processed wild foods or conducted other activities; occupation sites; rock shelters; stone cairns; a stone alignment used in communal hunting activities; and one human burial site. Fifty sites are eligible or potentially eligible and 13 are not eligible for the National Register. One site is on the National Registry. This site, the Beaver Creek Rock shelter, has been test excavated. The results revealed a continuous chronological sequence through the entire Holocene, making it an extremely valuable site for understanding cultural and environmental changes during the Holocene. The discovery of the site and the continuing discovery of additional sites in the Park have led to a heightened awareness of the Park's archeological potential.

h. *Historic Structures*

Twenty structures are listed on the National Register as components of the Administrative and Utlility Area Historic District. The District was listed on January 20, 1995. Two additional structures; the Beaver Creek Bridge and the Pigtail Bridge were added later.

j. Paleontological Resources

A small percentage of Wind Cave National Park has been surveyed for fossil resources. Recent discoveries within the Park have documented Pleistocene mammals including rhinoceros, bison, horse, and rabbit.

k. Air Quality

Historically, the Park and surrounding area have enjoyed excellent air quality, with only occasional, short-term air pollution from transient wildland fire smoke or blowing dust. Certain topographical features, 40-60 miles eastward, are clearly visible throughout much of the year. National Park Service fire management activities which result in the discharge of pollutants (smoke, carbon monoxide, particulates, and other pollutants from fires) are subject to and must comply with all applicable federal, state, interstate, and local air pollution control requirements as specified by Section 118 of the Clean Air Act, as amended (42USC §7418). Wind Cave National Park was classified as a Class 1 Area under the National Clean Air Act of 1977 (42 USC 7401 et seq.). Under this designation, very little additional air pollution is permitted in the vicinity of the Park beyond baseline levels of certain pollutants – particulate matter, sulfur dioxide, and nitrogen dioxide.

It is likely that presettlement visibility was lower than current levels due to frequent fires in summer months. However, as agriculture and settlement took place within the area, fire suppression activities increased. The following air quality measurement programs are currently being conducted within the Park:

- Passive Ozone Monitoring System (May through September)
- An Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring site was installed in the Park in January 2000 to assess response to the U.S. Environmental Protection Agency's Regional Haze regulations requiring improvement of visibility in Class 1 air quality areas.
- National Atmospheric Deposition Program (NAPD)/ National Trends Network (NTN) wet sampling station to determine spatial and temporal trends in the chemistry of precipitation, primarily the measurment of nitrates and sulfates. This data allows agencies to understand the effects of air pollution and climate variations on the amount of man-made chemicals that may affect resources.
- CASTNET provides atmospheric data on the dry deposition component of total acid deposition, ground-level ozone and other forms of atmospheric pollution and was installed in the Park in December 2003. This is considered the nation's primary source for atmospheric data to estimate dry acidic deposition and to provide data on rural ozone levels. Used in conjunction with NADP, CASTNET can help determine the effectiveness of national emission control programs.

- In the spring of 2004, the Park entered into an agreement with the

South Dakota Department of Environment and Natural Resources (DENR) to add continuous samplers to collect data for ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), PM_{10}, and $PM_{2.5}$ to the Park air quality monitoring site. The goal of the project is to increase the number of air pollution parameters and yearly sample numbers, collect data for current levels of air pollutants, and determine air pollution trends.

l. Water Resources

Wind Cave National Park has approximately six miles of surface streams and 96 known springs. Historic information and recent trends indicate that longer stretches of flowing surface water existed in the early decades of the 1900s. For example, the main branch of Beaver Creek once contained more water than now exists and also flowed for a greater distance through the Park. Between 1996 and present, Beaver Creek increased its surface flow approximately one mile within the Park, with no human manipulation. Beaver Creek originates outside the Park and is influenced by external activities such as wells, irrigation, and other water use projects. Some reduction in flow may also be caused by increased transpiration resulting from a steady increase of forest within the watershed, but no studies have been undertaken to document this. Some of the Park's springs were developed to provide a water source for large mammals, although there is no documentary evidence that this development has aided in dispersing elk and bison. In 2002, baseline water quality measurements were begun on Highland, Beaver, and Cold Spring Creeks.

Until the mid-1950s, the Park relied on water from Cold Spring Creek for domestic use purposes. In 1957, the Park began using a well drilled into the Madison Formation Aquifer, with supplemental water from the original Cold Spring Creek Supply. This continued until 1991 when the spring water supply use was discontinued.

m. Human Uses

The Park receives a large amount of non-recreational visitation because of two major transportation routes, US-385 and SD-87, which traverse the Park. The Park is located between Hot Springs (to the south) and Custer (to the north). Custer State Park, Mount Rushmore National Memorial, and Rapid City are also located to the north of the Park while Jewel Cave National Momunment is located to the northwest.

Visitor use of the Park is highest from June through August, with the greatest number of visitors staying for a few hours. Cave tours are the most popular activity. Many visitors drive through the Park, stopping infrequently for short walks on Park trails. Fewer visitors hike longer distances over the maintained trail system. There is a drive-in campground facility, the Elk Mountain Campground, which receives most of its use during the summer months. There is one developed picnic ground in the Park.

2. Strategic and Measurable Fire Management Objectives

See Section III. B. Fire Management Goals

3. Management Considerations

- All fire management activities will consider safety of personnel and the public as the highest priority.
- Smoke management reporting procedures for burning in South Dakota will be followed for all fire operations.
- Employ Minimum Impact Suppression Tactics.
- Park neighbors, park visitors and the local residents will be notified of all fire management activities that have the potential to impact them.
- Aircraft resources may be used with Forest Service/Bureau of Land Management (FS/BLM) approved retardants, but retardant will be kept out of streams. Low level aircraft use and retardant must be approved by the Superintendent.
- Bulldozers will not be used in prescribed fire operations. Only in extreme wildfire conditions bulldozer use may be authorized by the Superintendent.
- Off-road vehicle use is not allowed unless approved by the Superintendent.
- During extended wildland suppression actions that require ground disturbance, a trained archeologist will be consulted and should be on-site.
- All appropriate cultural clearances will be obtained as part of the planning process for prescribed fires.
- Class I air quality standards will be maintained and air quality requirements are considered in developing implementation plans.
- Socio-political economic impacts, including wildland urban interface, will be considered in the development of implementation plans.
- All park closures are at the discretion of the Superintendent.
- No fire management operations will be initiated until all personnel involved receive a safety briefing describing known hazards and mitigating actions, current fire season conditions and current and predicted fire weather and behavior.
- Fire management operations will be carried out by qualified individuals that promote the safe and skillful application of fire management strategies and techniques.
- Smoke impacts to visibility along Highways 79, 87, 385, NPS-5 & 6; and resulting traffic safety concerns must be factored into selection of suppression tactics and prescribed fire implementation.
- Engines and other off-road activities will be restricted from areas identified as potentially affected by vehicle traffic where rutting, soil compaction or other habitat damage could occur.

4. Historic Role of Fire

With the large tracts of continuous, fine fuels, frequent periods of hot, dry weather, and common occurrence of lightning, the mixed-grass prairie in and around the Park has historically experienced fire. This is an integral part of the ecological process shaping the form and content of the vegetative and wildlife composition of the area. From documented reports of early pioneer settlers in the west, the mixed-grass prairie was influenced by fires (both purposeful and accidental) set by Native Americans. Fires occurring in the mixed-grass prairie typically have been fast burning, surface fires that tend to leave a mosaic of vegetation. The Park's prairie vegetation grows rapidly, dies back annually above ground, and decomposes slowly, with an average height of 2 to 4 ft (grasses) and small trees and low brush (on north-facing slopes and in draws). Low humidities and low precipitation characterize the area. Periodic drought is common, although the Park had above average precipitation most years from 1988 through 2001. Over the past 36 years of record keeping (National Park Service 2005a) the Park has exceeded its average precipitation of 18 inches, 27 out of 36 years. Research indicates that fire, together with climate and topography, plays a major role in maintaining the grassland ecosystem and restricting the growth of trees and shrubs to the drier, rocky breaks, less frequently burned draws and riparian lands.

Knowledge of the fire history enhances the understanding of the type and frequency of fires that occur and their effect on the vegetation. It allows for insights as to the origins of the present vegetative cover and the reasons for its structure and distribution. Ultimately, this information should aid in developing prescribed fire prescriptions necessary for the restoration and maintenance of cover types that existed in pre-settlement times.

In the Black Hills of South Dakota and Wyoming, ponderosa pine stands cover almost 95% of the area (Sheppard and Battaglia 2002). Black Hills forests are dynamic and have evolved with a variety of natural disturbances including variable and sometimes extreme weather, periodic fires, and insect and disease epidemics. Of these disturbances, fire was one of the most prevalent (Sieg and Severson 1996). These disturbances limited the density and extent of ponderosa pine trees across the landscape (Parrish et al. 1996, McPherson 1997). Frequent fires resulted in a forest comprised of discontinuous, distinct groups of even-aged trees with a wide range of size classes represented (Biswell 1972, Biswell et al. 1973).

Before Anglo settlement, fires in the Black Hills were started by lightning and American Indians (Sieg and Severson 1996). The mean fire interval between 1388 and 1900 was approximately 20 to 24 years with a range of 1 to 93 years for interior ponderosa pine stands in the south-central Black Hills (Brown and Sieg 1996). More frequent fires have been reported for ponderosa pine savannas found in the foothills of the Black Hills. Fires burned approximately every 10 to 12 years with a range of 2 to 34 years in the Park (Brown and Sieg 1999) and every 11-15 years with a range of 1 to 43 years near Spearfish, South Dakota (Wienk et al. 2004). Fisher et al. (1987) reported similar fire frequencies for the Devil's Tower region on the northwestern edge of the Black Hills. The mean fire interval was 19 years before 1900, and 42 years since 1900. It also has been proposed that large, catastrophic disturbances were a part of the natural disturbance regime in ponderosa pine forests of the Black Hills (Shinneman and Baker 1997).

Decade to decade comparisons of wildfire activity are hampered by the series of boundary changes between 1903 and 1946 which enlarged the Park to 28,059 acres. In spite of incomplete records from the early decades of the Park, fire records are sufficient to illustrate fairly high occurrences of fires between 1910 and 2003, as shown in Appendix D – Wildfire History Map. During this period a total of 317 fires (an average of 4 fires and 238 acres annually) occurred in a fire season normally ranging from late March to late October. Of this total, 223 (70%) were lightning caused; 70 (22%) were human caused, and 24 (8%) were of undetermined origins. The size of these fires, including those that burned beyond the boundaries, ranged from one/one hundredth of an acre to 13,500 acres.

Little reference was made in the Park archives about wildfire until 1910 when two large conflagrations occurred. In late March, 1910, a fire of unknown origin was pushed by strong winds into the Park from the south. Eventually the town of Buffalo Gap, some 13 miles southeast of the Park, was threatened and several ranches were destroyed in its path. To date, it is the third largest fire in park history having consumed approximately 2,500acres, while nearly twice that amount was burned on adjacent private lands. The second of these fires was started by lightning in late June. It occurred northwest of the Park and took several days to control (no estimate was ever made of the acreage consumed).

In 1916 and 1917 two lightning fires and five of unknown origin burned at least 140 acres including 50 acres of forest in Wind Cave National Game Preserve (now part of the Park) and 80 acres of prairie to the east of the Park. An observation was made at the time that few trees were killed and that the range sustained little damage. Some indication of the frequency of fire during this period can be inferred from the Park Superintendent's plea: "We have three or four fires going at the same time now, and some provision should be made to protect us from fire."

Five fires were reported during the 1920s: three from lightning and the others of unknown cause(s). Of these, three were burning simultaneously at least ten miles beyond the Park boundary, but with a significant impact on the air quality. The Park Superintendent noted: "The valleys around here were filled with dense clouds of smoke and the wind was blowing a gale from the northeast…." Specific locations or acreage of the fires were not mentioned, but they were controlled by evening with the aid of light rain. Concerning these fires, it was written that the Park staff and neighboring landowners combined forces in a prompt response to limit them to a few acres. This is the first indication of a coordinated fire suppression effort involving park personnel and park neighbors.

More fire control emphasis and sophistication came about in the1930s with the initiation of a fire control and reporting system that, from the present perspective, was perhaps an over zealous reaction. This new emphasis on fire prevention and pre-suppression was manifested in the development of a network of fire roads that touch almost every section of the Park in the fire control activities of the Civilian Conservation Corp (CCC). A CCC staffed public contact station was erected on the highway near the south entrance. Here motorists were warned of the fire danger in the Black Hills and the related hazards of carelessness with cigarettes and campfires. The decade saw seventeen lightning and fourteen human-caused fires and one of unknown origin. Human-caused fires were the largest and ranged from 80 to 271 acres in size.

Although not in the Park when they occurred, two major wildfires burned lands that were later included in the Park: a 600 acre fire in 1911; and one of 9,040 acres in 1913. In comparing written records with tree scar data and the recollections of park neighbor, Carl Sanson, it is believed the 600 acre fire took place entirely within the current Park and that the 1913 fire consumed approximately ten sections or 6400 acres of present park lands.

During the 1940's, 24 lightning and eleven human-caused fires occurred in the Park. The largest of these was 150 acres in size and man-caused. Of the four fires that occurred adjacent to the Park, three ranged in size from 110 to 500 acres.

In combining the last three decades prior to 1979, there were 73 lightning-caused and 22 human-caused fires with twenty-four of unknown origin. The largest lightning ignited fire in the Park's history occurred in late-April, 1961 on the dry, rocky outcropping known as Boland Ridge. Fanned by strong winds, it burned 1,156 acres within the Park. In mid-August, 1963, four fires occurred within 48 hours, the largest being a 112 acre grass fire. The "South Gate" fire in mid November 1963 was a human-caused and burned 745 acres before being contained. But the "Headquarters" fire of September 2, 1964, attained the distinction of being the largest conflagration in park history. Ignited by a carelessly discarded cigarette, its forward rate of spread averaged 128 chains per hour during the initial run. Prior to this fire there had been a prolonged drying trend of 85 days. Winds of 30 mph with gusts to 50 mph were experienced before and during the fire. The fire was contained in 15 hours after burning 5,468 acres of National Park and 8,056 acres of private ranch lands. Four fire suppression agencies were involved and suppression costs amounted to an estimated $125,000. Another wildfire occurred on October 30, 1964, to the south of the Park. This fire illustrated once again the high fire potential of the flash fuels common in the Southern Hills by burning 6,000 acres in two hours.

The last twenty-three years have shown a decrease in human-caused fires although lightning-caused fires have increased. There were 103 lightning-caused, 17 human-caused and 3 of unknown origin. In July of 2000, the Park experienced one of its largest wildfires since 1964. The Highland Creek Fire, caused by lightning, burned 1,136 acres of the Park.

In 1968, the National Park Service revised its Fire Management Policy to enable naturally ignited fires under certain conditions to run their course and to allow for the use of prescribed fire as a substitute for natural fires. Experimental prescribed fire was initiated in the Black Hills during the early 1970s by the U.S. Forest Service and Dr. F.R. Gartner and his assistant, W. W. Thompson of South Dakota State University. Strenuous efforts were made by Gartner and others to publicize prescribed fire and its beneficial effects. The news media was very cooperative in this respect. In 1973, land management agencies of the Black Hills formed the Interagency Prescribed Burning Coordination Committee to unite in the promotion, use, and study of prescribed fire. The members included South Dakota Division of Forestry, U.S. Forest service, Custer State Park, Bureau of Land Management, South Dakota State University and the National Park Service.

After an extensive publicity campaign by the Committee and personal contacts with neighboring ranchers by the Park staff, prescribed fire was initiated at Wind Cave in September, 1973. The first burn was carried out to create a firebreak along roads in the eastern portion of the Park, which to some extent was also done in the interest of fostering better public relations. This was accomplished under the auspices of an Approved Negative Declaration. From this cautious beginning, prescribed fire continued through the 1970s coupled with research. By 1979, 1056 acres had been burned under prescription in the spring and fall months. In 1987, the Bison Trap prescribed fire consumed 2,460 acres and was the largest prescribed fire in Wind Cave National Park. Wind Cave and other public land management agencies of the committee have now adopted prescribed fire as an integral part of their land management efforts in the Black Hills.

Utilizing the criterion that a normal fire season is that period during which 90% of the fires occur, the fire records for 1960 to 2003 show a classic summer fire season of June, July, and August. However, by taking fire history into account, the fire season extends from mid April to October inclusive. It has not been uncommon for fires during the extremes of this period to burn 50 to 150 acres.

Approximately half of the total fires from 1960 through 2003 were Class A (1-25 acres) in size while only ten fires in the E, F, and G (300-999.9, 1,000-4999.9, and 5,000+acres respectively) Classes were recorded. It is interesting to note that only three lightning fires produced burns greater than Class C (10-99.9acres). The majority (15 of 21 or 71%) of Class D (100-299.9acres) and larger fires were man-caused. These statistics seem to indicate that:

- Human caused fires generally occur under severe weather conditions and are thus more destructive to the ecosystem and more difficult to control.
- Natural or lightning-caused fires usually ignite fuels under higher moisture conditions or in locales of sparser vegetation. The tendency for lightning to be associated with rain showers and for lightning bolts to strike points of higher elevation such as ridge tops might account for the lesser severity of these fires.

5. Wildland Fire Management Situation

a. *Historical Weather Analysis*

Weather information for the Park is collected through a Remote Automated Weather Station (RAWS) located on Elk Mountain within the Park and supplies the weather info for National Fire Danger Rating System (NFDRS) outputs. Fuel moisture content distribution shows maxima for live woody and herbaceous moisture contents during the summer when plants are actively growing. Dead fuel moisture contents show little fluctuation but reach minimum values during the late summer and fall months. Indicators of fire danger as computed through the NFDRS show that fire danger is highest when fuel moisture contents are lowest and when plants are not actively growing.

b. *Fire Season*

The fire season at Wind Cave National Park is generally the period from April 15 through October 30 each year, although large fires have frequently occurred in the months of February and March also. Park records do indicate a small number of fires have occurred in all other months. The April through October period represents situations from before spring green-up until after curing has occurred. Also during this time, climatic conditions are most favorable for ignition. The majority of annual rainfall is received during May and June, but severe thunderstorms can occur in July and August which are responsible for lightning caused fires.

c. *Fuel Characteristics*

Wind Cave National Park is a combination of mixed-grass prairie, pine/grass savanna, and ponderosa pine forest.

Fuels in the Park can be classified in four types in the National Fire Danger Rating System, Fuel Models L (western grasses), C (pine/grass Savanna) and U (Western Pines).

Fuel Models C and L are the predominant fuel types at Wind Cave National Park. The fuel is characterized by annual and perennial grasses, and fire behavior is best exemplified by fire behavior models 1 and 2.

Grassland fuels burn rapidly when dry. Most grassland plants are surface deciduous with aboveground parts dying back at least once each year, even in regions with seasonless climates. As a result, grasslands are particularly vulnerable to fires during stages when standing plant parts are dry and cured. Most species are xerophytic, often with stiff, scabrous leaves and rigid stems. Associated herbs also orient their leaves to minimize exposure to sun and air and reduce transpiration. Shoots produced after a fire have also been found to have a stiffer composition and more erect form than ordinary shoots. This rigid structure and erect nature not only helps to keep stems upright well after growth terminates, but also exposes the understory and soil surface to sun and wind. Conditions more conducive for combustion can result. Compaction of grassland fuels is nearly always conducive to fire propagation and seldom reaches the degree attained by heavier fuels, even after heavy snows or rains.

The remainder of the Park can be classified with Fuel Models C and U. Associated fire behavior is typically similar to fire behavior models 2 and 9. Though some of the Model U can be expected to demonstrate higher fireline intensity due to higher fuel loading associated with fire exclusion. Higher rates of torching and crowning in the pine could also be expected.

The effect of fire on ponderosa pine is generally related to tree size, fire intensity, and tree density. Low-intensity fires readily kill seedlings less than 12 inches in height. Larger ponderosa pine seedlings can sometimes survive heat generated by low-intensity surface fires, especially dormant season fires. Larger seedlings, saplings, and poles are only damaged by low-intensity fires. Beyond the pole stage, ponderosa pine is quite resistant to the majority of low intensity surface fires.

d. Fire Regime Alteration

The presettlement fire regime was one of generally light, frequent surface fires. These fires would kill some seedlings, saplings and pole sized trees. Dendrochronology studies (Brown and Sieg, 1996) indicate that following European settlement in the late 1800s, landscape scale fire virtually disappeared from the area.

Large-scale, anthropogenic changes in the Black Hills began with the discovery of gold in 1874, after which Anglo populations increased sharply and large quantities of timber were harvested to support growing towns and mining activities (Progulske 1974). Regulation of Black Hills forests began with the establishment of the Black Hills Forest Reserve in 1897 and the first timber sale from the national forest system in 1899. Since that time, nearly every hectare of Black Hills forests has been cut at least once (Ball and Schaefer 2000). Frequent, low-intensity fires also ceased in the late 1800s and early 1900s, probably the result of active fire suppression, logging, geographic fragmentation, and livestock grazing (Brown and Sieg 1996, McPherson 1997, Brown and Sieg 1999). The combination of intensive silvicultural management and suppression of fires has resulted in increased density and extent of ponderosa pine stands and decreases in understory productivity, extent of interior prairies and meadows, and species diversity (Progulske 1974, Progulske and Shideler 1983, Parrish et al. 1996). In some areas covered with high densities of ponderosa pine, understory vegetation has been replaced by a thick mat of pine needles. These changes have contributed to increases in frequency and severity of insect and disease epidemics, increased severity of wildfires, and decreased number of large, old trees (Weaver 1943, Wright 1978, Covington and Moore 1992, Arno 1996)

Fire cessation at the Park sites during recent decades has been most likely a direct result of active fire suppression efforts by the National Park Service and an indirect result of livestock grazing in areas adjacent to the Park that disrupted what formerly would have been landscape-scale fire events. If herbivory by bison in savanna areas at the Park during the twentieth century has been no heavier than it was in pre-settlement times, then shifts in the ponderosa pine forest-savanna ecotonal mosaic at the Park in recent decades are primarily the result of fire exclusion only (Brown and Sieg 1999). Recent prescribed fires in the Park killed numerous ponderosa pine trees that had established in what were formerly savanna areas (Bock and Bock 1984). This also suggests that twentieth century shifts in the ponderosa pine forest-savanna ecotone in the Park area are more the result of fire exclusion, and a return to historic patterns of fire regimes in this area may return the ecotonal mosaic to more of a pre-settlement configuration (Brown and Sieg 1999).

A number of human influences have affected the fire regime. Among the primary influences are forest product removal and grazing. In forested areas where natural fires have long been excluded, there has been a reduction in forest floor vegetation and a tremendous increase in pine regeneration. Fires burning through such pine stands often resulted in a situation that destroyed entire stands of pine rather than merely thinning them. Federal fire suppression policies instituted in the early 1920s also resulted in a strong protection ethic that allowed a buildup of fuel volumes resulting in fewer, but generally more severe fires such as the Jasper Fire at Jewel Cave National Monument in 2000.

Examination of fire scarred ponderosa pine at Wind Cave indicates that for the period 1820 to 1910 any given parcel of land within the Park had been burned over at least every 13 to 21 years. Fire frequency during that period increased up to the time when fire suppression efforts became effective. The exact reason for this increase in frequency has not been determined.

Early written records indicate that fire in the Black Hills and surrounding plains often continued for days and weeks and burned vast acreage. Records from the Park files illustrate that during the period 1910 to 2003, 70% of the fires originated from lightning strikes. In spite of this, only one-ninth as many acres were burned by lightning fires as by human-caused fires. Few lightning fires developed to beyond ten acres in size while a considerable percentage of human-caused fires did. These data point to the fact that the large fires that still occur from time to time are considerably different in nature from those that took place in pre-suppression times.

An examination of the Park's fire history, as determined through studies and historical records, points to the need to incorporate prescription burns in the management of both prairie and forest vegetation. Fire prescriptions should be designed, inasmuch as possible, to duplicate the effects of the natural fires that occurred in pre-settlement times.

e. Control Problems

Control problems can be expected on fires burning in the peak fire season. When continuous fuels and warm, dry, windy environmental conditions are encountered, high fire intensities, including the potential for crown fire and rapid spread rates can be achieved within a short time. In these situations, firefighter safety may dictate use of indirect attack suppression methods.

Many areas within the Park present hazardous conditions, such as steep slopes with unstable footing; densely wooded draws; and continuous fuels. Suppression activities in such areas must be carefully planned and executed.

f. *Values to be Protected*

See Section X. of this plan.

In addition to Section X, the following values need to be considered and protected.

1) Wildland urban interface

   All structures within the Park and private structures within ½ mile of the park boundary need to be identifed and protected in wildland fire situations.

2) Class 1 Airshed

   Due to the Class 1 Airshed designation of the Park, the air quality needs to be taken into account when dealing with smoke mitigation from wildland fires.

3) Park Infrastructure

   Roads, trails, utilities and other infrastructure within the Park need to be identifed and protected in wildland fire situations.

4) Archeological sites

   Archeological sites within the Park will be identifed and protected in wildland fire situations.

5) Cultural landscapes.

   The cultural landscape will be maintained to the extent possible as outlined in the Cultural Landscape Plan (May, 2005).

6) Fences

   Damage to boundary fences and other fences within the Park will be minimized and given priority during wildand fire situations.

IV. WILDLAND FIRE MANAGEMENT PROGRAM COMPONENTS

A. GENERAL IMPLEMENTATION AND MANAGEMENT CONSIDERATIONS

Fire Management strategies on the Park are directed to suppression of all wildlfires regardless of cause.

Wildland Fire Implementation Plan (WFIP) Stage 1 Initial Fire Assessment will be completed for each incident. The Stage 1 WFIP provides a the decision framework for selecting the appropriate management response. Operational management decisions are described in the WFIP. Specific WFIP requirements are outlined in Chapter 4 of the Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide. Since suppression is the only appropriate response in the fire management unit (FMU), the requirment for a decision checklist as part of the Stage 1 analysis is consdiered to be met. (WFIP forms-Appendix E. ; WFSA forms Appendix F.

1. Water Availability

Water supplies for fighting fires are basically limited to the Park water system and the Park water tender. There are two small streams (Beaver Creek and Highland Creek) that run above ground in the northern section of the Park. These streams, in general, are not large enough to be of any assistance in a wildland fire situation and are critical to wildlife. At the headquarters area, there are 4 sealed reservoirs totaling 650,000 gallons, and one tank in service seasonally with an additional 30,000 gallons. An 1,800-gallon Type 3 water tender is located at the fire cache.

2. Equipment

The Park currently has two Type 6 wildland engines and one Type 3 water tender in operation. The Park has sufficient supplies to equip a crew of 30 firefighters. The Park's fire cache contains four chainsaws, two Mark III pumps, various other pumps, and an all-terrain vehicle. The Northern Great Plains Fire Management Office prescribed fire trailer is also stored at the fire cache. The suppression tactics to be used include use of water or foam firelines in conjunction with natural barriers to reduce damage potential from suppression actions. Water will normally be supplied by engines operating from established roads and/or trails.

3. Personnel

The Park currently has 30+ firefighters meeting minimum NWCG qualifications, including a seven-person FIREPRO-funded fire crew. Availability of qualified personnel is one area that can be a problem. The Park has a commitment to have 4-5 qualified wildland fire personnel able to respond to fires, but that number is not always available at any one time and varies from year to year. Additional personnel can be ordered through Northern Great Plains Interagency Dispatch.

There are three primary management constraints that apply to fire suppression operations:

- The use of mechanized earthmoving equipment (tractor plows, bulldozers, etc) in suppression or prescribed fire operations must be authorized by the Superintendent.
- Engines will be restricted from areas identified as potentially affected by vehicle traffic where rutting, soil compaction or other habitat damage could occur.

- Handlines will be constructed only in areas where damage to archeological and/or historic resources is not likely to occur.

B. WILDLAND FIRE SUPPRESSION

Operational guidelines for managing fire-related activities vary, depending on the type of activity (prevention, pre-suppression, suppression, or prescribed fire) and on predicted and existing environmental conditions affecting fires at varying locations. This portion of the Wind Cave National Park Fire Management Plan details the operational procedures necessary to implement wildland fire management in the Park.

1. Potential Fire Behavior

The combination of grassland fuels, topography, and wind patterns in the Park generally result in wind-driven fires that move rapidly through fine fuels. Wind-driven head fires consume most of the vegetation, have rapid rates of spread, and frequently develop wide heads. These fire fronts often become irregular in outline as topography, fuel loads, winds, natural barriers, and developing fire storms speed up or retard movements. Head fires in dense fuels and tall grasslands have the capability to generate large flames. Wind blown embers can cause spot fires ahead of the main fire front and can contribute significantly to the rate of spread and difficulty in control attempts. Due to the normally high rates of spread, and relatively short duration of heat production, few long-lasting impacts to soils occur and key nutrients supplied by ash are quickly recycled into grassland communities.

Woody draws, confined primarily to north and east slopes, are usually small in size (generally less than 40 acres). Fire behavior in these stands can differ markedly from fires in grasslands. Spotting potential, and fire intensity are generally much higher in woody fuels. Monitoring and experimental burning are needed to better understand fire behavior in these pockets of woody vegetation.

The Park's fuels fall into Fire Behavior Fuel Models 1, 2 and 9. Fuel Model 1 is represented by grassland and grass/shrub combinations. Fuel Model 2 is represented by shrub and/or pine stands with an open grass understory. Fuel Mode 9 is represented by closed stands of long-needled pines such as ponderosa. The Park comprises approximatley 30 % ponderosa pine forest with understory and 70% mixed-grass prairie. The potential fuel behavior for average and extreme conditions are listed below.

Table 1. Fuel Model 1 - Average Fire Behavior.

Inputs		**Outputs**	
Fuel Model	1	Rate of Spread (chains/hour)	137
1 hour fuel moisture	6	Heat/Unit Area (BTU/ft^2)	91
Mid-Flame Wind Speed (mph)	6	Fireline Intensity (BTU/ft/s)	227
Slope(%)	10	Flame Length (feet)	5.5

Table 2. Fuel Model 1 - Extreme Fire Behavior.

Inputs		Outputs	
Fuel Model	1	Rate of Spread (chains/hour)	446
1 hour fuel moisture	3	Heat/Unit Area (BTU/ft²)	103
Mid-Flame Wind Speed (mph)	15	Fireline Intensity (BTU/ft/s)	844
Slope(%)	10	Flame Length (feet)	10

Table 3. Fuel Model 2 - Average Fire Behavior.

Inputs		Outputs	
Fuel Model	2	Rate of Spread (chains/hour)	64
1 hour fuel moisture	6	Heat/Unit Area (BTU/ft²)	498
10 hour fuel moisture	7	Fireline Intensity (BTU/ft/s)	580
100 hour fuel moisture	10	Flame Length (feet)	8.4
Herbaceous Fuel Moisture	30		
Mid-Flame Wind Speed (mph)	6		
Slope (%)	10		

Table 4. Fuel Model 2 - Extreme Fire Behavior.

Inputs		Outputs	
Fuel Model	2	Rate of Spread (chains/hour)	402
1 hour fuel moisture	3	Heat/Unit Area (BTU/ft²)	564
10 hour fuel moisture	4	Fireline Intensity (BTU/ft/s)	4153
100 hour fuel moisture	7	Flame Length (feet)	20.8
Herbaceous Fuel Moisture	30		
Mid-Flame Wind Speed (mph)	15		
Slope (%)	10		

Table 5. Fuel Model 9 - Average Fire Behavior.

Inputs		Outputs	
Fuel Model	9	Rate of Spread (chains/hour)	8
1 hour fuel moisture	6	Heat/Unit Area (BTU/ft²)	1218
10 hour fuel moisture	10	Fireline Intensity (BTU/ft/s)	182
100 hour fuel moisture	150	Flame Length (feet)	4.9
Mid-Flame Wind Speed (mph)	6		
Slope (%)	10		

Table 6. Fuel Model 9 - Extreme Fire Behavior.

Inputs		Outputs	
Fuel Model	9	Rate of Spread (chains/hour)	48
1 hour fuel moisture	3	Heat/Unit Area (BTU/ft²)	1470
10 hour fuel moisture	4	Fireline Intensity (BTU/ft/s)	1296
100 hour fuel moisture	7	Flame Length (feet)	12.2
Mid-Flame Wind Speed (mph)	15		
Slope (%)	10		

2. Preparedness Actions

Preparedness includes activities conducted before a fire occurrence to ensure the ability of the Park's fire management organization to initiate effective action. This action may include the evaluation of the situation and selection of appropriate suppression strategies. Preparedness activities include recruitment, training, planning, and organization, fire equipment maintenance and procurement of equipment and supplies. The objective of preparedness is to have a well-trained and equipped fire management organization in place to manage all fire situations that confront Wind Cave National Park managers.

a. Wildfire Prevention Program

A major goal of the Park fire management program is to reduce the threat and occurrence of human caused wildland fires. Prevention activities developed for specific areas include: education aimed at park visitors, employees, and adjacent landowners; engineering (or the use of appropriate equipment, methods, and projects); and enforcement of regulations aimed at preventing human caused fires. The Park Wildland Fire Prevention Plan is contained in Appendix G.

General activities identified through the analysis are summarized below.

1) Educational:
   - Educate park visitors and adjacent landowners about fire prevention regulations, appropriate prevention activities, and current fire danger ratings using media, signs, and verbal contact,
   - Educate park employees on fire prevention activities they can integrate into their jobs,
   - Work with cooperators to develop appropriate fire prevention messages for properties adjacent to the Park.
2) Engineering:
   - Provide and maintain fire prevention devices (e.g., spark arresters) on appropriate field equipment,
   - Monitor power lines or other potential sources of ignition on a yearly basis,
   - Evaluate park structures for flammable construction materials and the need for hazard fuel reduction work.
3) Enforcement:
   - Patrol and enforce regulations regarding campfires, smoking, etc., as appropriate.

b. Annual Training:

All training and qualifications of wildland fire personnel are based on the standards developed by National Wildland Fire Coordinating Group (NWCG) and may be found in the *Wildland and Prescribed Fire Qualification System Guide PMS 310-1*. Qualification standards for key fire program management positions are more precisely referenced in the *Interagency Fire Program Management Qualifications Standards and Guide.* Employee qualifications are tracked and archived through the Incident Qualifications Certification System (IQCS).

The Park goal is to have basic firefighter training and fitness testing for permanent employees completed prior to April 30th of each year and by June 30th for all others.

Advanced training will be coordinated through the Northern Great Plains Area (NGPA) Fire Management Office. Whenever possible, trainee assignments will be made to further develop skills.

Prior to and during the fire season, the NGPA Fire Management Office along with Park personnel will take the following measures to ensure adequate fire preparedness.

c. Annual Work Needed To Ensure Fire Readiness

Prior to and during the fire season, the Park staff with guidance from the Park Fire Coordinator will take the following measures to ensure adequate fire preparedness:

January 1 - April 30: Update and maintain accurate employee training and qualification records. Review Cooperative Agreements with surrounding fire management agencies. Prepare plans for any prescribed fire projects for hazard fuel reduction and resource management projects. Order fire cache supplies and replacement equipment as needed. Perform annual maintenance on fire weather station. Obtain necessary personal fire physical fitness evaluations. Provide updates or changes to cooperators for local and regional mobilization plans.

May 1 - June 15: Inventory fire supplies and equipment and update list. Inspect fire cache to ensure equipment is ready. Check operation of all engines and portable pumps. Outfit field vehicles, all initial attack personnel, and interagency crew participants. Review fire weather station observation, recording, and weather station equipment maintenance procedures. Review established procedures for utilizing suppression and emergency pre-suppression acounts. Evaluate the need for basic firefighter training and conduct if necessary.

June 16 - September 30: Maintain state of readiness as identified in the Step-Up Plan, (Table 7). Operate all portable pumps at least monthly.

October 1 - December 31: Critique fire season. Evaluate individual performance ratings of fire personnel and correct deficiencies and recommend training as needed. Review and revise Fire Management Plan as needed.

d. Fire Weather

1) Weather Stations – Wind Cave utilizes information provided by weather station 393505, Elk Mountain, Wind Cave National Park. Weather information is archived in the Weather Information Management System (WIMS) and available for parks use.
2) NFDRS- Wind Cave National Park uses NFDRS Model C (an open pine with grass understory), Burning Index(BI) as the trend monitoring index and fire danger prediction scale.

e. Step-Up Staffing Plan

Timely and safe response to wildfire situations involves prevention, detection, preparedness, and suppression activities. The scope of activities associated with each type of fire management action varies with changes in the risk of fires igniting and with the predicted fire behavior. This plan uses the Burning Index (BI), derived from the National Fire Danger Rating System (NFDRS) (Deeming et al. 1977), as an important measure for basing determinations regarding the scope and extent of fire management activities. Depending on the BI derived from the daily NFDRS/WIMS data, predicted fire danger is classified as low, moderate, high, very high, or extreme. A set of staffing classes which have a corresponding set of actions that the Park will initiate to meet potential fire danger has been developed and is presented below as the Step-up Staffing Plan.

Table 7. Step-Up Plan.

Staffing class	Burning Index	Actions
I (Low)	0 – 10	♦ Prevention – Fire Prevention activities can be grouped into three categories: in-Park activities, out-of-Park activities, and coordination with other agencies. During low fire danger situations, in-Park activities will represent the majority of the prevention activities. Visitors, upon entering the Park, will be instructed to restrict vehicle travel to constructed Park roads only; to make no open fires except in designated campgrounds and picnic areas and only in existing, constructed fire places; and to totally refrain from the use of any fireworks or explosives. ♦ Detection – Park personnel will carry out normally assigned duties. ♦ Get Away Standard (the goal for the length of time required to staff an engine)– None ♦ Preparedness – Park personel will carry out normal assigned duties
II. (Moderate)	11 – 20	*All Staffing Class-1 actions apply with further considerations noted below* ♦ Prevention - The in-Park and out-of-Park actions described above will be sufficient. ♦ Detection – Personnel to carry out normally assigned duties. ♦ Get Away Standard – 10 Minutes ♦ Preparedness – A minimum of one engine with 2 personnel will be prepared for operation. Fire suppression tools will be added to Park vehicles involved in field operations.
III (High)	21 – 42	*All Staffing Class-1 and 2 actions apply with further considerations noted below* ♦ Prevention – Visitor's will be visually warned of the level of fire danger and restrictions will be implemented against any smoking in the Park's backcountry. Out-of-Park activities may include notification to local media services of increasing fire danger. ♦ Detection – Personnel to carry out normally assigned field duties with special emphasis on fire detection. At the discretion of the Chief of Resource and Visitor Protection, one or more individuals may be assigned road patrol at set times during the day. ♦ Get Away Standard – 2 Minutes ♦ Preparedness – Initial attack crew of 3 personnel will be available. A minimum of one engine will be operable. Fire suppression tools will be added to all Park vehicles. The NGPA Fire Management Officer or the Park Fire Coordinator has the authority to increase the Staffing Class by one level if warranted by current and/or forecasted burning conditions.
IV (Very High)	43 – 51	*All Staffing Classes-1, 2, and 3 actions apply with further consideration noted below.* ♦ Prevention - Out-of-Park activities will be stepped-up to include notification of local and regional media services. Coordination with other agencies will increase in terms of both short and long range planning, public notification, coordinated prevention activities, and increased cooperation. ♦ Detection – Park personnel will carry on normally assigned detection duties. NGPA FMO or the Chief Ranger may designate one or more personnel to part or fulltime fire patrol. Fire patrols may be increased at the discretion of the NGPAFMO or Chief Ranger. The lookout tower may be staffed. ♦ Get Away Standard – 2 Minutes ♦ Preparedness – Preparedness overtime may be authorized by NGPA FMO, or Fire Program Coordinator if necessary to conduct these activities. An initial attack crew of at least 3 personnel, one of whom qualified as an ICT4, will will be available. All available engines and the water tender will be made fire-suppression ready. All Park personnel qualified and assigned fire suppression duties will be notified about the fire danger. Resource advisor(s) will be notified and availability determined. Dispatch may be staffed for extended hours. Automatic dispatch of the interagency helicopter to fires, if the helicopter is on contract, will be implemented. Notice will be forwarded to the cooperator offices of the very high fire danger condition. Daily availability of additional local and regional resources will be monitored. Temporary closures may be imposed upon areas in the Park or for certain activities in conjunction with similar impositions by adjacent land managing agencies.
V (Extreme)	52 +	*All Staffing Classes-1,2,3,4 actions apply with further consideration noted below .* Prepardness overtime may be authorized by Fire Mangement Officer or Chief Ranger if necessary to conduct the following activites. ♦ Prevention - Visitors to the Park will be verbally warned of the fire danger, all smoking on trails and in moving vehicles will be expressly prohibited, and no open fires or stove fires will be permitted anywhere in the Park. Daily notification of Regional Office FMO will be completed to enable public notification from that office. Cooperators will be continually updated in regard to conditions and opportunities for bans on open burning or related activities. ♦ Detection - Fire patrols will be increased in the number of personnel patrolling, in the frequency and in the extent of these patrols. The lookout tower may be staffed at the discretion of the FMO or Chief Ranger. ♦ Get Away Standard – 2 Minutes ♦ Preparedness – The Regional Office will be kept informed of current conditions. The locations of all work crews will be monitored and all on duty red carded personnel will be kept at a 10 minute call-up notice. Daily situation reports will reflect the fire danger situation. Neighboring FMOs, cooperators and other orgaanizations will be updated periodically regarding the situation. Consideration will be given to prepositioning additional local or regional suppression resources in the Park to supplement suppression capabilities. Fire information will be provided daily to visitors, cooperators, Regional Office, and local media.

Staffing action guidelines are based upon the National Fire Danger Rating System, Burning Index, Fuel Model C. Fire Season: 4/15-10/31. For these observations, the low fire danger rating equates with BI's ranging from 0 to 10; moderate equates with BI's ranging from 10 to 20; high ranging from 21-43; very high ranging from 43 to 51; and extreme with BI's of 52 and greater.

Actions to be taken with each level are discussed in the Step-Up Plan. Actions taken under staffing classes I - III are funded through the normal park budget. Normal Step –up staffing accounts can be established without approval from the Midwest Region FMO. However, when the Park does "step up" to SC IV and V, the Midwest Region Office should be informed. A Fire Severity request (usually brought about when extended, pronounced drought conditions exist) requires review and approval by the Midwest Region Fire Management Officer and severity accounts are established at the Midwest Region Office.

3. Wildland Fire Detection

Prompt and accurate reporting is essential to efficient fire suppression. All smoke and fire reports will be made to the Northern Great Plains Dispatch Center(GPC) and the Park's headquarters. The Park does not have a full time dispatcher. If a dispatcher cannot be reached, then a report will be made to the Chief Park Ranger or his/her designee and the Superintendent. To enhance communication with cooperators and the public, notification of cooperators' fire management offices and the local news media can also be made.

Park Rangers on road patrol and backcountry rangers and crews will look for new fire starts as part of their normal routine. These personnel are instructed to take fire reports from visitors and relay the pertinent information to the Park office. Further investigation may be necessary if park staff in the field cannot verify a reported fire.

Visitors and employees report most fires. Any park employee to whom a fire is reported shall obtain complete information regarding the following: location; fire behavior and smoke dispersal; approximate size; and name, address, and phone number of reporting party. If possible, have them remain in contact until the fire is confirmed and located.

During periods of high fire danger, the Park may staff the Rankin Ridge Fire Tower. Staffing can either be with existing suppression crew members or by assigning someone to serve as a lookout for an extended period of time.

4. Pre-Attack Plan

This is basically a checklist of items to be considered prior to wildland fire occurrence. The table is divided into four parts that correspond to four of the functions found in the Incident Command System and is found in Appendix H.. Items that are available at Wind Cave are marked as such.

5. Initial Attack

a. All suppression actions will be governed by consideration of human safety; availability of effective, appropriate equipment; and management objectives and constraints. Wind Cave National Park will initiate aggressive initial attack on all wildfires occurring within the Park. In general, the goals can be met most effectively and cost-efficiently by quickly evaluating each fire occurrence within the Park for location, spread potential and amount and type of force(s) needed for effective suppression, and providing rapid, aggressive initial attack for those fires to be suppressed.

Whenever fire is reported within Park boundaries, the following steps will be taken:

- Report of the fire to the Wind Cave National Park Headquarters with the Superintendent and Chief Ranger being notified.
- Nothern Great Plains Dispatch and Northern Great Plains Fire Management Office notified and a determination of location, legal description, and land ownership at the occurrence site.
- At least two or more Wind Cave National Park personnel will be dispatched to the location of the fire. Personnel dispatched will be qualified and equipped to undertake initial attack action.
- Immediately upon arrival at the fire location, an initial fire size-up (report of the fire size, behavior, environmental conditions, fuels, terrain features, existence of special hazards or threats to persons or improvements, and any other factors observed which requires immediate aggressive suppression could affect fire behavior and suppression efforts etc.) will be completed. This information will be reported to the Park Fire dispatch. These fire size-up observations will be immediately forwarded to Great Plains Dispatch in Rapid City, South Dakota and to the Chief Park Ranger. Additional resources will be ordered by the Incident Commander on scene through GPC.

Maps of developed areas, and cultural resources are avaialble at the Park headquarters.

b. Normally initial attack crews will be comprised of at least two persons fully equipped with personal protective equipment. A radio and tools such as rakes, back-pack pumps, etc., will be carried in all patrol vehicles. Additional gear may be provided by back-up personnel as needed. Small fires will be controlled, if possible by an initial attack handcrew. An initial attack crew on a larger fire will be reinforced by additional firefighters. If additional personnel or equipment are needed on the fire, the Incident Commander will notify the Park Fire Coordinator who will arrange for additional suppression forces and/or personnel to be available for initial dispatc

c. Confinement as an Initial Suppression Strategy-Confinement strategies may be used as the Park, if, in the opinion o fhte Initial Attack Incident Commander, direct suprression would put firefighters at risk due to terrain considerations, lack of adeqwuate IA staffing or other safety issues.

   If a confinement strategy is considered it should be supported by completeion of a Wildland Fire Implementation Plan (WFIP).

d. Response Times – For most fires, response time by NPS equipment and personnel will run up to 30 minutes depending on location of fire and responding personnel.

e. Management Constraints - The suppression tactics to be used at Wind Cave include use of water or foam firelines in conjunction with natural barriers to reduce damage potential from suppression actions. Water will normally be supplied by engines operating from established roads and/or trails. There are three primary management constraints that apply to fire suppression operations:

- The use of mechanized earthmoving equipment (tractor plows, bulldozers, etc) in suppression or prescribed fire operations is not authorized.
- Engines will be restricted from areas identified as potentially affected by vehicle traffic where rutting, soil compaction or other habitat damage could occur.
- Handlines will be constructed only in areas where damage to archeological and/or historic resources is not likely to occur.

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f. Local Issues – Close communication with local units of government, local landowners, Custer State Park, and the USFS should keep wildland fire controversy to a minimum.

6. Extended Attack and Large Fire Suppression

a. Extended Attack Needs – Based on the fire history, few fires will remain uncontrolled past the first burning period. Historically, most fires have been adjacent to roads in the area, easily accessed and quickly suppressed.
b. The GPC, will be informed of any fire activity at the Park. The GPC also processes requests for additional resources.
c. Implementation Plan Requirements – A Wildland Fire Implementation Plan (WFIP) will be required on initial attack fires as full suppression is established as the Appropriate Management Response. WFSA development will be required at the point when the check of fire spread is determined to be un-attainable during the second burning period. At this point a WFSA will be completed each day until the fire is surrounded by firelines or natural or other barriers that will stop fire spread.
d. Complexity Decision – When a WFSA has been completed for use during the operations on a second burning period, the fire will be considered to be an extended attack fire.
e. Based on the complexity and size of fire or fires, command will change from a type 5 to a type 4, 3, 2, or 1 as necessary.
f. Delegation of Authority – A sample limited delegation of authority to an Incident Commander.

7. Exceeding Existing Wildland Fire Implementation PlanWFIP

The WFIP will be periodically reassessed to determine if a change in strategy is needed.

If the fire is the result of an escaped prescribed fire, a Wildland Fire Situation Analysis(WFSA) will be completed and a new strategy selected based on the results.

If the initial attack management response was a confinement strategy, a WFSA will be completed and new strategy selected as appropriate.

8. Minimum Impact Suppression Tactics (MIST)

Minimum Impact Suppression Tactics (MIST) – Director's Order #18 states that: "Methods used to suppress wildland fires should minimize impacts of the suppression action and the fire, commensurate with effective control and resource values to be protected." (National Park Service 1999) The most effective rehabilitation measure is prevention of impacts through careful planning and the use of minimum impact suppression techniques.

Tactics to be considered:

- Bulldozers will generally not be used. However, their use may be authorized by the Superintendent during extreme wildland fire conditions.
- Engines will be restricted from areas identified where potential rutting, soil compaction or other habitat damage could occur. Exceptions must be authorized by the Superintendent.
- Fuels with high intensity and long burn durations along fire perimeters will be cut into manageable sections. To minimize ground disturbance, hand crews will first pick up the material before scattering it within the burn unit to reduce fire intensity. No material will be placed near known cultural sites.
- Fireline construction will be minimized by taking advantage of natural barriers, rock outcrops, trails, roads, streams, and other existing fuel breaks, and will not be constructed in areas where damage to cultural resources is likely to occur.
- Firelines will be the minimum width necessary to halt the spread of the fire and will be placed to avoid impacts to natural and cultural resources vulnerable to the effects of fire and fire suppression activities.
- Limbing along the fireline will be done only as essential for the suppression effort and for safety. If possible we will leave wood in place rather than dragging it to protect archeological sites.
- Unburned material may be left within the final line.
- Clearing and scraping will be minimized.
- Snags or trees will be felled only when essential for control of the fire or for safety of personnel.
- Where possible, on-site archeological clearance will be obtained prior to line construction.
- Retardant drops require Superintendent's approval.
- Use water drops where practical and effective.
- Minimize number of drops to what is essential for control of the fire.

9. Fire Rehabilitation

Possible rehabilitation needs include those associated with fireline construction, snag felling, road repair, fence replacement, and mop-up activities. Proper placement of hand constructed firelines should reduce the need for major work. Areas with handlines will be restored to their pre-fire condition as soon as possible. The nature of fires in the Park indicates that long term rehabilitation should not normally be necessary. If a Burned Area Emergency Rehabilitation (BAER) Team is required in the Park, an archeologist or cultural resource specialist and a natural resource specialist will be part of the team.

- The route to the fire from the nearest trail or road will be flagged. Flagging will be removed by the last person to leave the area.
- All equipment and debris will be removed from the area for proper disposal.
- Before closing the fire incident, rehabilitation will be completed to eliminate impacts from the suppression effort.

- Backfill cup trenches and scarify wide firelines.
- Construct waterbars to prevent erosion.
- Place "boneyards" of logs in a natural or random arrangement.
- Position cut ends of logs so as to be inconspicuous to visitors and camouflage where possible.
- Flush cut stumps, camouflage with soil and moss.
- Use existing campsites if available. Available space for visitors will always be the first priority. If existing sites are not available, select impact resistant sites that are a minimum of 200’ from water resources. Establish several small camps rather then one large one.
- Vary travel routes to the greatest extent possible to reduce impact.
- Minimize use of helispots and use natural openings for helicopter landings.
- Restore all helispots.

10. Wildland Fire Documentation, Reports, and Records

Individual Fire Reports (DI-1202) procedures are outlined in RM-18. Fire reports will be completed by the Incident Commander, submitted to the Fire Program Coordinator, and then forwarded to the NGPA Fire Management Office for approval and input to the National Park Service Shared Applications Computer System (SACS). Individual fire reports will be completed for Wind Cave National Park wildland fires, cooperative agreement fires, and all other fire responses, including all out-of-park fire assignments. Each wildland fire suppression documentation package will include the following:

- Wildland Fire Implementation Plan, Stage 1, 2, or 3 as required
- Individual Fire Report Form (DI-1202)
- Fire Weather Observations – Year-round
- WIMS forecasts (NFDRS indices and components)
- Incident Maps
- Narrative Summary (if appropriate)

The NGPA Fire Management Officer (FMO) is responsible for preparation of any annual reports dealing with fire activity. Such reports will be submitted to the Superintendent for approval and will remain on file in the NGPA Fire Management Office. Table 8 provides a list of reports and records required to implement and manage the Wind Cave Fire Management Program.

Table 8. Reports and Records Required to Implement the Wind Cave Fire Management Program.

RECORD/REPORT	FREQUENCY	RESPONSIBLE PARTY	DISTRIBUTION
DI-1202 Fire Report	Per Incident, w/I 5 days	IC	FPC, NGPAFMO
DI-1202 Computer Entry	Within 10 days	NGPAFMO	SACS
Fire Weather Records	Daily	NGPAFMO	Park
Fire Atlas	As Needed	FPC	Park
Wildland Fire Preparedness Review	Annual	FPC	Park, NGPAFMO
FMP revision and EA	5 years	FPC/NGPAFMO	Park, NGPAFMO, MWRO
Situation Report	As Needed	NGPAFMO	Park, , MWRO
Fire Danger/Staffing Class	Daily During Fire Season	NGPAFMO	FPC, Park
Wildland Fire Situation Analysis (WFSA)	Per Extended Attack Fire	IC, Supt	NGPAFMO, Supt, FPC
Rx Fire Plan	Per Rx Fire	Rx Fire Burn Boss, NGPAFMO	Supt, FPC, MWRO
IQCS updates and Red Cards	Annual	NGPAFMO	FPC, Park
Hazard Fuel/RM Project Accomplishment Reports	Per Project	NGPAFMO	Park, SACS
FIREPRO funding requests for Rx Fires	Annual	NGPAFMO	SUPT./ MWRO
Supplemental FIREPRO Budget Requests	Annual	NGPAFMO	FPO, SUPT. MWRO
Fire Reviews	As Needed	NGPAFMO	Park, FPC, MWRO
Fire Critique	As Needed	NGPAFMO, Park	Park

Abbreviations: NGPAFMO = Northern Great Plains Area Fire Management Office
MWRO = Midwest Regional Office
Supt = Wind Cave National Park Superintendent
FPC = Wind Cave Fire Program Coordinator
IC = Incident Commander
SACS = Shared Access Computer System (interagency fire database)
FIREPRO = Federal fire program

C. WILDLAND FIRE USE

Wind Cave National Park has a total of 28,295 acres. Due to staff limitations, small land management area, rapid rates of spread, long response times, valuable resources, and values at risk on neighboring lands, this plan does not recommend wildland fire use as a management option for the Park.

D. Prescribed Fire Program

1. Planning and Documentation

Prescribed fires are utilized as a tool to achieve management goals. Prescribed fire will reflect and support resource management objectives as stated in the Park's Draft Resource Management Plan (2003) and General Management Plan (1994) and Vegetation Management Plan (2005b). As outlined in the GMP, the long term goals of resource management and visitor protection are to maintain healthy plant and animal populations in harmony with the maintenance of natural plant communities (National Park Service 1994). The prescribed fire program will also facilitate the accomplishment of the resource management objectives listed in this plan.

To promote the overall fire management program, park management may use prescribed fires to create fuel breaks, reduce unnatural fuel loads, and reduce fire hazards around structures inside and adjacent to the Park, and along boundary areas. Prescribed fire may also be used in conjunction with mechanical hazard fuel reduction in order to burn fuels that accumulate from fuel reduction operations such as burn piles. Research burning may also take place when it is determined necessary for accomplishment of research project objectives.

Prescribed fire may be conducted anytime of the year, depending when the area to be burned is in prescription. The preferred time for burning will be during times of low visitation and potential fire intensity.

The Park has 21 units delineated as prescribed fire units. See Figure 3 for map.

These fires may be used whenever it is determined by resource management and fire management personnel that prescribed fires are necessary as a substitute for naturally occurring fires. Prescribed fire will also be used to restore fuel loading and vegetative composition to the natural conditions that existed prior to the beginning of fire exclusion within the Park. In addition, it will be used to restore fire as a critical component of the ecosystem.

Actions included in the prescribed fire program include: selection and prioritization of projects to be carried out during the year, prescribed fire plans, prescription preparation, documentation and reporting, and prescribed fire critiques. Measures to ensure successful implementation of prescribed fires will include: prescribed fire plans prepared by a qualified Prescribed Fire Manager (RXFM) or a Prescribed Fire Burn Boss (RXB1 or RXB2); prescribed fire plans will be reviewed by a qualified RXFM, RXB1, or RXB2 and a technical expert to verify the proposal in regard to fire behavior, fuel conditions, operational assignments, contingency plans, and safety; prescribed fires will be conducted by a qualified Prescribed Fire Burn Boss with qualified support personnel present to accomplish objectives; adequate number of personnel to monitor, control hot-spots and fires outside control lines, support ignition needs, and complete initial attack on escape fires. Prescribed fire plans will be approved and signed by the Park Superintendent. Outside support in the form of NPS prescribed fire management teams or interagency incident management teams may be requested for support in planning, implementation, or supplemental management stages.

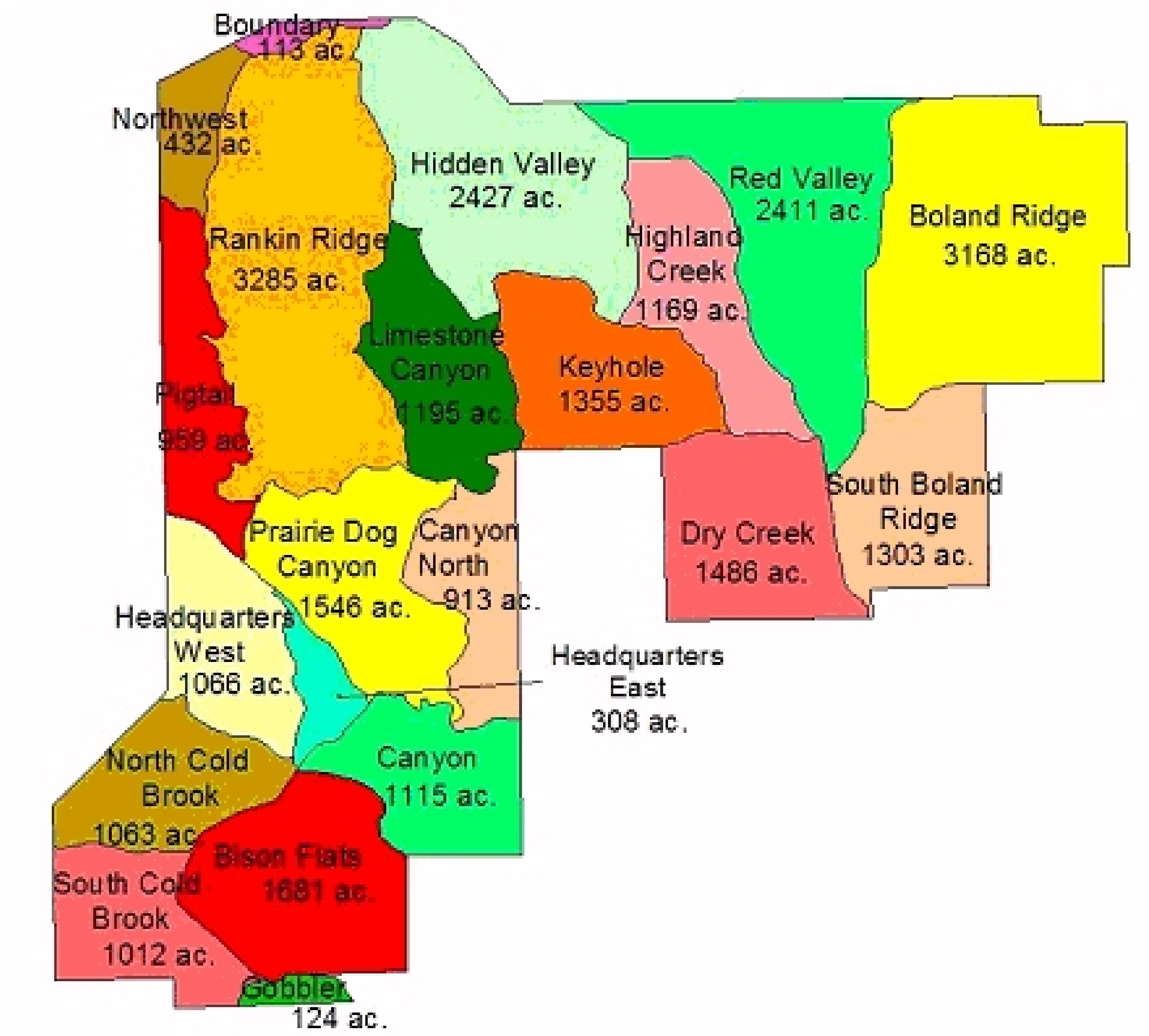

Figure 3. Wind Cave National Park Prescribed Fire Units.

a. *Annual Prescribed Fire Plan*

Prescribed fire may be used throughout Wind Cave National Park to accomplish resource management objectives as outlined in this plan. The Fire Program Coordinator will prepare the annual prescribed fire plan with assistance from the Assistant Fire Management Officer (AFMO), the Resource Managment Division Chief, and the fire ecologist. The program will detail all burn projects proposed for the coming year and will specify objectives of each burn. The program plan will be submitted to and reviewed by the Superintendent for approval.

The Fire Management Officer will recommend a Prescribed Fire Burn Boss for each specific planned fire. The Fire Program Coordinator and Burn Boss will conduct a field reconnaissance of proposed burn locations with park staff to discuss objectives and special concerns and to gather all necessary information to develop the Burn Plan. After completion of field reconnaissance, a prescribed fire plan will be developed.

Individual Prescribed Fire Plans- The individual prescribed fire plan is a site specific action plan that describes the purpose, objectives, prescription, operational procedures, contingency actions, monitoring actions, and safety concerns involved in prescribed fire preparation and implementation. The treatment area, objectives, constraints, and alternatives will be clearly outlined, and no burn will be ignited unless all prescriptions in the plan are met. The factors considered in all prescribed fire plans are described in DO-18. Prescribed fire plans will be prepared by a qualified burn boss, with technical assistance provided by the Northern Great Plains Area Fire Management Office. All plans will be reviewed by the NGPA Fire Management Office, Midwest Regional Office Fire Management staff and approved by the Park's Superintendent.

The ten-year prescribed fire schedule is included in Appendix. I. Additional prescribed fire projects may be added to either a) conduct specific exotic species control, particularly adjacent to roadsides, and b) to simulate natural processes within the Park.

b. Prescribed Fire Objectives

The objectives support the Park’s General Management Plan (1994) and the Resource Management Objectives listed in Section II.D. Prescribed fire will be used to perpetuate native plant and animal species and communities, to eradicate and minimize the opportunity for encroachment of exotic plant species, and to reduce hazardous fuel accumulations.

The primary reason for prescribed fire is to restore and maintain the Wind Cave National Park ecosytem to the condition existing prior to pre-fire suppression times. By doing this it will also have the added benefit of protecting the Park and surrounding resources from catastophic wildfires which could occurr.

c. Prescribed Fire Operations

Prescribed fires shall be conducted under the direction and control of a Prescribed Fire Burn Boss designated by the Park and the Northern Great Plains Area FMO. The project Burn Boss will be certified for that position according to standards currently utilized by the National Wildfire Coordination Group. All positions required to conduct the prescribed fire will be filled with qualified personnel. All personnel listed in the plan must be available for the duration of the burn or it will be postponed.

Operational guidelines, allowable ranges of fire behavior and allowable ranges in weather conditions shall be specified in the prescribed fire plan drafted for each prescribed fire project. Each prescribed fire project shall include monitoring and evaluation as part of the project. This monitoring and evaluation must be a continuous activity during the actual burn operation. Its purpose is to ensure that the ongoing fire behavior and weather conditions remain within the prescribed fire plan parameters. The individual responsible for the ongoing fire monitoring/evaluation shall keep the project Burn Boss informed of significant changes that might result in changes of fire behavior or damage to resources.

When all prescription criteria are within the desired ranges, the Prescribed Fire Burn Boss will select an ignition date/dates based on current and predicted weather forecasts and available resources. If possible all personnel and equipment will be assembled on the day prior to the planned ignition date. A thorough briefing will be conducted stressing personnel assignments, resource placements, contingency actions, and safety concerns and measures to mitigate these concerns. Assigned personnel will be qualified and competent, and will know the locations of sensitive areas to be excluded from treatment. A current spot weather forecast will be obtained on the day of ignition, and all prescription elements will be rechecked to determine if all parameters are within the desired ranges. If all prescription criteria meet the planned ranges, a test fire will be ignited to determine on-site fire behavior conditions. If these conditions appear satisfactory and consistent with the plan, the fire will continue. If the test fire indicates the fire behavior to be outside the desired ranges, the test fire will be suppressed and the main burn will be postponed until conditions are more favorable.

The Prescribed Fire Burn Boss will, at a minimum, be a qualified Incident Commander Type IV (ICT4). An Incident Commander Type III will be available within a one-hour response time of the project. In the event a prescribed fire escapes the assigned holding resources, ignition of the prescribed fire in progress will cease. The on-scene ICT3 or ICT4 will then assume control of the escaped fire and take appropriate suppression actions as discussed in the pre-burn briefing and identified in the contingency planning of the burn plan, while the Prescribed Fire Burn Boss continues management of the prescribed fire. If the prescribed fire does escape the predetermined area, suppression efforts, as discussed in the preburn briefing and identified in the contingency plan, will be initiated. The Superintendent, Fire Program Coordinator and NGPA Fire Management Office will be notified immediately of the current escape and prescribed fire status. If an escaped prescribed fire declaration has been made, the project cannot return to a prescribed fire designation. For all escaped prescribed fires converted to wildland fire status, a Wildland Fire Situation Analysis will be prepared and appropriate resource orders will be placed.

d. *Fire Behavior and Fires Effects Monitoring*

Operational guidelines, allowable ranges of fire behavior and allowable ranges in weather conditions shall be specified in the prescribed fire plan drafted for each prescribed fire project. Each prescribed fire project shall include monitoring and evaluation as part of the project. This monitoring and evaluation must be a continuous activity during the actual burn operation. Its purpose is to ensure that the ongoing fire behavior and weather conditions remain within the prescribed fire plan parameters. The individual responsible for the ongoing fire monitoring/evaluation shall keep the project Burn Boss informed of any and all changes which might result in the fire exceeding the prescribed fire plan parameters. Monitoring methods are found in the Fire Montioring Handbook (NPS2003c).

Weather and fuel moisture conditions must be monitored closely in planned burn units to determine when the prescription criteria are met. Weather data will be gathered for 30 days prior to burn implementation to enable calculations of fuel moistures, energy release component, ignition component, and burning index can be completed. Fuel moisture samples of dead fine fuels, fine dead woody fuels (if appropriate), and live fuels will be collected, weighed, oven dried, and percent moisture contents calculated to assist in determining when conditions are consistent with the prepared prescription. This fuel moisture testing will occur at the designated locations in the Park.

Prescribed fire can be successfully used to return fire as an ecosystem process and to move plant communities toward more desirable compositions. Prescribed fires will be used at Wind Cave to meet a number of resource management objectives. Monitoring is used to help write measurable objectives and then observe if these objectives were met. For example, the Park is going to use fire to promote hardwood regeneration in woody draws. Monitoring will measure what species are regenerated and how much regeneration has taken place over what period of time.

The Park will use the protocols in NPS Fire Monitoring Handbook (2003c) to examine short and long-term fire effects. More details about this program will be found in the Fire Effects Monitoring Plan (Appendix J).

e. *Critique of Prescribed Fire Operation*

The Superintendent or the Fire Management Officer shall convene an After Action Review for any prescribed fire. A report detailing the actual burn will accompany any recommendations or changes to the program identified. The report will be submitted to the Superintendent, the NGPA Fire Management Officer, Regional Fire Management Officer and other NGPA parks for review. The following items, as a minimum, will be reviewed following each prescribed fire operation.

- What worked well?
- What could have been improved?
- Were any unsafe acts noted?
- Were burn objectives met within an acceptable range of results?
- What should be done differently to obtain desired results or get better results?
- Was there any deviation from plan? If so, why?
- Was prescription appropriate?
- Were weather changes a factor?

f. *Prescribed Fire Documentation and Reporting*

All prescribed fire documentation will be completed by the Prescribed Fire Burn Boss and/or the Fire Management Officer. Fire monitors will collect all predetermined information and complete all necessary forms prior to, during, and after the fire. All records will be archived in the Park's fire records and stored in the WICA fire managmeent files and copies at the Northern Great Plains Area office, for future use and reference.

g. *Fuel Treatment History Maps*

After all prescribed fires or other fuel treatments information will be updated to the Historic Fuel Treatment Map file. Current fuel treatment history map located in Appendix K.

h. Park Specific Prescribed Fire Plan Requirements

All prescribed fire plans will at a minimum contain the following information (outline in RM-18 Chapter 10.):

Signature Page
Goals and Objectives
Risk Management
Project Complexity
Organization
Pre-Burn Considerations
Prescription
Ignition and Holding Action Plans
Wildland Fire transition Plan
Protection of sensitive features
Public and firefighter safety
Smoke management
Public Notification
Monitoring and Evaluations
Rehabilitation

A sample of a burn plan is located in the Appendix L.

2. Exceeding Existing Prescribed Fire Burn Plan

In instances where the Wildland Fire Transition Plan is implemented, a WFSA will be completed and an appropriate management response will be initiated based on the WFSA.

3. Air Quality and Smoke Management

National Park Service fire management activities that result in the discharge of air pollutants, (e.g., smoke, carbon monoxide, and other pollutants from fires) are subject to and must comply with all applicable federal, state, interstate, and local air pollution control requirements. These requirements are specified by Section 118 of the Clean Air Act, as amended (42 USO 7418). It is not the primary intent of the Clean Air Act to manage the impacts from natural sources of impairment (i.e. wildland fire use and wildfires). Smoke from these fires is an inevitable by-product. Fires are not considered point sources of emissions, but tend to be spatially distributed singular events, and temporary impacts to visibility and visitor enjoyment must be recognized, expected, and managed. This may include temporary closures or warnings during the progress of management approved prescribed fires.

Wind Cave National Park will comply with Air Quality-Smoke Management Guidelines listed in DO-18. The fire management program will be in compliance with interstate, state, and local air pollution control regulations, as required by the Clean Air Act.

Wind Cave National Park has been classified as a Class I Area under the National Clean Air Act of 1977 (42 USC 7401 et seq.). Under this designation, very little additional air pollution is permitted in the vicinity of the Park beyond baseline levels of certain pollutants – particulate matter, sulfur dioxide, and nitrogen dioxide. Historically, air quality has been considered excellent. Smoke from fire activities may impact air quality for short periods of time, but would not have lasting effects on the Park, resources, or the local area.

The procedure for compliance will be:

- The Fire Program Coordinator will contact local and state authorities to ascertain all procedures prerequisite to compliance with regulations or permits. A copy of the prescribed fire plan will be forwarded to the appropriate authorities, if necessary.
- The Fire Program Coordinator will obtain any necessary permits or ensure in writing that regulatory requirements will be met. An example is a county or state burn ban is in place and although unlikely it is determinded to go ahead and have a prescribed burn.
- Prescribed fires will be conducted only on days that are acceptable based on good or higher smoke dispersal criteria stated by the National Weather Service to the permitting agency.
- All prescribed fire plans will have clear objectives and will monitor impacts of smoke on the human and natural environments.
- Prescribed fires ignited in proximity to structures will only be ignited during periods of low visitation and if the prevailing winds will carry the smoke away from the structures.
- Current and predicted weather forecasts will be utilized along with test fires to determine smoke dispersal.
- Personnel from permitting agency will be allowed on-site during prescribed fires for observational purposes if necessary for their agency needs. These individuals must be escorted unless they have red card credentials and IC approval.
- Smoke from wildfires or prescribed fires of long duration may affect smoke sensitive areas off site. These off site effects could cause health problems for persons with chronic respiratory problems, impair fire detection, impair visibility, and impact airsheds to the point that other fire activities may be curtailed.

Considerations useful in managing smoke from longer duration fires include:

- Develop contingency plans to limit smoke production if the need arises (may involve suppression on portions of the line).
- Establish and maintain close communication with state and local air regulatory agencies regarding status of such fires.
- Monitor smoke plumes as appropriate to provide advance warning of deteriorating air quality conditions.
- Inform the general public of status of such fires, including smoke management contingencies, through the local news media.
- Consider suppressing RX fires when necessary for smoke management reasons, even though these fires may otherwise be in prescription.

Smoke sensitive areas within the Park include Highways 385, 87, NPS-5 and 6 and State Highway 79 to the East of the Park. Impacts of smoke on visibility will be monitored. If smoke is creating a hazard, appropriate action will be taken. This action may include warning signs and lights, information dispensed by patrol rangers, and closing of roads as a last resort. Closing of roads will involve cooperation with the City of Hot Springs, Fall River and Custer county and state law enforcement and DOT.

E. Non-Fire Fuel Treatment Application

Mechanical treatments, including thinning with chain saws, chipping, piling slash, track or wheeled equipment (could potentially be used when ground is snow covered and frozen, but must be authorized by the Superintendent), and burning slash piles may also be used as needed in the Park. These could be tools used to meet the objectives specified earlier in this plan.

See Appendix M. for the Non-Fire fuel Treatment Plan and a complete list of other treatment alternatives.

The Park will implement a combination of treatments to reduce forest closure and hazardous fuels through a program of manual and mechanical thinning with the creation of brush piles to be burned when conditions permit. Operations are proposed to commence with the completion of the fire management plan.

Non-fire fuel treatments will be achieved using a combination of park hand crews and, potentially, contracted resources from the local area, when funding is available. Project debris generated by park staff or contractors will be removed as part of contract agreement. Otherwise debris will be piled for burning at a later date. The details of hiring contract labor will be handled by the NEKOTA Contract Specialist and oversight will be provided by the park staff.

These treatments will result in the reduction of canopy in forested areas, utilizing the full range of these prescriptions while implementing this plan to maintain heterogeneity on the landscape. The goal is to achieve conifer stands that are widely spaced with varied age/size class distributions (including seedling, sapling, pole, mature, old growth, and snags). Individual stands should have a ponderosa savanna appearance of open ponderosa and grassland mosaics, in relative small patches (between 0.20-40.0-acres in size). For the most part, trees within stands will have wide and random spacing, including forest regeneration with seedling areas that are thin and widely spaced. However, some pockets of thick, dense conifer will be retained. Small pockets of regeneration would occur along meadow/prairie edges, but these will be the exception, as conifer regeneration within grasslands would be discouraged.

The following perscription will be used for mechanical treatments:

- Thinning and pruning will occur within all forested burn areas of the Park, but will target those areas planned for prescribed fires on a priority basis.
- Only upland thickets will be treated; no riparian areas will be cut.
- Cutting will be primarily by hand (i.e., brushsaw, chainsaw, weedwhip, lopper or hand pruners), but mowers and feller-bunchers may have certain applications. Brush saws will not be utilized as a wand to remove swaths of seedlings, but on individual trees.
- All cut material greater than 2 inches dbh will be cut into segments of less than 18 inches to reduce habitat for beetle infestation.
- When feasible, material will be utilized as firewood, fencing material, chipped mulch or other forest-based product. When not feasible, the cut material will be gathered and piled for burning when conditions permit. Pile dimensions will be kept to a minimum and will be placed in areas that allow safe burning at a later date. Materials would be hand-carried to the burn piles. After burning, piles will require mixing of the soil in the top few inches and a liberal application of an approved seed mix to minimize the invasion of weeds. No material will be placed near known cultural sites.

- No trees over 20 inches dbh will be cut and no yellow-barked ponderosa will be cut.
- Aspen and other hardwoods will not be cut.
- Snags larger than 6 inches dbh will be left standing, unless removal is required to maintain treatment objectives or for safety purposes.
- All stumps will be flush cut as close to ground level as possible. The tops of stumps will be scored and covered with proximal debris to facilitate rapid deterioration.
- Residual trees will be pruned of branches – both dead and green – to a minimum height of 5 feet above the ground.
- Only existing roads will be used; no new roads will be constructed.

Fuels reduction has the following probable benefits:

- Potential to create partnerships with adjoining local stakeholders while allowing the Park to fulfill its land management objectives.
- Placing fuels treatments within the Park reduces the threat of catastrophic wildfire to both the public and firefighters who may engage in fire suppression activities.
- By accomplishing fuels treatments the Park gains significant potential to continue the use of prescribed fire in the restoration of natural fire regimes in what were previously fire adapted ecosystems.
- It is believed that this project again will represent a critically important step forward towards a return to overall ecosystem sustainability and community support for future programs.
- Reduction of forest closure will return the area to more natural ecological conditions, which will in turn benefit wildlife by creating a wider variety of habitat, increase forest edge habitat and reduce the amount of transpiration.

The reduction of fuels within the Park has potential to create impacts on park resources intended to be managed in as near natural condition as possible. These impacts include cutting activity, noise, and brush pile accumulation. These impacts are expected to be short-termed.

Annual Goals

Acres accomplished through fuels reduction range in difficulty due to the spatial variation of the fuels across the landscape. While some areas are dominated by dense, small diameter trees with heavy dead and down fuel concentrations, other areas have only sparse fine fuels that require little to no treatment. The treatment prescription will be applied consistently across all target areas and some areas will be completed more rapidly than others, but areas planned for prescribed fires will be treated on a priority basis.

Seasonal Use Restrictions

The following described measures (project design specifications) would be incorporated into the proposed action to mitigate anticipated environmental impacts from implementation of the proposed action.

1. **Wildlife**

   a) *Bald Eagle.* No potential perch or roost trees would be affected as no work would occur in riparian zones. If bald eagle activity does occur within one mile of the project areas during implementation, then work hours would be restricted to between 9 am and 3 pm, or recommended time period for reducing the potential effects from noise.

   b) *Black-tailed prairie dog.* No potential habitat would be adversely affected as this project is intended to reduce encroachment of trees into the mixed-grass prairie, thereby benefiting prairie dog habitat.

c) *Neotropical Migratory Birds.* To reduce potential effects to neotropical migratory birds, no fuels reduction work would occur within a 100-foot riparian buffer. Prior to work in proposed fuel reduction areas, surveys will be conducted to determine use by neotropical migratory birds and appropriate seasons of work within those areas will be established. The time periods to reduce disturbance will be the breeding / nesting / fledgling period.

2. Vegetation

a) *Threatened and Endangered species.* There are no endangered and threatened plant species potentially occurring in the project area. Four South Dakota Natural Heritage Program listed plant species occur within the Park, and several additional state-listed plants occur in areas adjacent to the Park.

b) *Noxious Weeds.* In order to minimize the potential for the spread of noxious weeds:
   - No mechanized equipment (excepting chain saws, and weed whips), would leave existing roads, unless authorized by the Superintendent.
   - Cut material would be hand carried to the piles to minimize duff disturbance and exposed soil.
   - After burning, brush piles will have the top few inches of soil mixed by rake, drag, or disc, and liberally seeded with an approved seed mix.

3. Insects

a) *Mountain pine beetle.* The mountain pine beetle (*Dendroctonus ponderosae*), is a native insect affecting pines, particularly ponderosa. In general, these beetles prefer dense stands of large-diameter, mature and old-growth forests. Areas of such habitat is at greater risk of epidemic, than forested areas that include a mixture of age classes (either between stands or within stands) and tree species. Risk increases the closer the forest resembles an even-aged, pine monoculture of large trees with a closed canopy over a large area. An important strategy in mountain pine beetle management is the recognition and prevention of susceptible stand conditions that may lead to epidemics (US Forest Service 2000a).

b) *Ips sp. Ips* are bark beetles that can attack and kill sapling, pole-sized pines and the tops of larger pines. However, they prefer fresh downed wood or logging slash (diameter > 5 cm or 2 in.) or damaged and severely weakened trees. Research indicates that *Ips* adults prefer horizontal logs.

   1) The following constitute conditions which may promote *Ips:*

      a. Drought conditions, particularly in the spring, can lead to tree mortality by *Ips*.
      b. Managed stands following thinning or prescribed fire where an abundance of green slash has been created, especially in areas where these actions have been repeated on an annual basis.
      c. Natural disturbances such as windthrow and snow and ice damage.
      d. High-density, sapling- and pole-sized stands.

   2) Measures to prevent or minimize *Ips:*

a. Thin tree density, especially in very dense young stands and decadent old-growth stands.
b. Monitor green slash and standing trees for evidence of *Ips* attack, particularly during the April to July period and especially in those areas where management activities, such as thinning or prescribed fires have occurred. Should abundant evidence of *Ips* activity be located, consultation with a pest management specialist should be undertaken.
c. Creation of green slash between January and June should not be done, as slash created during this time period is excellent habitat for *Ips*. If slash production must be done during this time, material greater than 2 inches in diameter should be destroyed as soon as possible by burning, chipping, crushing, debarking, burying, spreading to dry in the sun, or piling under a clear plastic tarp in a sunny location.
d. Avoid continuous annual management activities in adjacent areas by separating management activities by two miles or more.
e. In areas that have trees of high value, removal of injured and diseased trees, with prompt disposal of slash is important (US Forest Service 2000b).

Long-Term Monitoring

1. **Monitoring Plan.** Monitoring of this work will be outlined in the Fire Monitoring Plan.

2. **Standards.** Standards against which success in achieving the Park's objectives can be measured

   a) Achieve the desired canopy closure for all forested aspects throughout the Park.
   b) Placement of prescribed fire in all prescribed fire management areas of the Park on normal fire return intervals in a safe and efficient manner.

F. *Emergency Rehabilitation and Restoration*

Because of the rapid post-burn re-growth of the grassland communities in the Park, emergency rehabilitation and restoration is not expected to be needed for any aspect of the fire program. However, in the event emergency restoration is needed, Burned Area Emergency Rehabilitation (BAER) plans and funding requests must be submitted to the Regional Fire Ecologist within five (5) calendar days following control of a wildfire. BAER plans shall follow the standard format as outlined in the draft DOI BAER Handbook, and will identify the cost of initial damage assessments and mitigation actions, and estimate the scope of follow-up phases of work expected to result from initial assessments. Initial damage assessments should be as thorough as possible so that critical mitigation work can be completed before damaging rainfall events occur. Delayed assessments are inappropriate if a true emergency exists, and reduce the chances that mitigation treatments can be accomplished within the funding time constraints.

The National Park Service will continue to utilize the least intrusive and least resource damaging methods to manage wildland fire, and the least intrusive BAER actions required to mitigate actual or potential damage caused by wildland fire. In natural areas, natural recovery of native plant species will continue to be the preferred action, except in rare circumstances. Seeding or planting non-native or even native species produces unnatural changes in success -ional patterns and vegetative communities and should be used only as last resort to prevent erosion damage or to combat invasion of non-native species.

V. ORGANIZATIONAL AND BUDGETARY PARAMETERS

The operation of a fire management program requires the coordination of numerous people with different duties. It is critical that the organization and responsibilities are clearly delineated. This section describes the key Park personnel involved in fire management, delineates the chain of command, discusses responsibilities, and recommended qualifications.

A. FIRE MANAGEMENT ORGANIZATION AND RESPONSIBILITIES

Park Superintendent

- Responsible for overall operation and management of the park, ensures that Department, Service and park policies are maintained and followed.
- Secures funds and personnel needed to meet the objectives of the park's Fire Management Program.
- Responsible for overall fire prevention within the park.
- Signs Go/No Go checklist for each prescribed fire.
- Signs verification forms for fuel management activities.
- Ensures that all park divisions support the team effort to maintain a fire management program.
- Approves Fire Management Plan and all burn plans.
- Responsible for implementation of the Fire Management Plan.

Chief Park Ranger

- Has overall supervisory responsibility for Park-related law enforcement and search and rescue emergency operations, as well as the integration of fire management activities as the Fire Program Coordinator (FPC) with other emergency operations.
- He/she supports the fire program by making personnel available for park fire operations, out-of-park fire assignments, and fire training to the extent possible.
- Annually reviews and revises (as necessary) this Fire Management Plan prior to commencement of the normal year fire season, and coordinates with the Chief of Resource Management to ensure that the planned actions and activities support and implement the Park's Resource Management Plan. Coordinates, with the NGPA Fire Management Officer, fire prevention activities, wildfires, prescribed fires, and post-fire activities occurring within the Park. Maintains equipment and supply caches adequate to undertake initial attack actions on fires occurring on parklands, ensuring that all equipment and supplies are in good working condition. Determines fire qualifications and training needs of all Park personnel who are to be made available for fire duties and informs the NGPA Fire Management Officer of this information.
- Coordinates the implementation of this Fire Management Plan with other governmental agencies administering adjacent lands and with local landowners. Develops and implements cooperative fire management agreements with other federal, state, and local agencies and with the local landowners.
- Supervises the Park fire staff including two permanent employees and a seasonal fire crew of five and oversees the Park fire cache.
- Ensures fire preparedness; maintains readiness for two type six engines throughout the year; notifies maintenance staff of equipment and vehicle repair needs via work requests; maintains fire cache; manages FIREPRO budget; requisitions fire equipment; utilizes support funding to the benefit of the park.

- Administers work capacity tests, coordinates physical exams, submits documentation to NGPAFMO; ensures firefighters are issued red cards from NGPAFMO correctly and in a timely manner.
- Ensures all documentation for park fires (including DI-1202 reports) is completed and provided to NGPAFMO for input into the national database.
- Coordinates with the NGPAFMO to plan and implement prescribed fires under the Fire Management Plan; assists NGPAFMO in writing prescribed fire plans.
- Coordinates park personnel dispatches for in- and out-of-park fire assignments with NGPAFMO and Northern Great Plains Interagency Dispatch Center.

Chief of Resource Management

The Chief of Resource Management has responsibility to develop vegetation management objectives for the Park, including identification of areas of potential benefit from prescribed fire, develop prescribed fire objectives, and evaluate post-burn fire effects. Works with Fire Program Coordinator to ensure planned actions and activities support and implement the Park's Resource Management Plan and hazard fuel reduction projects.

Chief of Interpretation

The Chief of Interpretation has the responsibility to ensure that the protection of the Park's cultural resoucres are provided for in all fire related activites. Provides basic fire program information to park staff and visitors. Ensures that accurate information is incorporated into park publications, interpretive ranger programs, and exhibits. Will function as the Park's Fire Information Officer.

Fire Management/Suppression Personnel

These include all Park personnel, whether permanent or seasonal, who are qualified to be involved in wildland fire activities and who are fully equipped with proper personal protective equipment and gear. As a minimum, have taken and passed the minimum classroom training and met physical fitness standards required of NWCG-qualified firefighters and support personnel. Undertake fire management duties as assigned by the qualified Incident Commander on each suppression action or by the Prescribed Fire Burn Boss on each prescribed fire project.

Northern Great Plains Area Fire Management Office

The Northern Great Plains Area Fire Management Office (located at Wind Cave National Park) was established to provide guidance and technical support for participating national park units (Wind Cave NP, Jewel Cave NM, Mount Rushmore NMem, Devils Tower NM, Scotts Bluff NM, Agate Fossil Beds NM, and Badlands NP). The following are the key positions associated with this shared office and their responsibilities in the Wind Cave NP Fire Management Program.

Fire Management Officer (FMO):

- Responsible for overall safety of the Fire Management Program.
- Coordinates fire management activities within the Northern Great Plains Area (NGPA), providing technical assistance and advice to the park as needed. Reviews and advises the Superintendent on requests for fire emergency assistance, operational activities required for the implementation of this Fire Management Plan, and completeness and correctness of all final fire reports.
- In cooperation with the Superintendent, is responsible for assisting and

coordinating the park's fire management program. This responsibility includes coordination with the Fire Program Coordinator (FPC) on all prevention, pre-suppression, detection, prescribed fire, suppression, monitoring, and post-fire activities involving park lands. Submits budget requests and monitors FIREPRO funds allocated to Wind Cave National Park.

- Nominates personnel to receive fire-related training as appropriate.
- Coordinates the implementation of the Fire Management Plan with other governmental agencies administering adjacent lands and with local landowners. Develops and implements cooperative fire management agreements with other federal, state, and local agencies and with the local landowners.
- Coordinates, prioritizes, and submits all FIREPRO funding requests for fire program activities. Reviews all burn plans and Fire Reports (DI-1202).
- Approves/certifies Red cards and Task books.

Assistant Fire Management Officer (AFMO)/Prescribed Fire Specialist:

- In cooperation with the park Fire Program Coordinator and Fire Program Manager, develops short and long-range plans for prescribed fires
- Responsible for coordinating development of Prescribed Fire Plans for individual projects.
- Makes entries into National Fire Plan Operations and Reporting System (NFPORS) database for prescribed fire and fuels treatment planning.
- Coordinates preparation and implementation of prescribed fire and fuels treatment projects.

Assistant Fire Management Officer (AFMO)/Training and Suppression:

- Serves as Safety Officer for the Fire Management Program.
- Ensures all park fire weather equipment is operable and performs required cyclic maintenance on the stations.
- Coordinates annual firefighter refreshers.
- Develop, coordinate and conduct fire training as necessary to meet wildland fire needs of the park according to approved Fire Management Plan and local and national guidelines.
- Coordinates Fire Preparedness Reviews and site reviews.

Fire Ecologist:

- Analyze and interpret fire effects data and report findings to Park Superintendent and fire staff.
- Manage fire effects database (monitoring plot database, spatial data, photographic images).
- Assists with describing monitoring types and developing prescribed fire objectives.
- Coordinates fire-related research.
- Assists with writing various management plans and compliance documents; helps ensure ecological implications of fire are included in all park planning.

Lead Fire Monitor:

- Responsible for implementing the park's Fire Monitoring Plan and descriptions of monitoring types.
- Responsible for all standard (NPS Fire Monitoring Handbook -2001) fire affects monitoring activities in the park; will coordinate with the Fire Program Coordinator and Fire Effects Liaison.

Fire Program Assistant:

- Provides technical and administrative support for the Area Fire Management Officer and all parks within the Northern Great Plains Area. Will assist with dispatching and mobilization activities.
- Collects and records daily fire weather observations and ensures they are entered into the Weather Information Management System (WIMS).
- Maintains records for all personnel involved in suppression and prescribed fire activities, detailing the individuals' qualifications and certifications for such activities.

Updates all fire qualifications for entry into the DOI Shared Applications Computer System

B. FIREPRO FUNDING

FirePro funding is available for approved equipment needs and prescribed fire operations. Project proposals, for prescribed fire and mechanical projects, are submitted through normal channels for approval. One Full Time Position (FTP), one Subject to Furlough (STF) and five seasonal positions are funded by FirePro.

C. FIRE QUALIFICATIONS

To meet program requirements (FIREPRO), the Park will maintain the following fire management forces. A minimum of ten (10) firefighters with one (1) Incident Commander Type 3 (ICT3), two (2) Incident Commander Type 4 (ICT4) one of which can also hold the ICT3 position, and one (1) Burn Boss Type 2 (RXB2). Additional wildland qualifications will be developed from park staff as interest, training and physical fitness requirements allow. The Northern Great Plains Area Fire Management Office is located at Wind Cave National Park. Although this highly qualified staff is available to assist with implementation of this plan, the Park will maintain the aforementioned capabilities independently.

All personnel involved in wildland fire suppression, prescribed fires, or fire monitoring will meet national standards as determined by the Incident Qualifications and Certification. Park personnel assigned fire management responsibilities and tasks are to meet the minimum training and experience guidelines for the position held. All personnel involved in fire management operations will have their qualifications, training, and experience entered into IQCS. Records will be available in the NGPA Fire Management Office for mobilization and dispatch purposes.

The wildland fire training program developed by the fire management staff is reviewed annually to prioritize training opportunities, nominate specific individuals for training courses, develop the annual park training schedule, and to provide training information to all park employees. Nominations for courses will be submitted for those personnel who have met the prerequisites and have identified these in their annual employee development plan.

Physical fitness standards for all wildland firefighters will be maintained in accordance with NPS and Wind Cave National Park guidelines.

D. INTERAGENCY COOPERATION AND COORDINATION

Wind Cave National Park maintains close coordination with numerous fire management agencies in the Southern Black Hills. The Fire Management Officer will serve as a primary liaison with other groups. Staff at the Park will regularly reinforce the contacts maintained by the Fire Management Officer and his/her staff. Assistance is available through the Northern Great Plains Interagency Dispatch Office. The dispatch office is located in Rapid City, South Dakota, and can be contacted for assistance at any time circumstances dictate.

The fire staff from the Black Hills National Forest, Custer State Park, the South Dakota Department of Forestry and dozens of paid and volunteer fire departments are key agencies involved in fire management in the Southern Black Hills.

From an interagency standpoint, Wind Cave National Park is situated in the Rocky Mountain Geographic Area. Coordination for resource orders for in-park needs and out-of-park needs are served through the following logistical support sequence:

Table 9. Resource Order Logistical Support Sequence.

Wind Cave National Park

↕

Northern Great Plains Interagency Dispatch Center (Rapid City, SD)

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Rocky Mountain Geographic Area Coordination Center (Denver, CO)

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National Interagency Coordination Center (Boise, ID)

The Northern Great Plains Interagency Dispatch Center, located at the Rapid City Airport (the former terminal building) provides the primary wildland fire dispatching function for Wind Cave National Park. The Northern Great Plains Area Fire Management Office compiles weekly availability of Wind Cave National Park resources during fire season. This availability list is then provided to the Interagency Dispatch Center. Procedures for requesting assistance are found in the Rocky Mountain Interagency Mobilization Guide, published annually, and the Mobilization Guide for the Northern Great Plains Area.

E. KEY INTERAGENCY CONTACTS

Interagency contacts are found in Appendix N.

Custer State Park Dispatch, (605) 255-4515.

Northern Great Plains Interagency Dispatch, (605) 393-8017.

Hells Canyon District Ranger, Black Hills National Forest, (605) 673-4853.

Buffalo Gap National Grasslands, (605) 745-4107.

F. FIRE-RELATED AGREEMENTS

The Fire Management Officer and Wind Cave National Park central files will maintain all written agreements with local agencies.

The National Agreement between the U.S. Departments of the Interior and Agriculture also serves as an umbrella agreement for interagency assistance

Two agreements exist for cooperative fire operations. One is with the Black Hills National Forest and defines responsibilities, initial attack zones and dispatch criteria. The second is an intra-agency agreement between Wind Cave National Park and the Northern Great Plains Area Fire Management Office. There are no agreements with any local governments. Copies of the agreements are found in Appendix A.

A statewide Interagency Cooperative Fire Management Agreement exists among the National Park Service, U.S. Forest Service, South Dakota State Division of Forestry, and 52 local fire departments.. The SD Division of Forestry coordinates annual wildland firefighter certification and interagency mobilization of local fire departments. This agreement specifies reimbursement rates and procedures and is reviewed annually. See Appendix A for a current listing of interagency agreements.

VI. MONITORING AND EVALUATION

A program to monitor fire effects has been in place since 1998. Monitoring is conducted to determine if prescribed fire objectives and non-fire treatment objectives are being met, and if any unwanted effects are occurring. A monitoring plan that describes all fire effects monitoring will become Appendix J to this plan.

Fire effects monitoring will be conducted by the NGPA fire effects crew following the guidance provided by the NPS Fire Monitoring Handbook (2003c). Monitoring includes sampling permanent vegetation plots measuring such variables as: overstory and pole trees, brush, groundcover, dead and down fuels and duff, and taking photo points. Normal sampling occurs pre-burn, immediate post-burn then at 1 year, 2 year, 5 year and 10 year intervals.

Annual fire effects monitoring results are provided to park staff, providing information on the success of prescribed fires or effects of wildland fires in meeting resource objectives. These results also provide a measure of whether desired future conditions are being approached.

VII. FIRE RESEARCH

A. Previous and Ongoing Fire Research

The following fire-related reasearch projects have been conducted within the Park or on subjects closely related to the Park's vegetative communities or cultural resources.

- The USGS-NPS vegetation mapping program (Pucherelli et al 1999) completed a distribution of the major vegetation types within the Park in 1999 and forms the foundation of vegetation management planning within the Park. Shafer (undated) examined distribution of forested areas at the time of early settlement of the prairie-forest areas of the Park. Another study examined vegetative community change within the area of the Park (Tieszen 1990).
- Descriptions of the prescribed fire history within Wind Cave National Park were prepared by Bone and Klukas (1988) and Lovaas (1976). Fritz (1982) described the ages of ponderosa in relation to fire history within the area of the Park. Fire history and fire return intervals in the Southern Black Hills have been examined in depth by Brown (2003) and Brown and Sieg (1996, 1999).
- Fire effects on vegetation and ecology within the Park and area have been studied (Wright and Bailey 1980), including ecological change induced by prescribed fires burns at different seasons (Schripsema 1978).
- Specific studies have been conducted by Bock and Bock (1980, 1981) on the effects of fire on forest floor vegetation and and wildlife, the effects of fire on woody vegetation in pine-grassland ecotone (1984), and ecology/evolution in the Great Plains (1989). Gartner (1974, 1977, 1984) examined the ecology of grasses and their responses to fire. Shown and Sloan (1981) examined the effects of fire on birds and small mammals in grasslands. Shepardson (1980) studied the affects of moisture, wildlife utilization, and fire suppression on how uncommon trees and shrubs regenerated. Worcester (1979) studied the effects of prescribed fires at different fuel moisture levels on vegetation and soils of grasslands.
- In addition, since 1997 the Park has followed the fire effects monitoring program outlined by the National Park Service. This program allows the documentation of basic information, to detect trends, and to ensure the Park meets its fire and resource management objectives. From identified trends, park staff can articulate concerns, develop hypotheses, and identify specific research studies to develop solutions to problems (National Park Service 2003c).
- A comprehensive noxious weed survey was initiated by the Park in 2002.
- A Cultural Landscape Report of the Historic Zone was completed in 2005.
- In 2002, research was begun by Dr. Kerri Vierling (South Dakota School of Mines and Technology) on the effects of fire on cavity nesting species within the Park.
- In 2004, research was begun by Dr. Cheryl Schmidt on the effects of fire on foraging behavior of bat species.
- In 2004, a study to learn the effects of prescribed fire on archaeological resouces was received in the Park. Some of the research occurred in Wind Cave National Park (Buenger, 2003).

B. FIRE RESEARCH NEEDED

Research may be performed to support the fire management program by providing information that is useful or necessary in decision making. Currently, principal research needs in Wind Cave National Park relate to:

- Determine which fire techniques are most effective for changing vegetation composition from undesirable (exotics i.e. Canadian thistle, Japanese brome, Smooth brome, etc.) to desirable plant species (native grasses and forbs).
- The effects of fire in hardwood shrub, woody draw areas. Research at the Park has indicated (Singer and Zeigenfuss, 1998) that fall burning, compared to spring burning, has significant impact on shrub production and regeneration immediately following burns.
- Using GIS, model potential areas for reduction of forest extent/density (i.e., south facing slopes, human plantings, etc.) and determine appropriate methods for treatment.
- Using GIS, model potential areas suitable for hardwood expansion and determine appropriate methods for treatment.

VIII. SAFETY

A. PUBLIC SAFETY

Because wildfires are dynamic and can be hazardous, public and firefighter safety must be given very high priority during certain critical conditions. Employees responsible for and involved in any wildland fire management activity must always consider the safety of human life above all other values. Ensuring visitor safety takes priority over other activities at all times; being able to provide a consistent and accurate evaluation of fire behavior is the basis for contingency plans, contacts, and briefings that ensure public and personnel safety. The following are the Park's public and employee safety considerations:

- There may be limited opportunities to find safety zones for escape from a fast moving wildfire in some stretches of the Park trail system. Park visitors may not have enough knowledge of fire behavior to recognize a safe area.
- Certain areas will be closed to use when there are risks to visitors or there are not enough personnel to handle the situation any other way.
- Any time human life may be endangered, all necessary means will be taken to warn or evacuate visitors and neighboring landowners and users.
- Visitors may ignore warnings or be unaware of potential dangers and wander into areas where fire is still active or where there are hazards from suppression activities such as tree falling.
- Smoke on roadways may create a visibility hazard for vehicle operators and fire personnel alike, from a fire either burning nearby or at night under light wind or weather inversion conditions. The smoke hazard could occur on roadways inside or outside the Park.
- The Burn Boss or Incident Commander will inform the Chief Park Ranger and the Superintendent of all potentially hazardous fires in the Park. The Chief Park Ranger and the Superintendent will then coordinate public notification efforts within and outside the Park. The extent of public notice will depend on the specific fire situation. The following actions should be considered:
- If fire affects travel along any roads in the Park, patrol rangers will be dispatched upon request by the initial attack incident commander, the fire management officer, or front country ranger to stop or control traffic.
- If evacuation of an area is recommended, the Superintendent will be informed immediately. If evacuation is not needed, but there is heavy smoke in the campground, personnel will be sent to inform people of the situation and assure them of the safety of remaining where they are.
- If a fire is projected to rapidly spread and threaten backcountry sites or trails where campers or hikers are known or strongly suspected to be, a park employee will be dispatched to the area by best possible means to notify visitors of the danger. Such individuals will be knowledgeable of fire behavior and fire safety principles to be able to stay with visitors as long as needed to assist them to safety.
- As part of initial and continuing size-up, an incident commander will determine the proximity to the fire of any visitors or other land users, inform them of potential hazards, and aid in evacuation if needed. If life is threatened, and the parties do not cooperate, law enforcement assistance may be requested through Custer County and/or Fall River County dispatch.
- Information on location, behavior, expected dangers, areas to avoid, and other

precautions will be posted on park bulletin boards, and local post offices and businesses. If necessary the Superintendent may wan tot hold a public information meeting in nearby communities.

- When the risks from a wildland fire are high, precautionary signs will be posted on trails leading into the fire area. Trails, campsites, and day use sites will be closed if deemed necessary by the Superintendent or his/her designee. The Prescribed Fire Burn Boss will ensure that closure and/or informational signs on prescribed fires are properly posted.
- Visitor use will be limited or prevented near wildland fires and nearby areas potentially affected. Rangers and interpreters will patrol the perimeters of prescribed fires to inform visitors and neighbors about the role of fire in a natural area, explain the risks of approaching too close to a fire, and enforce compliance of closures.
- An Incident Status Summary (ICS 209) for all fires burning over 24 hours will be provided to the Park information officer. Information on the fire activity will be broadcast on the Park radio as part of a morning report and further communicated with an email message to park divisions, if possible. The status summary will be distributed to all park divisions on a daily basis.
- Smoke plume trajectories from large fires will be plotted using computer programs and weather information. Expected impacts on nearby communities and roadways will be evaluated and information shared with the respective agencies. If needed, vehicular or air patrols will be used to monitor smoke plumes.
- Press releases will be sent to local news media on a regular bases (typically twice daily) or whenever news events warrant .
- The park's TIS (Traveler Information System), a low-wattage radio station at 1600 AM will be used to provide fire information to the public traveling in the vicinity of park headquarters.
- If needed, a park information "hot line" will be installed, and the phone receptionist will be updated whenever new fire information is available.
- The Fire Management Office and Chief Park Ranger will notify nearby agencies, as appropriate, about park fires.
- Notice of closures due to fire activity will be posted at trailheads, the campground and day use areas as necessary. Roads, trails, campgrounds and other facilities will stay closed while hazard trees are removed. The public will be informed of hazards and appropriate safety precautions for hiking through areas after they have burned.

B. FIREFIGHTER SAFETY

Ensuring and maintaining firefighter safety is of the utmost importance and takes precedence over rapid suppression targets or goals. Memories of the South Canyon Fire in Colorado in 1994 serve to reinforce the need to ensure and maintain firefighter safety. On all actions on wildland fires in the Park, the 10 Standard Firefighting Orders and 18 Watchout Situations will represent Park Policy and will be strictly adhered to.

It will be the responsibility of the Fire Safety Officer or the Park Safety Officer(or designee) to ensure that all safety measures are implemented and anyone failing to adhere to fire line safety will be removed from the fire.

The Incident Commander or Prescribed Fire Burn Boss will ensure that:

- All fire fighters are red carded
- All firefighters will wear proper personal protective equipment.

- All firefighters will have completed an annual fire refresher.
- Communications are possible with all people involved with the fire.
- Fire weather will be taken at minimum every hour during on-going fires.
- Any significant change in fire behavior or weather will be communicated immediately to everyone on the fire line.

IX. PUBLIC INFORMATION AND EDUCATION

Good public relations can engender public support and is prerequisite to a successful fire management program. Failure to provide good public information can be responsible for collapse of the program. Prairie fires can spread very quickly and visibly, necessitating that timely, accurate information concerning both management actions and wildfires be provided to park visitors and adjacent land owners.

The Superintendent's Office will issue all press releases regarding fire danger levels, closures, special precautions, prescribed fires, and wildland fires to newspapers, radio and television stations. The Chief of Interpretation will function as the Information Officer and provide for effective communication between park personnel, the public, and the media. The fire management program will be incorporated into the Park's overall interpretive program and explained when possible and appropriate. At higher staffing classes and/or during periods of high fire activity, an Information Officer may be ordered from outside the Park.

Prior to prescribed fires, the NGPA Fire Management Office will inform project personnel on details of the burn. Landowners or agencies located near the prescribed fire will be contacted and the Superintendent will initiate a press release. On the day of the burn, all staff should be notified as to the burn's location and any special safety warnings to pass on to visitors, i.e., caution to watch for smoke on the road, or advice not to hike in the area. Key visitor use or access sites where visitors could likely observe or approach the burn area should have temporary signs indicating a prescribed fire is occurring. The park’s low-wattage radio station will broadcast informaton about the burn. These efforts will provide for public safety and education, and decreases the likelihood that visitors will report or attempt to put out a prescribed fire.

Post-season activities will include those tasks necessary to adequately assess how the local public and cooperators received the Park’s fire management efforts. This will be accomplished through coordination with neighbors, local groups, and the State Department of Air Quality. This coordination will be performed by the NGPA Fire Management Office for issues with the State fire office, and VFD’s. Park staff would take the lead on issues with adjacent landowners, State air quality and VFD;s in some instances. The purpose of this feedback is to revise plans, procedures, and educational efforts regarding overall fire management at the Park.

The Fire Program Coordinator will cooperate with the Chief of Interpretation on the following programs:

- Development of a site bulletin which will discuss the basic objectives of using Prescribed Fire.
- Develop an outline and materials for an evening program that contains a prevention message and describes the Park’s fire program.
- Maintaining a file of public comments received concerning prescribed fires and using them to improve communication efforts targeted at increasing support for the fire management program.

X. PROTECTION OF SENSITIVE RESOURCES

Wind Cave National Park preserves a variety of cultural resources that complement the natural resources and contribute to the significance of the Park.

The cultural resources of the Park and the associated management problems are more fully described in the Cultural Resource Section of the Park's Resource Management Plan (2003b). The NGPA Fire Management Officer and the Fire Program Coordinator will work closely with the Chief of Interpretation to identify all historic, ethnographic, archeological, cultural landscapes, and collections that need special protection from fire. The NGPA Fire Management Officer will coordinate planning efforts to ensure that these objectives are met. The Chief of Interpretation, with assistance from Cultural Resource Specialists, will integrate fire management into the planning process during the early stages to ensure full consideration of fire management needs and capabilities.

When making decisions regarding management actions for wildland fire, incident commanders will consider potential impacts to resources including cultural resources prior to implementation. Cultural resource protection actions will be utilized when necessary. A variety of fire management techniques including black lining, foam and or water application, and mechanical fuel removal may be utilized to protect sensitive areas.

As a general rule, vehicle traffic is limited to established roads in the Park. Fire suppression and prescribed fire activities involve construction of black-line and scratch line, use of swatters, and direct attack with water, all primarily in fine fuels. Soil disturbance is not encouraged and will not likely occur under most fire management events. Consequently, cultural resources are not likely to be adversely affected. The order of attack, to minimize soil disturbance, is as follows:

- Direct attack with water resources (engine use only from established roadways).
- Use of flappers.
- Burning-out to create a black-line.
- Direct attack with water resources (off-road).
- Construction of a scratch line.

A. Archeological / Cultural / Historic Resources

1. Archeological Resources

There are approximately 76 known archeological sites to be considered during fire management operations. Firelines for prescribed fires will avoid these sites. An archeologist or cultural specialist should be brought on site during any significant suppression operation. Based on the fire behavior modeling program BEHAVE only lithic scatters on the surface are expected to be affected by wildland fire passing over them. Factors found to influence archology sites from prescribed fires include 1) fuel loads, 2) fire behavior, 3) peak temperature and duration of heating, 4) proximity of artifacts to fuels, and 5) class of artifact. (Buenger, 2003) These effects would be similar for a wildland fire. It is generally thought that fire has passed over the landscape numerous times with minimal effect. More damage is likely to be done to artifacts during suppression operations than by the fire itself. The Parks historic structures and other buildings would be protected by commitment of suppression resources to that task.

2. Historic Resources

The Park contains approximately 30 Historic structures. These include CCC era buildings, the historic cave entrance, historic trails and two bridges.

3. Mitigation

Personnel taking part in suppression actions 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 and foam are the preferred minimum impact suppression techniques. Handline construction will be avoided in identified archeological sites. Fuels with high intensity and long burn durations along burn perimeters will be cut into manageable sections. To minimize ground disturbance, hand crews will first pick up the cut burnable fuels before scattering it within the burn unit to reduce fire intensity. No cut fuels will be placed near known cultural sites.

B. Natural Resources

1. Resources

The vegetative resources are generally fire adapted and require no specific protection. Effects on vegetation are not expected to be severe unless a crown fire occurs. Otherwise, some mortality of understory shrubs, seedlings and small trees is possible. Grasses and forbs will not be affected as resprouting from roots and rhizomes is the normal situation and the species found on the unit are, for the most part, fire adapted.

A severe fire burning ground fuels at high temperature, could affect soils and consequently water quality. Both surface and cave water quality and quantity are critical to the Park's environment.

Most wildlife species in the vicinity of the Park will be minimally affected by fire. Wildlife populations will be affected slightly by both fire and smoke. The effects will be temporary, lasting for perhaps 6-24 hours after the passage of the flame front. Large animals are not expected to show mortality. Some small mammals such as field mice, cottontail rabbits, squirrels, and ground nesting birds that have not fledged may be caught by the flame front but mortality is not expected to be heavy. Regeneration of vegetation provides excellent habitat for these small species and natural reproduction will quickly repopulate the area. Overall short-term impacts on fauna will be minimal while long-term changes in habitat conditions will be beneficial.

There are three avian species that are migrant and seasonally resident in the area that are on the federally threatened/state endangered species list: the bald eagle (*Haliaeetus leucocephalus),* the state endangered peregrine falcon (*Falco peregrinus*) and the state threatened osprey (*Pandion haliaetus*). None of these would have long term impacts through the implementation of this plan.

The park includes large colonies of the black-tailed prairie dog (*Cynomys ludovicianus*). These colonies provide a prey base and critical habitat for the federal and state endangered black-footed ferret (*Mustela nigripes*) and potentially the state threatened swift fox (*Vulpes velox*). (At this time neither of these specvies have been documented currently in the park). Prairie dog communities occur throughout the park and would be subjected to prescribed fire use and possibly to wildland fires.

The park lies within the historic range of the American burying beetle (*Nicrophorus* americanus), although none have been documented within the park.

Ground dwelling reptile and insect populations are not expected to be affected.

2. Mitigation

Prescribed fires will be planned to do the least amount of damage to the soil so that water quality remains high and potential erosion is minimized. Frequent, light fires will be used to restore the natural role of fire to the lands on the Park. Park management planning will consider the effects of cave “breathing” in an attempt to minimize smoke impacts to either the bat population or visitors touring the cave.

C. Infrastructure

1. Unit Infrastructure

There are numerous facilitites throughout the Park including the headquarters administrative and visitor area, Park housing and maintenance facilities. Other facilities throughout the Park include fence line, interpretive and regulatory signs, bison corrals, air quality stations and a Class A campground.

2. Mitigation

Most of the facilities are in lightly wooded or prairie areas and extensive hazard reduction operations have been conducted to protect them. Continued thinning and prescribed fire will be used to maintain a reduced risk of wildland fire damaging the Park’s infrastructure.

XI. FIRE CRITIQUES AND ANNUAL PLAN REVIEW

This Fire Management Plan will be reviewed and evaluated annually to determine if the objectives have been met and to make necessary revisions. The Chief Park Ranger, Chief of Resource Management, and Fire Management Officer will conduct this evaluation. Any problems associated with the guidelines or standards set for fire management, cost effectiveness and suppression will be addressed through revision or addendum and made a part of this plan. The Superintendent will approve all revisions.

Fire reviews will be conducted in accordance with procedures found in RM-18. Each review will be documented and filed with the final fire documentation. The Fire Management Officer will retain a file copy.

The Fire Management Team and cooperators will critique all suppression actions on fires having extended attack and multi-period activities, or other significant events such as MVA's, injury and accidents. if appropriate. If the need exists, the Regional FMO can be included in such reviews and a national review by the Branch of Fire and Aviation Management can be requested.

All entrapment and fire shelter deployments will be reviewed in accordance with NWCG "Wildland Fire Entrapment/Fatality Initial Report and Entrapment Investigation Element Matrix." (RM-18, Chapter 13.)

XII. CONSULTATION AND COORDINATION

The primary duty of the Park staff is to carry out the fire management program with emphasis on human safety and prevention of damage to private and public buildings and facilities. Careful planning, good public information and a well-trained staff can provide for a safe and effective fire program.

The Fire Management Officer is responsible for coordination and consultation with cooperators regarding fire management activities. This includes involvement with the Midwest Regional Office FMO, Billings Zone Coordination Center; Northern Great Plains Dispatch Office; the South Dakota Interagency Fire Council, US Forest Service; South Dakota State Forestry Service; and local cooperators.

The following staff participated in the planning and preparation of this fire management plan:

Wind Cave National Park

Linda Stoll, Superintendent

Dan Foster, Chief, Resource Management

Rick Mossman, Chief, Visitor and Resource Protection

Dan Roddy, Resource Management Specialist

Barb Muenchau, Biological Science Technician

Marie Curtin, Biological Science Technician

Duane Weber, Biological Science Technician

Kevin Merrill, Former Lead Forestry Technician

Sabrina Henry, Lead Forestry Technician

Denny Ziemann, Former Chief, Visitor and Resource Protection

Bill Koncerak, GIS Specialist, Wind Cave National Park

Tom Farrell, Chief of Interpretation, Cultural Resource Coordinator

Northern Great Plains Area Fire Management Office

Doug Alexander, Former Fire Management Officer

Dan Morford, Assistant Fire Management Officer

Steve Ipswitch, Assistant Fire Management Officer

Cody Wienk, Fire Ecologist

Andy Thorstensen, Fire Monitoring Team Leader

Agencies/Tribes/Organizations/Individuals Contacted

Tribes. Several Indian American tribes have demonstrated interest in the areas within Wind Cave National Park. Letters were sent to 19 tribes and tribal contacts regarding this project on February 8, 2005. The list of contacts is found in Appendix N and a sample of the letter sent to the tribal representatives is found in Appendix O.

State Historic Preservation Office. The Park sent a letter regarding this Fire Management Plan to the South Dakota Historic Preservation Officer (SHPO) on February 8, 2005.

U.S. Fish and Wildlife Service. The U.S. Fish and Wildlife Service was contacted by telephone regarding this project on December 2, 2003.

Both the State Historic Preservation Office and U.S. Fish and Wildlife Service deferred comment until the Draft Fire Management Plan and Environmental Assessment were released for public comment.

Copies of the Fire Management Plan and Environmental Assessment have been mailed to the following agencies and organizations:

Federal Agencies and Government

- Advisory Council on Historic Preservation
- Dept. of Agriculture
  - U.S. Forest Service
- Dept. of the Interior
  - National Park Service
  - Badlands National Park
  - Devils Tower National Monument
  - Jewel Cave National Monument
  - Midwest Regional Office
  - Minuteman Missile National Historic Site
  - Mt. Rushmore National Memorial
- U.S. Fish and Wildlife Service
- U.S. Congressional Representatives from South Dakota
- Bureau of Indian Affairs

Indian Tribes

- Apache Tribe of Oklahoma
- Arapaho Business Council
- Cheyenne River Sioux Tribe
- Cheyenne-Arapaho Tribes of Oklahoma
- Crow Creek Sioux Tribe
- Flandreau Santee Sioux Tribe
- Fort Belknap Community Council
- Fort Peck Tribal Executive Board
- Lower Brule Sioux Tribe
- Northern Cheyenne Tribe
- Oglala Sioux Tribe
- Ponca Tribe of Nebraska
- Ponca Tribe of Oklahoma
- Rosebud Sioux Tribe
- Santee Sioux Tribe
- Sisseton-Wahpeton Sioux Tribe
- Standing Rock Sioux Tribe
- Three Affiliated Tribes

Yankton Sioux Tribe

State and Local Agencies and Governments
Custer County Commissioners
Custer Volunteer Fire Department
Pringle Volunteer Fire Department
South Dakota State Historic Preservation Officer

APPENDIX A

ANNUAL REVISION DOCUMENTS/AGREEMENTS

- Reciprocal Fire Protection Act of May 27, 1955 (69 Stat 66; 42 USC 1856a)
- Memorandum of Understanding between United States Department of Interior and Department of Agriculture, dated January 28, 1943
- Protection Act of 1922 (16 USC 594)
- Interagency Agreement between the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service, of the United States Department of Interior and the U.S. Forest Service of the United States Department of Agriculture, and Amendment No. 2 to Joint USDI Agencies and USDA Forest Service Interagency Fire Agreement No. 83-SIE, dated May 5, 1987
- The Clean Air Act (42 USC 7401) provides the primary authority for protection and enhancing the nation’s air quality.

Interpark Agreement

Between:
Northern Great Plains Area Fire Management
AND
Agate Fossil Beds National Monument
Badlands National Park
Devils Tower National Monument
Jewel Cave National Monument
Mount Rushmore National Memorial
Scotts Bluff National Monument, and
Wind Cave National Park

Revised February 13, 2003

ARTICLE I. PURPOSE

The FIREPRO process arranges for the funding for fire staff to support the seven NPS units listed above. This grouping is known as the Northern Great Plains Area (NGPA). These positions will be referred to in this document collectively as the "Fire Staff". The purpose of this agreement is to define the mutual responsibilities of the Fire Staff and staff from the other NPS units in the Northern Great Plains Area in terms of fire management activities.

ARTICLE II. RESPONSIBILITIES

The duties of the Fire Staff will include providing professional and technical support for the fire management programs at all NGPA units.

A. Specific responsibilities of the Fire Management Staff include:

1. Assist in the development and implementation of wildland fire prevention, preparedness, suppression, and aviation programs through site visits, program and readiness reviews, inspections, cache inventories and other staff work.

2. Assist in coordination of fire-related reports, correspondence, preparation and/or review of fire management plans, and aviation plans. Participate in other fire management planning as requested.

3. Assist in coordination and implementation of prescribed fire programs, fuel treatments, and fire use programs according to unit fire management plans.

4. Coordinate, through appropriate zone coordination center, mobilization of National Park Service personnel for fire assignments.

5. Develop, coordinate, and conduct fire-related training as necessary to meet wildland fire needs of the units and interagency needs according to approved fire management plans, and local and national guidelines.

6. Manage fire qualification and training records in the Shared Applications Computer System (SACS), including: initial record input; updating fitness scores, training, experience, and issue incident qualification cards. Fire Staff will provide an annual timetable to each unit fire coordinator for transferring the information to the Fire Program Assistant so that it can be input into the SACS.

7. Communicate with respective units on issues and concerns prior to representing the Northern Great Plains Area at meetings, conferences, seminars, and other functions as requested and required, including: South Dakota Interagency Fire Council, Board of Directors for the Northern Great Plains Dispatch Center, Multiagency Coordination Group, NPS Intermountain and Midwest Regional Offices and others.

8. Coordinate NPS role in the interagency fire community; developing interagency agreements, cooperative agreements, and other agreements necessary for carrying out wildland fire management.

9. The Fire Staff will coordinate with the respective park fire coordinator, out-of-park work requests for the engine crews at BADL and WICA, including pre-positioning of resources in response to preparedness issues and fuels projects.

B. Responsibilities of the superintendents of Northern Great Plains Area include:

1. Make requests for assistance through the fire management office with sufficient lead time to meet due dates and set-up meetings. Each unit superintendent will designate a unit fire coordinator who requests program assistance, budget, and training needs through the Fire Management Officer.

2. Submit fire experience and fire training records (using the EZ form), physical fitness scores, physical exam results (pass or fail), individual fire reports (DI-1202), availability reports, and situation reports, following established times and due dates. Unit fire coordinators will be responsible for maintaining fire readiness to the level identified in the park's fire management plan.

3. Notify the Fire Staff as soon as practical of any fire restrictions, closures, or fire occurrences.

4. Participate in the overall fire management of the Great Plains area units and of the NPS by committing to sharing of training and available personnel upon request.

5. The Superintendent of Wind Cave National Park will be the official supervisor of the Fire Management Officer (FMO). The other Superintendents will also work closely with the FMO and will provide input to the Wind Cave Superintendent for the FMO's performance appraisal.

ARTICLE III. WORK GROUP

The Fire Management Staff Officer will facilitate a Fire Management Work Group, which meets at least once a year to review budget inputs prior to submission, review the Interpark Agreement, and prioritize work plan activities. The Work Group will be composed of the Fire Coordinators from the park units covered by this Agreement.

ARTICLE IV. FUNDING

Program costs (e.g. travel/per diem, communication, supplies and materials) incurred by the Fire Staff will be charged to FIREPRO accounts. In addition, any costs associated with the work group may be funded through FIREPRO accounts assigned to each park unit. If personnel are working on a project, which has been individually funded, such as a prescribed fire, the overtime and travel costs for personnel may be paid from the appropriate project funds. The annual budget request will be reviewed and concurred with by the Work

Group so that any supplemental requests, i.e.: physical exams, personal protective equipment, training, cache items, capital equipment, and hazard fuel reduction projects, are reflected in the annual budget request.

ARTICLE V. LOCATION OF THE FIRE STAFF

While it needs to be very clear that the fire staff serves all seven parks, they will be located at Wind Cave National Park, with the exception of the Black Hills Fire Use Module, which is located at Jewel Cave National Monument. These two parks will provide office facilities to the extent practical. If funding is secured to build a dedicated facility for the NGPA staff, at a location to be determined later, this agreement can be modified if necessary to reflect the change. The Fire Staff will endeavor to minimize adverse impacts on the parks as much as possible, including paying for electricity and heating used in their fire facilities.

ARTICLE VI. TERM OF AGREEMENT

The term of this Agreement will be 5 years, beginning in fiscal year 2003. It is renewable at the end of each five-year period by written letter of agreement signed by each of the superintendents of the Northern Great Plains Area.

Amendments to this Agreement can be made at any time subject to the written concurrence and approval of all superintendents.

Superintendent	Date
Agate Fossil Beds National Monument	
Superintendent	Date
Badlands National Park	
Superintendent	Date
Devils Tower National Monument	
Superintendent	Date
Jewel Cave National Monument	
Superintendent	Date
Mount Rushmore National Memorial	
Superintendent	Date
Scotts Bluff National Monument	
Superintendent	Date
Wind Cave National Park	
NGP Fire Management Officer	Date

ANNUAL OPERATING PLAN
between
THE BLACK HILLS NATIONAL FOREST
and
DEVILS TOWER NATIONAL MONUMENT
MOUNT RUSHMORE NATIONAL MEMORIAL
JEWEL CAVE NATIONAL MONUMENT
and
WIND CAVE NATIONAL PARK

I. PURPOSE

This Operating Plan establishes specific procedures for Interagency Fire Protection by each agency on forest/range fires reported within the Black Hills National Forest, Devils Tower National Monument Mount Rushmore National Memorial, Jewel Cave National Monument, and Wind Cave National Park.

II. AUTHORITY

1. Listed under Interagency Cooperative Fire Protection Agreement #1102-0005-95-013, between agencies of the United States Department of Agriculture, agencies of the United States Department of the Interior and the State of South Dakota.

III. GENERAL

1. Crew Definition

   Crews normally consist of two fire-qualified perpersonnel with engine, but may consist of additional resources depending values at risk and incident potential.

2. Reporting a Fire

   When a smoke is detected and reported, it will be the responsibility of the detecting agency to promptly notify the other agency dispatch center so initial attack crews may be promptly dispatched.

3. Contact Points

   A. Forest Service – All requests will be directed to the Interagency Dispatch Center located at Custer, SD
   B. National Park Service – Requests will be made to the headquarters of the appropriate National Park Service Area.

4. Release of Resources

   A. All crews assigned to an incident will be utilized until demobilized.
   B. Other agency crews will normally be demobilized first.
   C. Home unit requests for early release of specified personnel or equipment will be honored whenever possible, when made through the appropriate contact point.

IV. INITIAL ATTACK PROCEDURES

1. Black Hills National Forest

   A. <u>Adjective rating class of Moderate -High</u>

      Forest Service District fire crews, unless otherwise notified by the National Park Service through the zone dispatcher, will:

      (1) Respond to all-fires reported within the boundaries of Jewel Cave National Monument and the Mount Rushmore National Memorial.
      (2) Respond to fire on Wind Cave National Park as follows:
         (a) All fires west of US 385 and State Hwy 87
         (b) Fires east of US 385 and State Hwy 87 upon request.

B. Adjective Ratinq Class of Very High -Extreme -Red Flag Alert

(1) Forest Service District crews, unless otherwise notified by the National Park Service, will:

(a) Respond to all fires within the boundaries of Jewel Cave National Monument and Wind Cave National Park and Mount Rushmore National Memorial.

(b) Respond to fires of Devils Tower National Monument upon request only.

(2) Available helicopters and/or air tankers will dispatched to National Park Service lands or requested through the Custer Zone Dispatcher.

2. National Park Service

Adjective Ratinq Class of Moderate and above, including Red Flag Alerts

A. National Park Service crews from Wind Cave and Jewel Cave, unless otherwise notified by Forest Service Zone Dispatcher, will respond to all reported fires on National Forest 1and within three (3) miles of contiguous Park boundaries. Crews from these units, if asked and available, will respond forest-wide.

B. National Park Service crews from Mount Rushmore, unless otherwise notified by the Forest Zone Dispatcher, will respond to all fires on National Forest lands within one (1) mile contiguous to National Memorial boundary.

C. National Park Service crews from Devils Tower, if requested, will respond to fires in the Bearlodge Ranger District of the Black Hills National Forest.

V. REVIEW/PERIOD OF AGREEMENT

This Operating Plan will be reviewed annually to evaluate the effectiveness of action by all parties and to provide for amendment prior to Feb. 28.

VI. DISCRIMINATION

The parties of this Memorandum of Understanding shall not discriminate against any employee or applicant for employment because of race, color, religion, sex or National origin. They will take affirmative action to insure that applicants are employed, and that employees are treated fairly during employment without regard to race, color, religion, sex or National origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

They further agree to post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the responsible officers setting for the provisions of the nondiscrimination clause.

All parties agree to insert the foregoing provision in subcontracts hereunder, except subcontracts for standard commercial supplies or raw materials.

VII. OFFICIAL NOT TO BENEFIT

No member of or delegate to Congress, or resident Commissioner, shall be admitted to any share or part of this contract, or to any benefits that may arise therefrom.

IV. IN WITNESS WHEREOF, the parties hereto have executed this Operating Plan as of the date last signed below.

Supervisor Black Hills National Forest	Date
Superintendent, Wind Cave National Park	Date
Superintendent, Mount Rushmore National Memorial	Date
Superintendent, Devils Tower National Monument	Date
Superintendent, Jewel Cave National Monument	Date

Fire Call –up List

WIND CAVE NP: (605)-745-4600 FAX 605-745-4207, Headquarters; 8:00am to 4:30pm ,

Rick Mossman, Chief Ranger	(W)-(605)-745-1151	(H)-(605)-745-4463 (C)-(605)-685-4471 (P)-(605)-399-8964
Sabrina Henry, Supv. Fire Tech.	(W)-(605)-745-1166	(H)-(605)-745-4324 (C)-(605)-440-0017
Vacant , Lead Fire Tech.	(W)-(605)-745-1174	(H)-(605)-745- (C)-(605)-440-0018
Mark Davison, Park Ranger	(W)-(605)-745-1153	(H)-(605)-745-5424 (C)-(605)-890-4130 (P)-(605)-745-2203
Mike Henry, Park Ranger	(W)-(605)-745-1152	(H)-(605)-745-4324 (C)-(605)-890-0561 (P)-(605)-745-2204

Preparedness / Cache Inventory

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
029 Stihl Saw	winterized	cache shelf	1				
036 Stihl Saw		"	1				
044 Stihl Saw		"	2				
046 Stihl Saw		"	1				
1 1/2" Barrel Nozzle		fittings locker	3				
1 1/2" Mad Dog Nozzle		"	2				
1 1/2" Maxi Fog Nozzle		"	1				
1 1/2" NH Shut-off Valve		"	4				
1 1/2" NH Caps		"	3				
1 1/2" NH Double Female		"	2				
1 1/2" NH Double Male		"	6				
1 1/2" NH Gated Wye		"	15				
1 1/2" NH Hose	feet	hose shelf-far wall	1550				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
1 1/2" NH In-line Tee		fittings locker	8				
1 1/2" NH Wye		"	3				
1 1/2"NH X 1 1/2" NPSH Thread Adapter		"	3				
1 1/2"NH x 1"NPSH Reducer		"	28				
1 1/2"NH x 1"NPSH Wye		"	1				
1 1/2"NH X 3/4"GH Reducer		"	1				
1 1/2"NPSH X 1 1/2" NH Thread Adapter		"	3				
1 1/2"NPSH x 3/4"GH Reducer		"	0				
1" Barrel Nozzle		"	17				
1" Combination Nozzle		"	0				
1" NPSH Hose	feet	hose shelf-far wall	1300				
1"NPSH Shut-off Valve		fittings locker	1				
1"NPSH Wye		"	1				
1" NPSH X 1" NH Thread Adapter		"	0				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
1"NPSH X 1 1/2" NH Increaser		"	5				
1"NPSH x 3/4"GH Reducer		"	9				
2 1/2" Caps		"	3				
2 1/2" Double Female		"	1				
2 1/2" Double Male		"	0				
2 1/2" NH Shut off Valve	red-for pumpkin	"	0				
2 1/2" NPSH Hose	feet	hose shelf-far wall	100				
2 1/2"NH X 2 NPSH Reducer		fittings locker	0				
2" Foot Valve and Strainer		"	2				
2" NPSH x 1 1/2" NH Reducer		"	8				
20 lb fire extinguisher		air ops container	2				
3/4" Foam Nozzle?		fittings locker	1				
3/4" Garden Hose	feet	under desk	1000				
3/4" Gated Wye		fittings locker	3				
3/4" Shut off Valve		"	4				
3/4" Nozzle		"	19				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
3/4" Wye		"	16				
3/4"GH X 1"NPSH Increaser		"	0				
ATV	6-wheeler	upper garage	1				
ATV Ramp		cache	1				
Axe Handles		cache shelf	4				
Back brace		locker	2				
Batteries	boxes/24 ea.	"	24				
Bed Rolls		cache shelf	5				
Belt Weather Kit		locker	4				
Binoculars		locker	3				
Backpack Pump	complete	labeled container	14				
Blivets	70 gal	air ops container	3				
Bolt Cutters	small	cache	1				
	large	"	1				
Brush jackets	small	brush jacket locker	2				
	medium	"	6				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
	large	"	7				
	x-large	"	6				
Camelpak		locker	0				
Camelpak Bite Valves		"	6				
Cargo Swivel		cache	5				
Chainsaw Bars	18 in	cache	2				
	20 in	"	5				
	24 in	"	6				
Chainsaw Chain	20 in	"	0				
	24 in	"	3				
Chaps	28	cache & bay wall	2				
	32	"	6				
	36	"	1				
	40	"	1				
Chest Harness		locker	11				
Chin Straps	black	"	5				
	white elastic	"	11				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
Clamshell		radio cabinet	6				
CO2 Extinguisher	20-30 lb	cache	1				
Collapsible Bucket		appliance locker	3				
Combie		tool rack	21				
Combie Handles		cache shelf	9				
Come-a-long		cache	1				
Compass		locker	3				
Counselor Rake		tool rack	4				
Crash Rescue Kit		cache	1				
Crow Bar		"	1				
Cut Saw		"	1				
Desk Top Charger		radio cabinet	3				
Domar	plastic	fuel locker	7				
	metal	"	11				
Drinking Water Bags		locker	5				
Drip Torch		fuel locker	19				
Eagle gear bags	black	brush jacket	1				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
		locker					
Eagle line-gear packs	red/black	cache	5				
Ear plugs	carbonex	appliance locker	6				
	disposable	"	1 box				
	peltor heavy-duty	"	2				
Extension Cord	25 ft	"	1				
	50 ft	"	1				
Extra Canteen Pouches	red	cache shelf	10				
Extra Stuff Sack		"	2				
Fiber Tape	rolls	cache	8				
Fire Extinguisher	10 lb	"	1				
	5 lb	"	4				
	2.5 lb	"	1				
Fire Shelter boxes	empty	locker	6				
Fire Shelters		"	20				
First Aid Kits	personal	"	36				
	20-person	cache	2				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
Flagging	"Killer Tree"	locker	10				
	assorted colors	"	52				
Flappers		cache	7				
Flight gloves (pair)		brush jacket locker	8				
Flight helmet bags	green	"	3				
	navy	"	1				
	black	"	0				
Flight helmets	XL	brush jacket locker	1				
	REG	"	1				
Flight jackets		brush jacket locker	3				
Flight suits		self-labeled locker	7				
Floto-pump		cache shelf	1				
Fold-a-tank	1500 gal	trail room	1				
	2100 gal	bay	1				
Food Coolers	10 gal	bay shelf	6				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
FSS 2 week bags	red	cache	11				
Fuel Cans	2.5 gal	fuel locker	6				
	5 gal	"	19				
Fusees	box	cache shelf	1				
Goggles	clear	locker	8				
	black	"	4				
GPS Unit		"	2				
Grease Gun		cache	1				
Hack Saw		"	3				
Headlamps	AA	locker	29				
Helmet Suspension		"	3				
Helmet Bands (extra)		"	8				
Helmet Shroud (extra)		"	10				
Helmets	black	cache shelf	1				
	red	"	4				
	yellow	"	27				
Homelite Pump		fuel locker	1				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
Hose clamps		appliance locker	11				
Hydrant Pressure Gauge		cache shelf	1				
Hydrant Wrench		appliance locker	2				
Jig	chainsaw	cache	5				
Jump jackets	small	brush jacket locker	0				
	medium	"	0				
	large	"	1				
	x-large	"	0				
Jumper Cables		cache	0				
Kestrel	2000	Barry	1				
	3000	engines	2				
	4000	Sabrina's desk	1				
Leaf Rake		tool rack	6				
Leather Gloves	x-small	grey cabinet	0				
	small	"	19				
	medium	"	8				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
	large	"	1				
	x-large	"	9				
Level		cache	3				
Light Sticks	boxes/10 ea.	locker	5				
Mag Lites	rechargeable	top of lockers	1				
Mark III w/ kit		fuel locker	2				
McLeod		tool rack	16				
Mobile Radio	bendix/king	radio cabinet	1				
Mobile Radio Mikes	smart mike	"	4				
Mop-up Kit		cache	1				
Mop-up Wands		"	10				
MRE	cases/12 ea	top of lockers	3				
Nomex jumpsuits	medium	self-labeled locker	1				
	large	"	3				
Nomex pants-advanced	S 30	pants locker	1				
	S 32	"	1				
	M 36	"	1				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
Nomex pants-crew boss	S 30	"	2				
	S 32	"	4				
	M 30	"	0				
	M 32	"	2				
	M 34	"	1				
	L 34	"	0				
Nomex pants-GSA BDU	30-34x33	pants locker	3				
	32-36x34	"	3				
	34-38x34	"	5				
	36-40x33	"	2				
	38-42x29	"	6				
Nomex pants-GSA Reg.	28x30	pants locker	6				
	30x30	"	6				
	30x32	"	1				
	30x34	"	5				
	32x30	"	1				
	32x34	"	2				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
	34x30	"	7				
	34x34	"	6				
	36x30	"	9				
	36x34	"	2				
	38x32	"	2				
	38x34	"	4				
	40x34	"	1				
Nomex shirts	x-small	shirts locker	2				
	small	"	11				
	medium	"	8				
	large	"	12				
	x-large	"	8				
	xx-large	"	1				
Pack Sacks	green	locker	4				
Pack Shack 2 week bags	red	"	8				
Pack Shack fireline packs	red	cache	11				
Pack Shack gear bags	red	locker	1				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
Pack Test Packs		bay	6				
Pack Vests		cache	4				
Pack Vests Bags		top of lockers	2				
Packing Tape	rolls	cache	5				
Panels	set	air ops container	1				
Parachute Cord	roll	cache	1				
Pitot Gauge		cache shelf	1				
Portable Generator		trail room	1				
Portable Radio	bendix/king	pelican case	2				
Portable Radio Antenna	regular	pelican case	5				
	extended	"	8				
Practice Fire Shelters		cache shelf	2				
Prime-Safe	gallons	cache	3				
Printer		desk/cache shelf	2				
Pro Pack		top of lockers	1				
Propane Torch		maintenance shop	1				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
Pulaski		tool rack	23				
Pulaski Handles		cache shelf	14				
Pumpkin	1600 gal	bay	2				
Push Broom		cache	1				
Radio Belt Harness		radio cabinet	4				
Radio Mikes	portable	"	1				
Rechargeable Battery	extra	"	5				
Red gear bags	red	cache	2				
Rope	assorted	"	4				
Safety Cones		"	8				
Safety Glasses	clear	locker	27				
Saw Pads		grey locker	4				
Saw wedges		fittings locker	9				
Shovel		tool rack	29				
Sigg Bottles	empty	fittings locker	4				
	bar oil/saw gas	fuel locker	4				
Silicone Gun		cache	1				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
Silvex Class A Foam	5 gal	bay shelf	26				
Sledge Hammer		cache	3				
Sleeping Bags w/ stuff sack		cache shelf	18				
Slip-on Unit	250 gal	outside cache	1				
Spanner wrench	small	fittings locker	12				
	medium	"	3				
	large	"	2				
Splitting Axe		cache	2				
Stuff Sack			2				
T-square		"	1				
Tecnu	boxes	grey locker	3				
Tents		labeled container	9				
Thermarest		"	3				
Water Bottles	boxes	"	1.75				
Water Coolers	5 gal	"	8				
Water Jugs-Cubies	box	top of lockers	1				
Wet/Dry Vacuum		cache	1				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
Wetting Agent	1 qt	cache	8				
Wind Sock		"	1				
Whisk Broom	floor	"	1				
	hand-held	"	3				
Wire Brush		"	5				
Wool Blankets		"	2				
Fire Hose Gasket	1"	fittings locker	20				
Fire Hose Gasket	1 1/2"	"	20				
Ear plugs	Howard Light	"	9				
Foam Pump		cache	1				
Fire Extinguisher Holders		cache shelf	20				
Mop- Up Nozzles		cache	11				
Waterproof Gear Bags	blue	tent container	6				
Portable Radio Mike	pelican case	cache shelf	1				
Safety Glasses	dark lenses	locker	23				
	clear	locker	21				
Rain Fly	yellow	cache shelf	1				

ITEM	DESCRIPTION	LOCATION	QUANITY	STOCKING LEVEL	INVENTORY		
					DATE/INITIAL	DATE/INITIAL	DATE/INITIAL
Sleeping Bags w/o stuff sack	yellow/green	cache shelf	6				
Winch Cover		cache shelf	1				
Winch		"	1				
Space Blankets	red	"	1				
Chainsaw Helmets		"	3				
Ice Packs		"	10				
Priming Pumps		"	1				
Prefilters		"	5				
Pig Pads		"	1 box				
Cargo Nets	BHNF-holding	"	3				
Dell Inspiron Laptop	1200089330	Kevin	1				
	1200089331	Sabrina’s desk	1				
Epson PC650 Digital Camera	1200089345	cache	1				

APPENDIX B.
Wind Cave National Park Climate Chart

MONTH	TEMPERATURE			AVERAGE PRECIPITATION 1963-1998
	AVERAGE 1974-1994			
	AVE. MAX	AVE. MIN.	AVE.	
January	39.9	10.6	25.2	.35
February	45.0	13.7	29.3	.55
March	52.5	20.7	36.6	1.00
April	65.4	33.1	49.2	1.88
May	72.9	43.6	58.2	3.27
June	83.0	52.6	67.8	3.10
July	92.2	59.2	75.7	2.63
August	91.1	56.9	74.0	1.79
September	82.8	46.1	64.4	1.47
October	68.6	35.1	51.8	1.30
November	49.0	18.9	33.9	.67
December	39.7	14.1	26.9	.53

AVERAGE ANNUAL PRECIPITATION: 18.0”

All temperatures are in FAHRENHEIT

All precipitation is in INCHES

APPENDIX C.

Species List

The following species lists are not all inclusive and constitute a “work in progress” as the Inventory and Monitoring Program matures. The latest information should be available at the Park Headquarters.

Wildlife

Common Name	Scientific Name
Amphibians	
Tiger salamander	*Ambystoma tigrinum*
Great plains toad	*Bufo cognatus*
Woodhouse’s toad	*Bufo woodhousei woodhousei*
Boreal chorus frog	*Pseudacris triseriata maculata*
Northern leopard frog	*Rana pipiens*
Plains spadefoot toad	*Scaphiopus bombifrons*
Birds	
Pied-billed Grebe	*Podilymbus podiceps*
Eared Grebe	*Podiceps nigricollis*
Red Necked Grebe	*Podiceps grisegena*
American White Pelican	*Pelecanus erythrorhynchos*
Double-crested Cormorant	*Phalacrocorax auritus*
American Bittern	*Botaurus lentiginosus*
Great Blue Heron	*Ardea herodias*
Turkey Vulture	*Cathartes aura*
Ross's Goose	*Chen rossii*
Snow Goose	*Anser albifrons*
Canada Goose	*Branta bernicla*
Wood duck	*Aix sponsa*
Gadwall	*Anas strepera*
American Wigeon	*Anas americana*
Mallard	*Anas platyrhynchos*
Blue-winged Teal	*Anas discors*
Cinnamon Teal	*Anas cyanoptera*
Northern Shoveler	*Anas clypeata*
Northern Pintail	*Anas acuta*
Green-winged Teal	*Anas crecca*
Ring-necked Duck	*Aythya collaris*
Lesser Scaup	*Aythya affinis*
Bufflehead	*Bucephala albeola*
Osprey	*Pandion haliaetus*
Bald Eagle	*Haliaeetus leucocephalus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*

Common Name	Scientific Name
Birds (continued)	
Northern Goshawk	*Accipiter gentilis*
Swainson's Hawk	*Buteo swainsoni*
Red-tailed Hawk	*Buteo jamaicensis*
Ferruginous Hawk	*Buteo regalis*
Rough-legged Hawk	*Buteo lagopus*
Golden Eagle	*Aquila chrysaetos*
American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Peregrine Falcon	*Falco peregrinus*
Prairie Falcon	*Falco mexicanus*
Gray Partridge	*Perdix perdix*
Ring-necked Pheasant	*Phasianus colchicus*
Sharp-tailed Grouse	*Tympanuchus phasianellus*
Wild Turkey	*Meleagris gallopavo*
Sora	*Porzana carolina*
American Coot	*Fulica americana*
Sandhill Crane	*Grus canadensis*
Simipalmated Plover	*Charadrius semipalmatus*
Killdeer	*Charadrius vociferus*
American Avocet	*Recurvirostra americana*
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Solitary Sandpiper	*Tringa solitaria*
Willet	*Catoptrophorus semipalmatus*
Spotted Sandpiper	*Actitis macularia*
Upland Sandpiper	*Bartramia longicauda*
Long-billed Curlew	*Numenius americanus*
Marbled Godwit	*Limosa fedoa*
Common Snipe	*Capella gallinago*
Wilson's Phalarope	*Phalaropus tricolor*
Red-necked Phalarope	*Phalaropus lobatus*
Bonaparte’s Gull	*Larus philadelphia*
Franklin’s Gull	*Larus pipixcan*
Ring-billed Gull	*Larus delawarensis*
Black Tern	*Chlidonias niger*
Rock Dove	*Columba livia*
Mourning Dove	*Zenaida macroura*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Eastern Screech-owl	*Otus asio*
Great Horned Owl	*Bubo virginianus*
Snowy Owl	*Nyctea scandiaca*
Burrowing Owl	*Speotyto cunicularia*
Long-eared Owl	*Asio otus*
Short-eared Owl	*Asio flammeus*
Northern Saw-whet Owl	*Aegolius acadicus*
Common Nighthawk	*Chordeiles minor*
Common Poorwill	*Phalaenoptilus nuttallii*
White-throated Swift	*Aeronautes saxatalis*

Common Name	Scientific Name
Birds (continued)	
Ruby-Throated Hummingbird	*Archilochus colubris*
Broad-tailed Hummingbird	*Selasphorus platycercus*
Rufous Hummingbird	*Selasphorus rufus*
Belted Kingfisher	*Ceryle alcyon*
Lewis' Woodpecker	*Melanerpes lewis*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Red-naped Sapsucker	*Sphyrapicus nuchalis*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides villosus*
Black-backed Woodpecker	*Picoides arcticus*
Northern Flicker	*Colaptes auratus*
Olive-sided Flycatcher	*Contopus borealis*
Western Wood-pewee	*Contopus sordidulus*
Alder Flycatcher	*Empidonax alnorum*
Willow Flycatcher	*Empidonax traillii*
Least Flycatcher	*Empidonax minimus*
Dusky Flycatcher	*Empidonax oberholseri*
Cordilleran Flycatcher	*Empidonax occidentalis*
Eastern Phoebe	*Sayornis phoebe*
Say's Phoebe	*Sayornis saya*
Cassin’s Kingbird	*Tyrannus vociferans*
Western Kingbird	*Tyrannus verticalis*
Eastern Kingbird	*Tyrannus tyrannus*
Loggerhead Shrike	*Lanius ludovicianus*
Northern Shrike	*Lanius excubitor*
Bell's Vireo	*Vireo bellii*
Plumbeous Vireo	*Vireo plumbeus*
Warbling Vireo	*Vireo gilvus*
Red-eyed Vireo	*Vireo olivaceus*
Gray Jay	*Perisoreus canadensis*
Blue Jay	*Cyanocitta cristata*
Pinyon Jay	*Gymnorhinus cyanochephalus*
Clark's Nutcracker	*Nucifraga columbiana*
Black-billed Magpie	*Pica pica*
American Crow	*Corvus brachyrhynchos*
Horned Lark	*Eremophila alpestris*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*Tachycineta serripennis*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Bank Swallow	*Riparia riparia*
Cliff Swallow	*Hirundo pyrrhonota*
Barn Swallow	*Hirundo rustica*
Black-capped Chickadee	*Parus atricapillus*
Red-breasted Nuthatch	*Sitta canadensis*
White-breasted Nuthatch	*Sitta carolinensis*
Pygmy Nuthatch	*Sitta pygmaea*
Brown Creeper	*Certhia americana*
Rock Wren	*Salpinctes obsoletus*

Common Name	**Scientific Name**
Birds (continued)	
Canyon Wren	*Catherpes mexicanus*
House Wren	*Troglodytes aedon*
Winter Wren	*Troglodytes troglodytes*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Eastern Bluebird	*Sialia sialis*
Mountain Bluebird	*Sialia currucoides*
Townsend's Solitaire	*Myadestes townsendi*
Veery	*Catharus fuscenscens*
Swainson's Thrush	*Catharus ustulatus*
American Robin	*Turdus migratorius*
Gray Catbird	*Dumetella carolinensis*
Northern Mockingbird	*Mimus polyglottos*
Brown Thrasher	*Toxostoma rufum*
European Starling	*Strunus vulgaris*
Bohemian Waxwing	*Bombycilla garrulus*
Cedar Waxwing	*Bombycilla cedrorum*
Tennessee Warbler	*Vermivora peregrina*
Orange-crowned Warbler	*Vermivora celata*
Yellow Warbler	*Dendroica petechia*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Black-throated Blue Warbler	*Dendroica caerulescens*
Yellow-rumped Warbler	*Dendroica coronata*
Prairie Warbler	*Denroica discolor*
Palm Warbler	*Denroica palmarum*
Blackpoll Warbler	*Dendroica striata*
Black-and-White Warbler	*Mniotilta varia*
American Redstart	*Setophaga ruticilla*
Ovenbird	*Seiurus aurocapillus*
Northern Waterthrush	*Seiurus noveboracensis*
MacGillivray's Warbler	*Oporornis tolmiei*
Common Yellowthroat	*Geothlypis trichas*
Wilson's Warbler	*Wilsonia pusilla*
Yellow-breasted Chat	*Icteria virens*
Western Tanager	*Piranga ludoviciana*
Spotted Towhee	*Pipilo maculatus*
American Tree Sparrow	*Spizella arborea*
Chipping Sparrow	*Spizella passerina*
Clay-colored Sparrow	*Spizella pallida*
Field Sparrow	*Spizella pusilla*
Vesper Sparrow	*Pooecetes gramineus*
Lark Sparrow	*Chondestes grammacus*
Lark Bunting	*Calamospiza melanocorys*
Savannah Sparrow	*Passerculus sandwichensis*
Grasshopper Sparrow	*Ammodramus savannarum*
Baird's Sparrow	*Ammodramus bairdii*
Song Sparrow	*Melospiza melodia*
Lincoln's Sparrow	*Melospiza lincolnii*

Common Name	Scientific Name
Birds (continued)	
White-throated Sparrow	*Zonotrichia albicollis*
White-crowned Sparrow	*Zonotrichia leucophrys*
Harris' Sparrow	*Zonotrichia querula*
Dark-eyed Junco	*Junco hyemalis*
White-winged Junco	*Junco hyemalis aikeni*
McCown's Longspur	*Calcarius mccownii*
Lapland Longspur	*Calcarius lapponicus*
Chestnut-collared Longspur	*Calcarius ornatus*
Snow Bunting	*Plectrophenax nivalis*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Blue Grosbeak	*Guiraca caerulea*
Lazuli Bunting	*Passerina amoena*
Indigo Bunting	*Passerina cyanea*
Dickcissel	*Spiza americana*
Bobolink	*Dolichonyx oryzivorus*
Red-winged Blackbird	*Agelaius phoeniceus*
Eastern Meadowlark	*Sturnella magna*
Western Meadowlark	*Sturnella neglecta*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Brewer's Blackbird	*Euphagus cyanocephalus*
Common Grackle	*Quiscalus quiscula*
Brown-headed Cowbird	*Molothrus ater*
Orchard Oriole	*Icterus spurius*
Baltimore Oriole	*Icterus galbula*
Bullock’s Oriole	*Icterus bullockii*
Gray-crowned Rosy Finch	*Leucosticte tephrocotis*
Purple Finch	*Carpodacus purpureus*
Cassin's Finch	*Carpodacus cassinii*
House Finch	*Carposacus mexicanus*
Red Crossbill	*Loxia curvirostra*
Common Redpoll	*Carduelis flammea*
Pine Sisken	*Carduelis pinus*
American Goldfinch	*Carduelis tristis*
Evening Grosbeak	*Coccothraustes vespertinus*
House Sparrow	*Passer domesticus*
Fish	
Creek chub	*Semotilus atromaculatus*
Fathead minnow	*Pimephales promelas*
Longnose dace	*Rhinichthys cataractae*
White sucker	*Catostomus commersoni*
Mountain sucker	*Catostomus platyrhychus*
Brook trout	*Salvelinus fontinalus*

Common Name	Scientific Name
Mammals	
Hayden's shrew	*Sorex haydeni*
least shrew	*Cryptotis parva*
little brown myotis	*Myotis lucifugus*
western small-footed myotis	*Myotis ciliolabrum*
long-legged myotis	*Myotis volans*
long-eared myotis	*Myotis evotis*
fringe-tailed myotis	*Myotis thysanodes*
Townsend's big-eared bat	*Corynorhinus townsendii*
hoary bat	*Lasiurus cinereus*
silver-haired bat	*Lasionycteris noctivagans*
big brown bat	*Eptesicus fuscus*
common raccoon	*Procyon lotor*
ermine	*Mustela erminea*
long-tailed weasel	*Mustela frenata*
striped skunk	*Mephitis mephitis*
American badger	*Taxidea taxus*
coyote	*Canis latrans*
mountain lion	*Felis concolor*
bobcat	*Felis rufus*
yellow-bellied marmot	*Marmota flaviventris*
black-tailed prairie dog	*Cynomys ludovicianus*
least chipmunk	*Tamias minimus*
red squirrel	*Tamiasciurus hudsonicus*
eastern fox squirrel	*Sciurus niger*
thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*
northern flying squirrel	*Glaucomys sabrinus*
northern pocket gopher	*Thomomys talpoides*
olive-backed pocket mouse	*Perognathus fasciatus*
silky pocket mouse	*Perognathus flavus*
hispid pocket mouse	*Chaetodipus hispidus*
western harvest mouse	*Reithrodontomys megalotis*
deer mouse	*Peromyscus maniculatus*
white-footed mouse	*Peromyscus leucopus*
bushy-tailed woodrat	*Neotoma cinerea*
meadow vole	*Microtus pennsylvanicus*
prairie vole	*Microtus ochrogaster*
southern red-backed vole	*Clethrionomys gapperi*
muskrat	*Ondatra zibethicus*
house mouse	*Mus musculus*
meadow jumping mouse	*Zapus hudsonius*
porcupine	*Erethizon dorsatum*
white-tailed jackrabbit	*Lepus townsendii*
eastern cottontail	*Sylvilagus floridanus*
mountain cottontail	*Sylvilagus nuttallii*
desert cottontail	*Sylvilagus audobonii*
elk	*Cervus elaphus*
mule deer	*Odocoileus hemionus*

Common Name	**Scientific Name**
Mammals (continued)	
white-tailed deer	*Odocoileus virginianus*
pronghorn	*Antilocapra americana*
bison	*Bison bison*
Reptiles	
Eastern yellow-bellied racer	*Coluber constrictor flaviventris*
Prairie rattlesnake	*Crotalis viridis viridis*
Western hognose snake	*Heterodon nasicus*
Milk snake	*Lampropeltis triangulum*
Smooth green snake	*Liochlorophis vernalis*
Bullsnake	*Pituiphis melanoleucus*
Wandering garter snake	*Thamnophis elegans*
Plains garter snake	*Thamnophis radix*
Red-sided garter snake	*Thamnophis sirtalis parietalis*
Common snapping turtle	*Chelydra serpentina*
Western painted turtle	*Chrysemys picta belli*

Invertebrate Species

Butterflies

Baird's Swallowtail	*Papilio machaon bairdii*
Nitra Swallowtail	*Papilio zelicaon nitra*
Indra Swallowtail	*Papilio indra*
Eastern Tiger Swallowtail	*Papilio glaucus*
Canadian Tiger Swallowtail	*Papilio canadensis*
Western Tiger Swallowtail	*Papilio rutulus*
Two-tailed Swallowtail	*Papilio multicaudata*
Pine White	*Neophasia menapia*
Nordin's White	*Pontia sisymbrii nordini*
Checkered White	*Pontia protodice*
Western White	*Pontia occidentalis*
Cabbage White	*Pieris rapae*
Olympia Marble	*Euchloe olympia*
Clouded Sulphur	*Colias philodice*
Orange Sulphur	*Colias eurytheme*
Christina Sulphur	*Colias christina krauthii*
Queen Alexandra's Sulphu	*Colias alexandra*
Dainty Sulphur	*Nathalis iole*
Gray Copper	*Lycaena dione*
Bronze Copper	*Lycaena hyllus*
Purplish Copper	*Lycaena helloides*
Siva Hairstreak	*Callophrys gryneus siva*
Western Pine Elfin	*Callophrys eryphon*
Frank's Common Hairstreak	*Strymon melinus franki*
Reakirt's Blue	*Hemiargus isola*
Western Tailed-Blue	*Everes amyntula*
Valerie's Tailed-Blue	*Everes amyntula valeriae*
Spring Azure	*Celastrina "ladon"*
Summer Azure	*Celastrina neglecta*
Oro Blue	*Glaucopsyche lygdamus oro*
Melissa Blue	*Lycaeides melissa*
Amica Blue	*Plebejus saepiolus amica*
Gulf Fritillary	*Agraulis vanillae*
Variegated Fritillary	*Euptoieta claudia*
Great Spangled Fritillary	*Speyeria cybele*
Aphrodite Fritillary	*Speyeria aphrodite*
Regal Fritillary	*Speyeria idalia*
Edwards' Fritillary	*Speyeria edwardsii*
Coronis Fritillary	*Speyeria coronis* ssp.
Calgary Fritillary	*Speyeria callippe calgariana*
Carlota Checkerspot	*Chlosyne gorgone carlota*
Pearl Crescent	*Phyciodes tharos*
Northern Crescent	*Phyciodes cocyta*
Tawny Crescent	*Phyciodes batesii*
Barnes's Pale Crescent	*Phyciodes pallida barnesi*
Anicia Checkerspot	*Euphydryas chalcedona anicia*
Question Mark	*Polygonia interrogationis*

Common Name	Scientific Name
Butterflies (continued)	
Eastern Comma	*Polygonia comma*
Colorado Comma	*Polygonia faunus hylas*
Zephyr	*Polygonia gracilis zephyrus*
Gray Comma	*Polygonia progne*
Mourning Cloak	*Nymphalis antiopa*
Milbert's Tortoiseshell	*Nymphalis milberti*
Red Admiral	*Vanessa atalanta rubria*
American Lady	*Vanessa virginiensis*
Painted Lady	*Vanessa cardui*
Viceroy	*Limenitis archippus*
Oberfoell's Admiral	*Limenitis weidemeyerii oberfoelli*
Prairie Ringlet	*Coenonympha tullia benjamini*
Ochre Ringlet	*Coenonympha tullia ochracea*
Uhler's Arctic	*Oeneis uhleri*
Monarch	*Danaus plexippus*
Silver-spotted Skipper	*Epargyreus clarus*
Northern Cloudywing	*Thorybes pylades*
Afranius Duskywing	*Erynnis afranius*
Small Checkered-Skipper	*Pyrgus scriptura*
Common Checkered-Skipper	*Pyrgus communis*
Common Sootywing	*Pholisora catullus*
Garita Skipperling	*Oarisma garita*
Uncas Skipper	*Hesperia uncas*
Western Branded Skipper	*Hesperia colorado idaho*
Ottoe Skipper	*Hesperia ottoe*
Pawnee Skipper	*Hesperia leonardus pawnee*
Pahaska Skipper	*Hesperia pahaska*
Tawny-edged Skipper	*Polites themistocles*
Rhena Skipper	*Polites origenes rhena*
Dakotah Long Dash	*Polites mystic dacotah*
Sachem	*Atalopedes campestris*
Iowa Skipper	*Atrytone arogos iowa*
Hobomok Skipper	*Poanes hobomok*
Taxiles Skipper	*Poanes taxiles*
Kiowah Skipper	*Euphyes vestris kiowah*
Dusted Skipper	*Atrytonopsis hianna*
Turner's Skipper	*Atrytonopsis hianna turneri*
Simius Roadside-Skipper	*"Amblyscirtes" simius*
Oslar's Roadside-Skipper	*Amblyscirtes oslari*
Common Roadside-Skipper	*Amblyscirtes vialis*
Leussler's Giant Skipper	*Megathymus streckeri leussleri*

Damselflies

Ebony Jewelwing	*Calopteryx maculata*
Great Spreadwing	*Archilestes grandis*
Common Spreadwing	*Lestes disjunctus*
Emerald Spreadwing	*Lestes dryas*
Lyre-tipped Spreadwing	*Lestes unguiculatus*
Red Damsels	*Amphiagrion* sp.
Paiute Dancer	*Argia alberta*
Springwater Dancer	*Argia plana*
Vivid Dancer	*Argia vivida*
River Bluet	*Enallagma anna*
Familiar Bluet	*Enallagma civile*
Northern Bluet	*Enallagma cyathigerum*
Arroyo Bluet	*Enallagma praevarum*
Pacific Forktail	*Ischnura cervula*
Plains Forktail	*Ischnura damula*
Western Forktail	*Ischnura perparva*
Eastern Forktail	*Ischnura verticalis*

Dragonflies

California Darner	*Aeshna californica*
Blue-eyed Darner	*Aeshna multicolor*
Paddle-tailed Darner	*Aeshna palmata*
Shadow Darner	*Aeshna umbrosa*
Horned Clubtail	*Arigomphus cornutus*
Pale Snaketail	*Ophiogomphus severus severus*
Dot-tailed Whiteface	*Leucorrhinia intacta*
Eight-spotted Skimmer	*Libellula forensis*
Widow Skimmer (possible observation)	*Libellula luctuosa*
Common Whitetail	*Libellula lydia*
Twelve-spotted Skimmer	*Libellula pulchella*
Variegated Meadowhawk	*Sympetrum corruptum*
Saffron-winged Meadowhawk	*Sympetrum costiferum*
Black Meadowhawk	*Sympetrum danae*
White-faced Meadowhawk	*Sympetrum obtrusum*
Western Meadowhawk	*Sympetrum occidentale fasciatum*
Striped Meadowhawk	*Sympetrum pallipes*
Ruby Meadowhawk	*Sympetrum rubicundulum*
Black Saddlebags (possible observation)	*Tramea lacerata*

Snails

	Cionella lubrica
	Columella edentula
	Deroceras laeve
	Discus catskillensis
	Discus whitneyi
	Euconulus fulvus
	Gastrocopta armifera
	Gastrocopta holzingeri
	Gastrocopta pellucida

Common Name	Scientific Name
Snails (continued)	
	Gastrocopta procera
	Hawaiia minuscula
	Nesovitrea binneyana
	Nesovitrea electrina
	Pupilla blandi
	Pupilla hebes
	Pupilla muscorum
	Pupoides albilabris
	Striatura milium
	Vallonia gracilicosta
	Vallonia parvula
	Vallonia pulchella
	Vertigo arthuri
	Vertigo tridentata
	Vitrina alaskana/pellucida
	Zonitoides arboreus

Vegetation

Family	Common Name	Scientific Name
Aceraceae	boxelder maple	*Acer negundo L. var.*
Agavaceae	yucca, soapweed	*Yucca glauca*
Alismataceae	arrowhead	*Sagittaria cuneata*
Amaranthaceae	mat amaranth	*Amaranthus graecizans*
	pigweed; redroot amaranth	*Amaranthus retroflexus*
Anacardiaceae	skunkbush sumac	*Rhus aromatica Ait. var. trilobata*
	smooth sumac	*Rhus glabra*
	western poison ivy	*Toxicodendron rydbergii*
Apiaceae	cow parsnip, eltrot	*Heracleum sphondylium*
	cutleaf waterparsnip	*Berula*
	desert biscuitroot	*Lomatium foeniculaceum*
	golden Alexanders	*Zizia aptera*
	maryland sanicle, snakeroot	*Sanicula marilandica*
	parsnip, mt. Springparsley	*Cymopterus montanus*
	poison hemlock	*Conium maculatum*
	sweet Cicely, longstyle sweetroot	*Osmorhiza longistylis*
	water parsnip	*Sium suave*
	western water hemlock	*Cicuta maculata*
	wild carrot, Queen Anne's lace	*Daucus carota*
Apocynaceae	indianhemp	*Apocynum cannabinum*
	spreading dogbane	*Apocynum androsaemifolium*
Araliaceae	wild sarsaparilla	*Aralia nudicauli.*
Asclepiadaceae	common milkweed	*Asclepias syriaca*
	green milkweed	*Asclepias viridiflora*
	ovalleaf or dwarf milkweed	*Asclepias ovalifolia*
	plains or dwarf milkweed	*Asclepias pumila*
	showy milkweed	*Asclepias speciosa*
	slimleaf or green milkweed	*Asclepias stenophylla*
	swamp milkweed	*Asclepias incarnata*
	whorled milkweed	*Asclepias verticillata*
Asteraceae	a goldenrod	*Solidago rigida*
	a microseris	*Microseris cuspidata*
	a sunflower	*Helianthus rigidus*
	an aster, lilac aster	*Aster hesperius*
	annual ragweed	*Ambrosia artemisiifolia*
	aromatic aster, prairie aster	*Aster oblongifolius*
	beggarticks	*Bidens vulgata*
	bitter fleabane	*Erigeron acris*
	black-eyed Susan	*Rudbeckia hirta*
	blacksamson, purple cone-flower	*Echinacea angustifolia*
	blanket flower	*Gaillardia aristata*
	blazing star, dotted gayfeather	*Liatris punctata*
	blue lettuce	*Lactuca oblongifolia*
	broom snakeweed, match brush	*Gutierrez sarothrae*
	buff fleabane	*Erigeron ochroleucus*
	bull thistle	*Cirsium vulgare*
	Canada goldenrod	*Solidago canadensis*

Family	Common Name	Scientific Name
Asteraceae	Canada lettuce, wild lettuce	*Lactuca canadensis*
	Canada thistle	*Cirsium arvense*
	Canadian horseweed	*Conyza canadensis*
	cluster aster	*Aster falcatus*
	common or gray-seeded dandelion	*Taraxacum officinale*
	common sunflower	*Helianthus annuus*
	common tansy	*Tanacetum vulgare*
	curlycup gumweed	*Grindelia squarrosa*
	daisy fleabane	*Erigeron lonchophyllus*
	desert groundsel	*Senecio eremophilus var. eremophilus*
	dwarf horseweed	*Conyza ramosissima*
	dwarf pussy-toes	*Antennaria dimorpha*
	Dyersweed or gray goldenrod	*Solidago nemoralis*
	Engelmann's daisy	*Engelmannia pinnatifida*
	false boneset	*Kuhnia eupatorioide*
	fetid marigold, dogweed	*Dyssodia papposa*
	field pussy-toes	*Antennaria neglecta*
	field sagewort	*Artemisia campestris*
	fineleaf hymenopappus	*Hymenopappus filifolius*
	fleabane	*Erigeron caespitosus*
	fleabane	*Erigeron glabellus*
	fleabane	*Erigeron pumilus*
	Flodman's thistle	*Cirsium flodmanii*
	foothill sagewort, white sage	*Artemisia ludoviciana var. ludoviciana*
	fringed sagewort	*Artemisia frigida*
	giant goldenrod	*Solidago gigantea*
	giant sumpweed, false ragweed	*Iva xanthifolia*
	golden aster	*Chrysopsis villosa*
	golden aster	*Chrysopsis villosa*
	golden aster, gold star	*Chrysopsis villosa*
	goldweed	*Ximenesia encelioides*
	grayheaded prairie coneflower	*Ratibida pinnata*
	great or giant ragweed, kinghead	*Ambrosia trifida*
	green prairie coneflower	*Ratibida tagetes*
	groundsel	*Senecio crassulus*
	hairy goldenaster	*Chrysopsis villosa*
	heath aster, white aster	*Aster ericoides*
	hoary fleabane	*Erigeron canus*
	Hooker's townsendia	*Townsendia hookeri*
	Hopi tea greenthread	*Thelesperma megapotamicum*
	iron plant, goldenweed	*Machaeranthera spinulosa*
	Jerusalem artichoke	*Helianthus tuberosus*
	lacy tansy aster	*Haplopappus spinulosus*
	lambstongue groundsel	*Senecio integerrimus var. integerrimus*
	lesser or common burdock	*Arctium minus*
	littleleaf pussy-toes	*Antennaria microphylla*
	Maximilian sunflower	*Helianthus maximiliani*
	mayweed, dog fennel	*Anthemis cotula*
	meadow knapweed	*Centaurea pratensis*

Family	Common Name	Scientific Name
Asteraceae	meadow salsify	*Tragopogon pratensis*
	Missouri goldenrod	*Solidago missouriensis*
	musk thistle	*Carduus nutans*
	narrowleaf hawkweed	*Hieracium umbellatum*
	nodding beggartick	*Bidens cernua*
	northern pussy-toes	*Antennaria neodioica*
	Nuttall's sunflower	*Helianthus nuttallii*
	oppositeleaf bahia	*Picradeniopsis oppositifolia*
	pale agoseris, false dandelion	*Agoseris glauca*
	pearly everlasting	*Anaphalis margaritacea*
	perennial sowthistle	*Sonchus arvensis*
	Philadelphia fleabane	*Erigeron philadelphicus*
	plains sunflower	*Helianthus petiolaris*
	prairie groundsel, prairie ragwort	*Senecio plattensis*
	prairie or daisy fleabane	*Erigeron strigosus*
	prickly lettuce	*Lactuca serriola*
	rabbit brush	*Chrysothamnus nauseosus*
	rabbit-tobacco, diapteria	*Diapteria prolifera*
	ragwort	*Senecio rapifolius*
	rayless aster	*Machaeranthera grindelioides*
	Riddell's ragwort	*Senecio riddellii*
	rigid goldenrod	*Solidago rigida*
	rush aster	*Aster junciformis*
	rush skeletonplant	*Lygodesmia juncea*
	sand sagebrush	*Artemisia filifolia*
	scotch thistle	*Onopordum acanthium*
	showy goldenrod	*Solidago speciosa*
	silver sagebrush	*Artemisia cana*
	small leaf pussy-toes	*Antennaria parvifolia*
	smooth aster, blue aster	*Aster laevis*
	smooth blue aster	*Aster laevis*
	spiny annual sowthistle	*Sonchus asper*
	spotted joe-pye weed	*Eupatorium maculatum*
	spotted knapweed	*Centaurea maculosa*
	stemless hymenoxys	*Hymenoxys acaulis*
	stemless townsendia	*Townsendia exscapa*
	sticky or clammy cudweed	*Gnaphalium viscosum*
	stiff greenthread	*Thelesperma filifolium*
	streamside fleabane	*Erigeron glabellus*
	threenerve fleabane	*Erigeron subtrinervis*
	trailing fleabane	*Erigeron flagellaris*
	upright prairie coneflower	*Ratibida columnifera*
	velvety goldenrod	*Solidago mollis*
	viscid euthamia, fragrant goldenrod	*Euthamia gymnospermoides*
	wavyleaf thistle, rose thistle	*Cirsium undulatum*
	western fleabane	*Erigeron bellidiastrum*
	western ragweed	*Ambrosia psilostachya*
	western yarrow	*Achillea millefolium subsp. lanulosa*
	white aster	*Aster commutatus*

Family	Common Name	Scientific Name
Asteraceae	white hawkweed	*Hieracium albiflorum*
	white-flowered goldenrod	*Solidago ptarmicoides*
	wild lettuce	*Lactuca biennis*
	willow-leaved lettuce	*Lactuca saligna*
	woolly groundsel, squaw weed	*Senecio canus*
	wormwood, silky wormwood	*Artemisia dracunculus*
	yarrow	*Achillea millefolium*
	yellow salsify, yellow goatsbeard	*Tragopogon dubius*
	yellowspine thistle	*Cirsium ochrocentrum*
Betulaceae	beaked hazelnut	*Corylus cornuta*
	hop-hornbeam	*Ostrya virginiana*
	paper birch, canoe birch	*Betula papyrifera*
	water birch, mountain birch	*Betula occidentalis*
Boraginaceae	a stickseed	*Lappula echinata*
	buttecandle, Bradbury cryptantha	*Cryptantha celosioides*
	calcareous catseye	*Cryptantha thyrsiflora*
	corn gromwell	*Lithospermum arvense*
	cryptantha	*Cryptantha cana*
	false gromwell	*Onosmodium molle*
	flat-pine stickseed	*Lappula redowski*
	forget-me-not	*Myosotis sylvatica*
	hound's tongue	*Cynoglossum officinale*
	lanceleaf bluebells	*Mertensia lanceolata*
	little catseye	*Cryptantha minima*
	narrowleaf gromwell, fringed puccoon	*Lithospermum incisum*
	nodding stickseed	*Hackelia deflexa*
	stick seed	*Hackelia floribunda*
	stick seed, catchweed	*Cryptantha crassisepala*
	tall stickseed	*Hackelia virginiana*
	western onosmodium, false gromwell	*Onosmodium molle*
Brassicaceae	a rockcress	*Arabis hirsuta ssp. pycnocarpa*
	alpine bladderpod, lesquerella	*Lesquerella alpina*
	bitter cress	*Cardamine pensylvanica*
	bladder pod	*Lesquerella montana*
	blue mustard	*Chorispora tenella*
	bog yellowcress	*Rorippa palustris*
	Carolina whitlowgrass	*Draba reptans*
	charlock	*Brassica kaber*
	common pepperweed, peppergrass	*Lepidium densiflorum*
	dames rocket	*Hesperis matronalis*
	desert madwort	*Alyssum desertorum*
	false flax	*Camelina sativa*
	field pennycress	*Thlaspi arvense*
	field peppergrass	*Lepidium campestre*
	foothill bladderpod	*Lesquerella ludoviciana*
	Great Plains bladderpod	*Lesquerella arenosa*
	herb sophia, tansy mustard	*Descurainia sophia*
	Holboell's rockcress	*Arabis holboellii var. pinetorum*
	littlepod falseflax	*Camelina microcarpa*

Family	Common Name	Scientific Name
Brassicaceae	pale madwort	*Alyssum alyssoides*
	sanddune wallflower	*Erysimum capitatum*
	shepherd's purse	*Capsella bursa-pastoris*
	wormseed mustard	*Erysimum inconspicuum*
	tall tumblemustard, tumbling mustard	*Sisymbrium altissimum*
	watercress	*Nasturtium officinale*
	western tansy mustard	*Descurainia pinnata*
	western wallflower	*Erysimum asperum*
	whitlow-grass	*Draba aurea*
	wormseed wallflower	*Erysimum cheiranthoides*
Cactaceae	a pincushion cactus	*Coryphantha vivipara*
	cactus	*Coryphantha missouriensis*
	fragile pricklypear	*Opuntia fragilis*
	missouri pincushion	*Coryphantha missouriensis*
	nylon hedgehog cactus	*Echinocereus viridiflorus*
	plains pricklypear	*Opuntia polyacantha*
	pricklypear	*Opuntia humifusa*
Callitrichaceae	vernal waterstarwort	*Callitriche verna*
Campanulaceae	blue cardinal flower	*Lobelia siphilitica*
	clasping Venus' lookingglass	*Triodanis perfoliata*
	harebell	*Campanula rotundifolia*
	marsh bellflower	*Campanula aparinoides*
	palespike lobelia	*Lobelia spicata*
	slimpod Venus' lookingglass	*Triodanis leptocarpa*
Cannabaceae	common hops	*Humulus lupulus*
Capparaceae	cristatella	*Cristatella jamesii*
	RM bee plant	*Cleome serrulata*
	sandyseed clammyweed	*Polanisia dodecandra*
	toothed spiderflower	*Cleome serrata*
Caprifoliaceae	common snowberry	*Symphoricarpos albus*
	nannyberry	*Viburnum lentago*
	stinking elderberry	*Sambucus racemosa L. subsp. pubens*
	western snowberry, wolfberry	*Symphoricarpos occidentalis*
	wild honeysuckle	*Lonicera dioica*
Caryophyllaceae	big chickweed, mouse ears	*Cerastium vulgatum*
	bladder campion	*Silene vulgaris*
	bouncingbet, soapwort	*Saponaria officinalis*
	chickweed	*Stellaria longipes*
	common chickweed	*Stellaria media*
	cowcockle	*Vaccaria pyramidata*
	Deptford pink, spreading nailwort	*Dianthus armeria*
	Drummond's campion	*Silene drummondii*
	field or mouse-eared chickweed	*Cerastium arvense*
	grove sandwort	*Arenaria lateriflora*
	Hooker's sandwort	*Arenaria hookeri*
	longleaf starwort	*Stellaria longifolia*
	night-blooming catchfly, campion	*Silene noctiflora*
	sleepy silene, sleepy catchfly	*Silene antirrhina*
	spreading nailwort; whitlow wort	*Paronychia depressa*

Family	Common Name	Scientific Name
Caryophyllaceae	white campion, white cockle	*Silene pratensis*
	whitlow-wort? nailwort?	*Paronychia sessiliflora*
Celastraceae	American bittersweet	*Celastrus scandens*
Chenopodiaceae	desert goosefoot	*Chenopodium pratericola*
	kochia, Mexican firebush	*Kochia scoparia*
	lambsquarters, goosefoot	*Chenopodium album*
	mapleleaf goosefoot	*Chenopodium gigantospermum*
	Nuttall's povertyweed	*Monolepis nuttalliana*
	pitseed goosefoot	*Chenopodium berlandieri*
	prickly Russian thistle	*Salsola iberica*
	winged pigweed	*Cycloloma atriplicifolium*
Cistaceae	hoary frostweed	*Helianthemum bicknellii*
Clusiaceae	lesser Canadian St. Johnswort	*Hypericum canadense*
Commelinaceae	longbract spiderwort	*Tradescantia bracteata*
	prairie spiderwort	*Tradescantia occidentalis*
Convolvulaceae	bush morning glory	*Ipomoea leptophylla*
	field bindweed	*Convolvulus arvensis*
	hedge false bindweed	*Calystegia sepium*
	shaggy dwarf morningglory	*Evolvulus nuttallianus*
Cornaceae	red osier dogwood	*Cornus stolonifera*
Crassulaceae	spearleaf stonecrop	*Sedum lanceolatum*
Cucurbitaceae	wild cucumber	*Echinocystis lobata*
Cupressaceae	common juniper	*Juniperus communis*
	creeping juniper	*Juniperus horizontalis*
	Rocky Mountain juniper	*Juniperus scopulorum*
Cyperaceae	Back's sedge	*Carex backii*
	bearded flatsedge	*Cyperus aristatus*
	bottlebrush sedge	*Carex hystericina*
	cleaked or giant bulrush, tule	*Scirpus validus*
	cloaked bulrush	*Scirpus pallidus*
	common spikerush	*Eleocharis palustris*
	Douglas' sedge	*Carex douglasii*
	eastern woodland sedge	*Carex blanda*
	fescue sedge	*Carex brevior*
	fox sedge	*Carex vulpinoidea*
	Hood's sedge	*Carex hoodii*
	Nebraska sedge	*Carex nebrascensi*
	Pennsylvania sedge	*Carex pensylvanica*
	Richardson's sedge	*Carex richardsonii*
	Schweinitz's flatsedge	*Cyperus schweinitzii*
	sedge	*Carex tenera*
	sedge	*Cyperus lupulinus*
	sedge, bulrush, tule	*Scirpus atrovirens*
	Sprengel's sedge	*Carex sprengelii*
	sun sedge	*Carex heliophila*
	tapertip flatsedge	*Cyperus acuminatus*
	threadleaf sedge	*Carex filifolia*
	woolly sedge	*Carex lanuginose*

Family	Common Name	Scientific Name
Dipsacaceae	common teasel	*Dipsacus sylvestris*
Dryopteridaceae	mountain cliff fern	*Woodsia scopulina*
Elaeagnaceae	russet buffaloberry	*Shepherdia canadensis*
Elaeagnaceae	silver buffaloberry	*Shepherdia argentea*
Equisetaceae	field horsetail	*Equisetum arvense*
	scouringrush or rough horsetail	*Equisetum hyemale*
	smooth horsetail	*Equisetum laevigatum*
Ericaceae	kinnikinnick, bearberry	*Arctostaphylos uva-ursi*
	pine-drops	*Pterospora andromedea*
Euphorbiaceae	a spurge	*Euphorbia glyptosperma*
	a spurge	*Euphorbia serpyllifolia*
	a spurge	*Euphorbia stictospora*
	leafy spurge	*Euphorbia esula*
	Missouri spurge, prairie spurge	*Euphorbia missurica*
	Rocky Mountain spurge	*Euphorbia robusta*
	snow on the mountain	*Euphorbia marginata*
	toothed spurge	*Euphorbia dentata*
	warty spurge	*Euphorbia spathulata*
Fabaceae	alfalfa, wild alfalfa	*Medicago sativa*
	alpine milkvetch	*Astragalus alpinus*
	American licorice	*Glycyrrhiza lepidota*
	American vetch	*Vicia americana*
	black medick, nonesuch	*Medicago lupulina*
	breadroot scurfpea, tipson, prairie turnip	*Psoralea esculenta*
	cream peavine	*Lathyrus ochroleucus*
	crown vetch	*Coronilla varia*
	desert indigobush, false indigo	*Amorpha fruticosa*
	Drummond milk-vetch	*Astragalus drummondii*
	dwarf wild indigo, dwarf false indigo	*Amorpha nana*
	flexile milkvetch	*Astragalus flexuosus*
	golden prairieclover	*Dalea aurea*
	groundplum milkvetch	*Astragalus crassicarpus*
	Lambert's crazyweed	*Oxytropis lambertii*
	largebract Indian breadroot	*Psoralea cuspidata*
	leadplant	*Amorpha canescens*
	locoweed, slender locoweed	*Oxytropis macounii*
	loco-weed, slender locoweed	*Oxytropis dispar*
	lotus milkvetch	*Astragalus lotiflorus*
	massive spike prairie-clover	*Dalea cylindriceps*
	milkvetch	*Astragalus purshii*
	Missouri milkvetch	*Astragalus missouriensis*
	nineanther prairieclover	*Dalea enneandra*
	plains milkvetch	*Astragalus gilviflorus*
	Platte River milk-vetch	*Astragalus plattensis*
	prairie milkvetch	*Astragalus adsurgens*
	prairie thermopsis, golden pea	*Thermopsis rhombifolia*
	purple milkvetch	*Astragalus agrestis*
	Purple prairie clover	*Dalea purpurea*
	purple prairieclover	*Dalea purpurea*

Family	Common Name	Scientific Name
Fabaceae	red clover	*Trifolium pratense*
	showy peavine	*Lathyrus polymorphus*
	silverleaf scurfpea	*Psoralea argophylla*
	silvery lupine	*Lupinus argenteus*
	silvery lupine, blue-bonnet	*Lupinus argenteus*
	silvery oxytrope; white locoweed	*Oxytropis sericea*
	slender milkvetch; locoweed	*Astragalus gracilis*
	slender white prairieclover	*Dalea candida*
	slimflower scurfpea	*Psoralea tenuiflora*
	tufted milkvetch	*Astragalus spatulatus*
	two-grooved milkvetch, locoweed	*Astragalus bisulcatus*
	white clover	*Trifolium repens*
	white praire-clover	*Dalea candida*
	white sweetclover	*Melilotus alba*
	yellow sweetclover	*Melilotus officinalis*
	bur oak	*Quercus macrocarpa*
Fumariaceae	golden corydalis	*Corydalis aurea*
	golden corydalis, scrambled eggs	*Corydalis aurea*
	slender fumewort	*Corydalis micrantha*
Gentianaceae	autumn dwarfgentian	*Gentianella amarella*
	closed gentian, bottle gentian	*Gentiana andrewsii*
	spurred gentian	*Halenia deflexa*
Geraniaceae	Richardson's geranium	*Geranium richardsonii*
	small geranium	*Geranium pusillum*
	sticky geranium	*Geranium viscosissimum*
Grossulariaceae	spiny currant	*Ribes setosum*
	Canadian gooseberry	*Ribes oxyacanthoides ssp. oxyacanthoides*
	golden currant, buffalo currant	*Ribes odoratum*
	gooseberry	*Ribes missouriense*
	wax currant, western red currant	*Ribes cereum*
Hydrophyllaceae	Aunt Lucy	*Ellisia nyctelea*
Iridaceae	mountain blue-eyed grass	*Sisyrinchium montanum*
	Rocky Mountain iris, blue flag	*Iris missouriensis*
Juncaceae	Dudley's rush, wiregrass	*Juncus dudleyi*
	inland rush	*Juncus interior*
	swordleaf rush	*Juncus ensifolius*
	toad rush, wiregrass	*Juncus bufonius*
	Torrey's rush	*Juncus torreyi*
Juncaginaceae	arrow-grass	*Triglochin palustris*
Lamiaceae	American waterhorehound	*Lycopus americanus*
	azure blue sage	*Salvia azurea*
	blue giant or lavender hyssop	*Agastache foeniculum*
	catnip	*Nepeta cataria*
	common motherwort	*Leonurus cardiaca*
	common selfheal	*Prunella vulgaris*
	dragonhead	*Dracocephalum parviflorum*
	Drummond's falsepennyroyal	*Hedeoma drummondii*
	horehound	*Marrubium vulgare*

Family	Common Name	Scientific Name
Lamiaceae	lance-leaved sage	*Salvia reflexa*
	marsh hedgenettle	*Stachys palustris*
	marsh skullcap	*Scutellaria galericulata*
	mintleaf beebalm, wild bergamot	*Monarda fistulosa*
	rough falsepennyroyal	*Hedeoma hispida*
	splitlip hempnettle	*Galeopsis bifida*
	wild mint, field mint	*Mentha arvensis*
Lemnaceae	common duckweed	*Lemna minor*
Liliaceae	carrion-flower	*Smilax herbacea*
	common starlily	*Leucocrinum montanum*
	false Solomon's seal, spikenard	*Smilacina racemosa*
	garden asparagus	*Asparagus officinalis*
	Geyer's onion	*Allium geyeri*
	grape hyacinth	*Muscari botryoides*
	grassy deathcamas	*Zigadenus venenosus var. gramineus*
	Gunnison's Mariposa lily	*Calochortus gunnisonii*
	king Solomon's seal	*Polygonatum biflorum*
	nodding onion, wild onion	*Allium cernuum*
	roughfruit fairybells	*Disporum trachycarpum*
	sego lily	*Calochortus nuttalli*
	starry false Solomon's seal, spikenard	*Smilacina stellata*
	textile onion	*Allium textile*
	tulip	*Tulipa sp.*
	wild onion	*Allium drummondii*
	wood lily	*Lilium philadelphicum*
Linaceae	blue flax	*Linum perenne*
	compact stiffstem flax, yellow flax	*Linum rigidum*
	stiffstem flax; yellow flax	*Linum rigidum*
	stiffstem flax; yellow flax	*Linum rigidum*
Loasaceae	chickenthief, stick-leaf blazing star	*Mentzelia oligosperma*
	sand lily, blazing star	*Mentzelia nuda*
	tenpetal blazingstar, stickleaf	*Mentzelia decapetala*
Malvaceae	hollyhock	*Althaea rosea*
	scarlet globemallow	*Sphaeralcea coccinea*
Marsileaceae	hairy pepperwort	*Marsilea vestita*
Monotropaceae	pine drops	*Pterospora andromedea*
Nyctaginaceae	hairy four o'clock	*Mirabilis hirsuta*
	heartleaf four o'clock	*Mirabilis nyctaginea*
	narrowleaf four o'clock	*Mirabilis linearis*
	sweet sand verbena	*Abronia fragans*
Oleaceae	common lilac	*Syringa vulgaris*
	green ash	*Fraxinus pennsylvanica*
Onagraceae	autumn willowweed	*Epilobium paniculatum*
	broadleaf enchanter's nightshade	*Circaea lutetiana ssp. Canadensis*
	cowboy primrose/moonflower	*Oenothera caespitosa*
	crownleaf eveningprimrose	*Oenothera coronopifolia*
	cutleaf eveningprimrose	*Oenothera laciniata*
	evening primrose	*Oenothera biennis*
	fireweed	*Epilobium angustifolium*

Family	Common Name	Scientific Name
Onagraceae	hairy or yellow evening primrose	*Oenothera villosa*
	hairy willowherb	*Epilobium ciliatum*
	mountain eveningprimrose	*Oenothera latifolia*
	Nuttall's eveningprimrose	*Oenothera nuttallii*
	scarlet gaura; scarlet beeblossom	*Gaura coccinea*
	velvetweed	*Gaura parviflora*
	whitest eveningprimrose	*Oenothera albicaulis*
	shrubby evening primrose	*Calylophus serrulatus*
Orchidaceae	hooded ladies' tresses	*Spiranthes romanzoffiana*
	northern green orchid	*Habenaria hyperborea*
	spring coralroot	*Corallorrhiza wisteriana*
Orobanchaceae	clustered broomrape, cancer-root	*Orobanche fasciculata*
	prairie broomrape	*Orobanche ludoviciana*
Oxalidaceae	yellow wood sorrel	*Oxalis stricta*
	Dillen's oxalis	*Oxalis dillenii*
	wood sorrel	*Oxalis corniculata*
Papaveraceae	crested pricklypoppy	*Argemone polyanthemos*
Phrymaceae	lopseed	*Phryma leptostachya*
Pinaceae	ponderosa pine, bull pine	*Pinus ponderosa*
Plantaginaceae	common plantain	*Plantago major*
	plantain, ribgrass	*Plantago rugelii*
	woolly or buckhorn plantain	*Plantago patagonica*
Poaceae	a bluegrass	*Poa canbyi*
	alkali sacaton	*Sporobolus airoides*
	alpine timothy	*Phleum alpinum*
	American mannagrass	*Glyceria grandis*
	American mannagrass	*Glyceria maxima ssp. Grandis*
	barnyard grass	*Echinochloa crusgalli*
	big bluestem	*Andropogon gerardii*
	blue grama	*Bouteloua gracilis*
	bluebunch wheatgrass	*Agropyron spicatum*
	bottlebrush squirreltail, squirreltail	*Sitanion hystrix*
	bristly muhly	*Muhlenbergia glomerata*
	buffalograss	*Buchloe dactyloides*
	Canada bluegrass	*Poa compressa*
	Canada wildrye	*Elymus canadensis*
	cheatgrass, downy brome	*Bromus tectorum*
	common timothy	*Phleum pratense*
	creeping bent	*Agrostis stolonifera L. var. palustris*
	creeping bentgrass	*Agrostis stolonifera*
	crested wheatgrass	*Agropyron cristatum*
	false buffalograss	*Munroa squarrosa*
	Fendler threeawn	*Aristida purpurea var. longiseta*
	Fendler's threeawn	*Aristida purpurea var. fendleriana*
	field brome	*Bromus arvensis*
	field sandbur	*Cenchrus longispinus*
	fowl bluegrass	*Poa palustris*
	fowl mannagrass	*Glyceria striata*
	foxtail barley	*Hordeum jubatum*

Family	Common Name	Scientific Name
Poaceae	giant wildrye, basin wild rye	*Elymus cinereus*
	green needlegrass	*Stipa viridula*
	hairy grama	*Bouteloua hirsuta*
	Heller's rosette grass	*Dichanthelium oligosanthes*
	indian ricegrass	*Oryzopsis hymenoides*
	inland bluegrass	*Poa interior*
	inland bluegrass	*Poa nemoralis var. interior*
	interrupted wildrye	*Elymus diversiglumis*
	Japanese brome	*Bromus japonicus*
	Junegrass	*Koeleria pyramidata*
	Kentucky bluegrass	*Poa pratensis*
	little barley	*Hordeum pusillum*
	little bluestem	*Schizachyrium scoparium*
	marsh muhly	*Muhlenbergia racemosa*
	meadow brome	*Bromus commutatus*
	Montana wheatgrass	*Agropyron albicans*
	native smooth brome	*Bromus inermis*
	needle-and-thread	*Stipa comata*
	orchard grass	*Dactylis glomerata*
	plains muhly	*Muhlenbergia cuspidata*
	porcupine grass	*Stipa spartea*
	poverty danthonia, poverty oatgrass	*Danthonia spicata*
	prairie cordgrass	*Spartina pectinata*
	prairie dropseed	*Sporobolus heterolepis*
	prairie Junegrass	*Koeleria macrantha*
	prairie sandreed	*Calamovilfa longifolia*
	purple lovegrass	*Eragrostis spectabilis*
	purple threeawn	*Aristida purpurea*
	red threeawn	*Aristida longiseta*
	reed canarygrass	*Phalaris arundinacea*
	rough bentgrass	*Agrostis scabra*
	roughleaf ricegrass	*Oryzopsis asperifolia*
	sand dropseed	*Sporobolus cryptandrus*
	Sandberg bluegrass	*Poa sandbergii*
	sheep's fescue	*Festuca ovina*
	shortawn foxtail	*Alopecurus aequalis*
	sideoats grama	*Bouteloua curtipendula*
	six-weeks fescue	*Festuca octoflora*
	sleepy grass	*Stipa robusta*
	slender wheatgrass	*Agropyron caninum var. unilaterale*
	slimleaf dicanthelium	*Dichanthelium linearifolium*
	small-seeded or littleseed ricegrass	*Oryzopsis micrantha*
	smooth brome	*Bromus inermis*
	spike bentgrass	*Agrostis exarata*
	stinkgrass	*Eragrostis cilianensis*
	switchgrass	*Panicum virgatum*
	thickspike wheatgrass	*Agropyron dasystachyum*
	ticklegrass	*Agrostis hyemalis*
	tumblegrass	*Schedonnardus paniculatus*

Family	Common Name	Scientific Name
Poaceae	Virginia wildrye	*Elymus virginicus*
	water foxtail	*Alopecurus carolinianus*
	water whorlgrass	*Catabrosa aquatica*
	western wheatgrass	*Agropyron smithii*
	yellow Indiangrass	*Sorghastrum nutans*
Polemoniaceae	alyssumleaf phlox, pointed phlox	*Phlox alyssifolia*
	ballhead gilia	*Ipomopsis congesta*
	narrowleaf mountain trumpet	*Collomia linearis*
	phlox	*Ipomopsis congesta*
	prairie, moss or creeping phlox	*Phlox andicola*
	spiked gilia, phlox	*Ipomopsis spicata*
	spiny or hood phlox	*Phlox hoodii*
Polygalaceae	Seneca snakeroot	*Polygala senega*
	white milkwort	*Polygala alba*
	whorled or whorl-leaved milkwort	*Polygala verticillata*
	annual buckwheat, umbrella plant	*Eriogonum annuum*
	black bindweed	*Polygonum convolvulus*
	bushy knotweed	*Polygonum ramosissimum*
	common knotweed	*Polygonum arenastrum*
	curly dock, sour dock	*Rumex crispus*
	curlytop knotweed	*Polygonum lapathifolium*
	fewflower buckwheat	*Eriogonum pauciflorum*
	knotweed	*Polygonum buxiforme*
	prostrate knotweed	*Polygonum aviculare*
	spotted ladysthumb	*Polygonum persicaria*
	veiny dock	*Rumex venosus*
	yellow eriogonum, umbrella plant	*Eriogonum flavum*
Polypodiaceae	Gastony's cliffbrake	*Pellaea gastonyi*
	Oregon woodsia	*Woodsia oregana*
	purple-stemmed cliff-brake	*Pellaea atropurpurea*
	slender lipfern	*Cheilanthes feei*
Pontederiaceae	blue mudplantain	*Heteranthera limosa*
Portulacaceae	little hogweed	*Portulaca oleracea*
	sunbright	*Talinum parviflorum*
Primulaceae	darkthroat shootingstar	*Dodecatheon pulchellum*
	fringed loosestrife	*Lysimachia ciliata*
	scarlet pimpernel	*Anagallis arvensis*
	tufted loosestrife	*Lysimachia thyrsiflora*
	western rockjasmine	*Androsace occidentalis*
Pteridaceae	cliff-brake	*Pellaea atropurpurea*
	purple-stalked cliff-brake	*Pallaea atropurpurea*
	slender lip fern	*Cheilanthes feei*
Pyrolaceae	greenflowered wintergreen	*Pyrola chlorantha*
	waxflower shinleaf	*Pyrola elliptica*
Ranunculaceae	American pasqueflower	*Anemone patens*
	baneberry	*Actaea rubra*
	blue larkspur	*Delphinium nuttallianum*
	candle anemone, windflower	*Anemone cylindrica*
	celeryleaf butter cup, cursed crowfoot	*Ranunculus sceleratus*

Family	Common Name	Scientific Name
Ranunculaceae	dioecious meadowrue	*Thalictrum dioicum*
	hornseed or burr buttercup	*Ranunculus testiculatus*
	leather-flower	*Clematis hirsutissima*
	little larkspur	*Delphinium bicolor*
	littleleaf buttercup	*Ranunculus avortivus*
	littleleaf or small-flowered buttercup	*Ranunculus abortivus*
	longbeak buttercup	*Ranunculus longirostris*
	Macoun's buttercup	*Ranunculus macounii*
	meadow rue	*Thalictrum venulosum*
	prairie buttercup	*Ranunculus rhomboideus*
	purple meadowrue	*Thalictrum dasycarpum*
	red columbine	*Aquilegia canadensis*
	red columbine	*Aquilegia canadensis var. latiuscula*
	sagebrush buttercup, crowfoot	*Ranunculus glaberrimus*
	tall thimbleweed, tall anemone	*Anemone virginiana*
	tiny mousetail	*Myosurus minumus*
	waxyleaf meadowrue	*Thalictrum revolutum*
	western white clematis	*Clematis ligusticifolia*
	wild columbine	*Aquilegia brevistylis*
Rhamnaceae	common buckthorn	*Rhamnus cathartica*
Rosaceae	American plum, wild plum	*Prunus americana*
	American red raspberry	*Rubus idaeus*
	black chokecherry, chokecherry	*Prunus virginiana var. melanocarpa*
	cinquefoil, gold cup	*Potentilla gracilis*
	crab apple	*Pyrus ioensis*
	elegant cinquefoil	*Potentilla concinna*
	fireberry hawthorn	*Crataegus chrysocarpa*
	five-finger or bigflower cinquefoil	*Potentilla fissa*
	gland cinquefoil	*Potentilla glandulosa*
	mountain ninebark	*Physocarpus monogynus*
	ninebark	*Physocarpus opulifolius*
	Norwegian or rough cinquefoil	*Potentilla norvegica*
	Pennsylvania cinquefoil	*Potentilla pensylvanica*
	pin cherry	*Prunus pensylvanica*
	prairie rose, wild rose	*Rosa arkansana*
	prairiesmoke, purple avens	*Geum triflorum*
	prickly wild rose	*Rosa acicularis*
	red raspberry	*Rubus strigosus*
	roadside agrimony	*Agrimonia striata*
	Saskatoon serviceberry	*Amelanchier alnifolia*
	succulent hawthorn	*Crataegus succulenta*
	tall cinquefoil	*Potentilla arguta*
	true mountain mahogany	*Cercocarpus montanus*
	Virginia or wild strawberry	*Fragaria virginiana*
	western sandcherry	*Prunus pumila var. besseyi*
	white avens, Canada avens	*Geum canadense*
	wild spiraea, meadow sweet	*Spiraea betulifolia*
	woodland strawberry	*Fragaria vesca*
	Woods' rose	*Rosa woodsii*
	woolly cinquefoil	*Potentilla hippiana*

Family	**Common Name**	**Scientific Name**
Rosaceae		yellow avens *Geum strictum*
Rubiaceae	fragrant or sweet-scented bedstraw	*Galium triflorum*
	northern bedstraw	*Galium boreale*
	stickywilly	*Galium aparine*
Salicaceae	Bebb willow	*Salix bebbiana*
	diamond willow	*Salix eriocephala*
	lanceleaf (black) cottonwood	*Populus x acuminata*
	narrowleaf cottonwood	*Populus angustifolia*
	peachleaf willow	*Salix amygdaloides*
	plains cottonwood	*Populus deltoides ssp. monilifera*
	quaking aspen	*Populus tremuloides*
	sandbar willow, slender willow	*Salix exigua*
	white poplar	*Populus alba*
	yellow willow	*Salix lutea*
	yellowstem white willow	*Salix alba var. vitellina*
Santalaceae	pale bastard toadflax	*Comandra umbellata ssp. pallida*
Saxifragaceae	alum-root	*Heuchera hispida*
	grass-of-Parnassus	*Parnassia parviflora*
	Richardson's alumroot	*Heuchera richardsonii*
	smallflower woodlandstar, prairie star	*Lithophragma parviflorum*
Scrophulariaceae	a speedwell	*Veronica catenata*
	American speedwell, brooklime	*Veronica americana*
	clammy hedge hyssop	*Gratiola neglecta*
	common mullein	*Verbascum thapsus*
	crested beardtongue	*Penstemon eriantherus*
	dalmation toadflax	*Linaria dalmatica*
	disk waterhyssop	*Bacopa rotundifolia*
	downy paintedcup, indian paintbrush	*Castilleja sessiliflora*
	lanceleaf figwort	*Scrophularia lanceolata*
	large beardtongue, shell-leaf penstemon	*Penstemon grandiflorus*
	lilac penstemon, slender beardtongue	*Penstemon gracilis*
	narrow beardtongue	*Penstemon angustifolius*
	neckweed	*Veronica peregrina*
	roundleaf monkeyflower	*Mimulus glabratus*
	sawsepal penstemon	*Penstemon glaber*
	smallflower blue-eyed Mary, blue-lips	*Collinsia parviflora*
	Texas toadflax	*Linaria canadensis var. texana*
	water speedwell	*Veronica anagallis-aquatica*
	white beardtongue, white penstemon	*Penstemon albidus*
	Wyoming besseya, ketten-tails	*Besseya wyomingensis*
	yellow monkeyflower, yellow owlclover	*Orthocarpus luteus*
	yellow toadflax, butter and eggs	*Linaria vulgaris*
Selaginellaceae	lesser spikemoss	*Selaginella densa*
Smilacaceae	carrionflower	*Smilax herbacea var. lasioneura*
Solanaceae	black henbane	*Hyoscyamus niger*
	black nightshade	*Solanum americanum*
	buffalobur nightshade	*Solanum rostratum*
	cutleaf nightshade	*Solanum triflorum*
	ground cherry	*Physalis heterophylla*

Family	Common Name	Scientific Name
Solanaceae	longleaf groundcherry	*Physalis longifolia*
	nightshade	*Solanum sarrachoides*
	Virginia groundcherry	*Physalis virginiana*
Sparganiaceae	narrowleaf burreed	*Sparganium emersum*
Typhaceae	broad-leaved cattail	*Typha latifolia*
	narrowleaf cattail	*Typha angustifolia*
Ulmaceae	American elm	*Ulmus americana*
	hackberry	*Celtis occidentalis*
	Siberian elm	*Ulmus pumila*
Urticaceae	Pennsylvania pellitory	*Parietaria pensylvanica*
	stinging nettle	*Urtica dioica ssp. Gracilis*
Verbenaceae	American lopseed	*Phyrma leptostachya*
	bigbract verbena, prostrate vervain	*Verbena bracteata*
	Dakota mock vervain	*Verbena bipinnatifida*
	hoary verbena, wooly verbena	*Verbena stricta*
	swamp verbena, vervain	*Verbena hastata.*
Violaceae	creepingroot violet; Canada violet	*Viola canadensis var. rugulosa*
	crowfoot violet, meadow violet	*Viola pratincola*
	downy yellow violet	*Viola pubescens*
	hookedspur violet	*Viola adunca*
	marsh violet	*Viola palustris*
	northern bog violet, mountain violet	*Viola nephrophylla*
	Nuttall's violet; yellow prairie violet	*Viola nuttallii*
	prairie violet	*Viola pedatifida*
Vitaceae	riverbank grape	*Vitis riparia.*
	woodbine	*Parthenocissus vitacea*

Exotic Plants

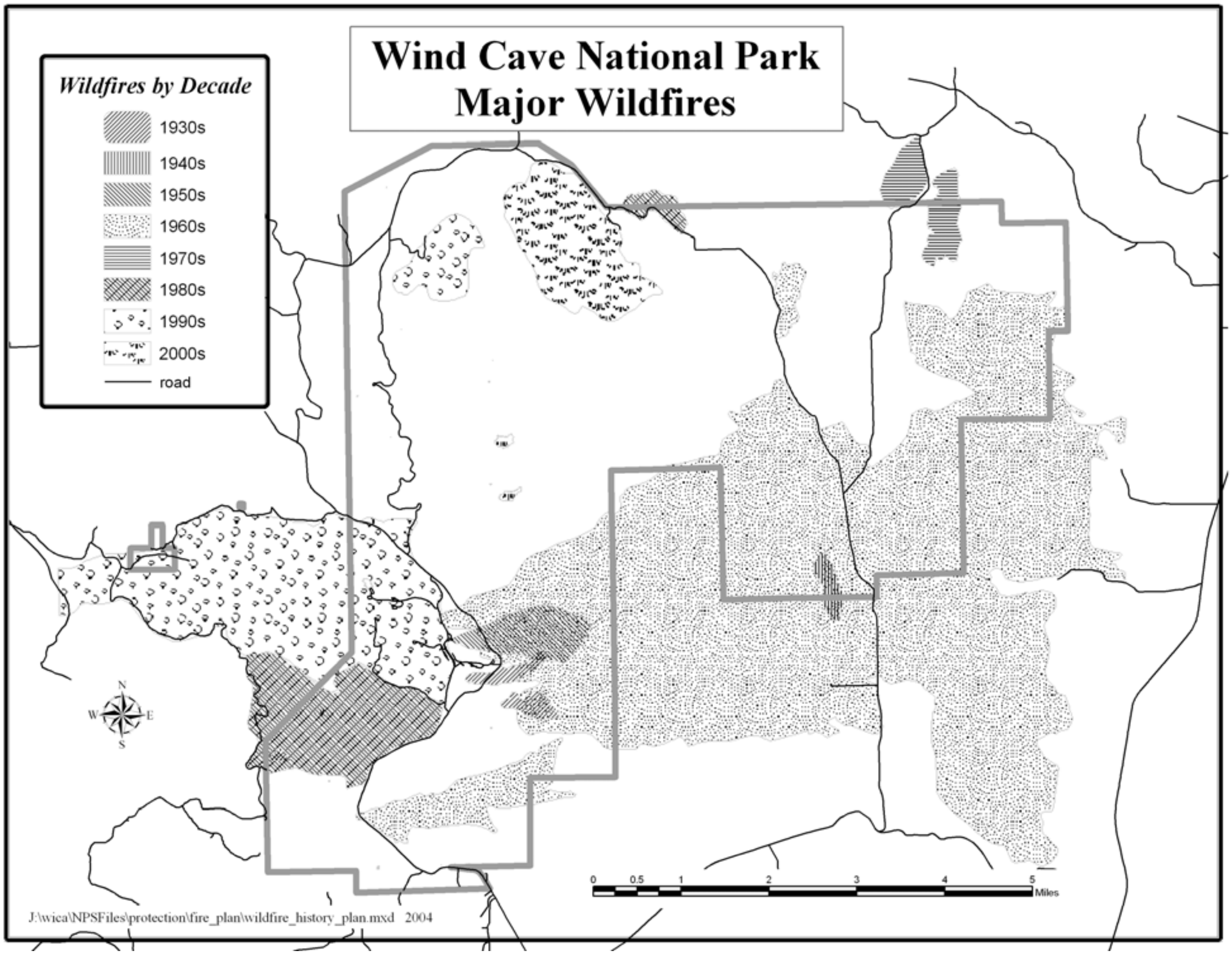
Amaranthaceae	rough pigweed, redroot	*Amaranthus retroflexu*
Apiaceae	poison hemlock	*Conium maculatum*
	wild carrot, Queen Anne's lace	*Daucus carota*
Asteraceae	annual sow thistle, prickly sow thistle	*Sonchus asper*
	bull thistle	*Cirsium vulgare*
	Canada thistle, field thistle	*Cirsium arvense*
	common burdock	*Arctium minus*
	common dandelion	*Taraxacum officinale*
	common tansy	*Tanacetum vulgare*
	Engelmann's daisy	*Engelmannia pinnatifida*
	field sow thistle, perennial sow thistle	*Sonchus arvensis*
	mayweed chamomile, dog fennel	*Anthemis xotula*
	meadow knapweed	*Centaurea pratensis*
	meadow salsify	*Tragopogon pratensis*
	musk thistle	*Carduus nutans*
	prickly lettuce	*Lactuca serriola*
	Russian knapweed	*Centaurea repens*
	Scotch thistle	*Onopordum acanthium*
	spotted knapweed	*Centaurea maculosa*
	western salsify, goat's beard	*Tragopogon dubius*
	willow-leaved lettuce	*Lactuca saligna*
	yarrow	*Achillea millefolium*
Boraginaceae	corn gromwell	*Lithospermum arvense*
	hound's tongue	*Cynoglossum officinale*
Brassicaceae	alyssum	*Alyssum desertorum*
	blue mustard	*Chorispora tenella*
	clasping peppergrass	*Lepidium perfoliatum*
	dame's rocket	*Hesperis matronalis*
	field pennycress	*Thlaspi arvense*
	field peppergrass	*Lepidium campestre*
	flixweed	*Descurainia sophia*
	small-seeded falseflax	*Camelina microcarpa*
	shepherd's purse	*Capsella bursa-pastoris*
	tumbling mustard	*Sisymbrium altissimum*
	wild mustard, charlock	*Brassica kaber*
Campanulaceae	creeping bellflower	*Campanula rapunculoides*
Cannabaceae	common hops	*Humulus lupulus*
Caryophyllaceae	big chickweed, mouse-ear chickweed	*Cerastium vulgatum*
	bladder campion	*Silene vulgaris*
	bouncingbet	*Saponaria officinalis*
	common chickweed	*Stellaria media*
	cow-cockle, cowherb	*Vaccaria pyramidata*
	Deptford pink	*Dianthus armeria*
	field chickweed, prairie chickweed	*Cerastium arvense*
	night-flowering catchfly, sticky cockle	*Silene noctiflora*
	white campion, white cockle	*Silene pratensis*

Family	Common Name	Scientific Name
Chenopodiaceae	kochia, Mexican firebrush	*Kochia scoparia*
	lamb's quarters	*Chenopodium album*
	Russian thistle, tumbleweed	*Salsola iberica*
Convolvulaceae	field bindweed, creeping jenny	*Convolvulus arvensis*
Dipsacaceae	common teasel	*Dipsacus sylvestris*
Elaeagnaceae	Russian olive	*Elaeagnus angustifolia*
Euphorbiaceae	leafy spurge	*Euphorbia esula*
Fabaceae	alfalfa	*Medicago sativa*
	black medick	*Medicago lupulina*
	crown vetch	*Coronilla varia*
	rabbitfoot clover, crimson clover	*Trifolium incarnatum*
	white clover	*Trifolium repens*
	white sweetclover	*Melilotus alba*
	yellow sweetclover	*Melilotus officinalis*
Geraniaceae	small geranium, small cranesbill	*Geranium pusillum*
Grossulariaceae	gooseberry, currant (Ribes odoratum)	*Ribes aureum var. villosum*
Lamiaceae	azure blue sage	*Salvia azurea*
	catnip	*Nepeta cataria*
	common horehound	*Marrubium vulgare*
	motherwort	*Leonurus cardiaca*
	splitlip hemp-nettle, common hemp-nettle	*Galeopsis bifida*
Liliaceae	garden asparagus	*Asparagus officinalis*
	grape hyacinth	*Muscari armeniacum*
	tulip	*Tulipa sp.*
Linaceae	blue flax	*Linum perenne*
Malvaceae	hollyhock	*Althaea rosea*
Oleaceae	common lilac	*Syringa vulgaris*
Oxalidaceae	creeping woodsorrel	*Oxalis corniculata*
Plantaginaceae	common plantain	*Plantago major*
Poaceae	barnyardgrass	*Echinochloa muricata var. microstachya*
	Canada bluegrass	*Poa compressa*
	common timothy	*Phleum pratense*
	crested wheatgrass	*Agropyron cristatum*
	downy brome, cheatgrass	*Bromus tectorum*
	green foxtail	*Setaria viridis*
	intermediate wheatgrass	*Agropyron intermedium*
	Japanese brome	*Bromus japonicus*
	Kentucky bluegrass	*Poa pratensis*
	longspine sandbur	*Cenchrus longispinus*
	meadow brome	*Bromus commutatus*
	orchard grass	*Dactylis glomerata*
	quackgrass	*Agropyron repens*
	redtop, creeping bentgrass	*Agrostis stolonifera*
	smooth brome	*Bromus inermis*
	stinkgrass	*Eragrostis cilianensis*
	tall wheatgrass	*Agropyron elongatum*

Family	Common Name	Scientific Name
Polygonaceae	curly dock	*Rumex crispus*
	wild buckwheat, climbing buckwheat	*Polygonum convolvulus*
Portulacaceae	little hogweed, common purslane	*Portulaca oleracea*
Primulaceae	scarlet pimpernel	*Anagalis arvensis*
Ranunculaceae	bur buttercup	*Ranunculus testiculatus*
	tall buttercup	*Ranunculus acris*
Rhamnaceae	European buckthorn	*Rhamnus cathartica*
Rosaceae	crab apple	*Pyrus ioensis*
Salicaceae	silver poplar, white poplar	*Populus alba*
	yellowstem white willow	*Salix alba*
Scrophulariaceae	common mullein	*Verbascum thapsus*
	corn speedwell	*Veronica arvensis*
	dalmatian toadflax	*Linaria dalmatica*
	penstemon	*Penstemon glaber*
	yellow toadflax, butter-and-eggs	*Linaria vulgaris*
Solanaceae	black henbane	*Hyoscyamus niger*
	viscid nightshade, hairy nightshade	*Solanum sarrachoides*
Ulmaceae	Siberian elm	*Ulmus pumila*
Verbenaceae	American lopseed	*Phryma leptostachys*
Zygophyllaceae	puncturevine	*Tribulus terrestris*

APPENDIX D.

WILDFIRE HISTORY MAP



APPENDIX E.

WILDLAND FIRE IMPEMENTATION PLAN (WFIP) FORMS

Wildland Fire Implementation Plan

This is Appendix A from the "Wildland Fire Use Implementation Procedures Reference Guide" and is provided as a template for field users to develop the WFIP. These represent standardized, reproducible forms for the WFIP process. While a standardized format is provided for the WFIP (in Word format) that can be used to prepare the document, an electronic version similar to the WFSA electronic program will be available. Users can choose to prepare a WFIP by using the forms presented here or by using the electronic version when available.

Specific forms are included for the complete WFIP:

WFIP Stage I:

- Strategic Fire Size-Up
- Decision Criteria Checklist
- Relative Risk Rating
  - Wildland Fire Relative Risk Assessment: Step 1: Determining Values
  - Wildland Fire Relative Risk Assessment: Step 2: Determining Hazard
  - Wildland Fire Relative Risk Assessment: Step 3: Determining Probability
  - Wildland Fire Relative Risk Assessment: Step 4: Determining Wildland Fire Relative Risk
- Planning Needs Assessment Chart
- Fire Use Manager Decision Chart

WFIP Stage II:

WFIP Stage III

Wildland Fire Implementation Plan

Table of Contents

Documentation Product	*Needed*	*Completed*
WFIP Stage I:		
Strategic Fire Size-Up		
Decision Criteria Checklist		
Management Actions		
Periodic Fire Assessment		
WFIP Stage II:		
Objectives		
Fire Situation		
Management Actions		
Estimated Costs		
Periodic Fire Assessment		
WFIP Stage III		
Objectives		
MMA Definition		
Weather Conditions and Drought Prognosis		
Long-Term Risk Assessment		
Threats		
Monitoring Actions		
Mitigation Actions		
Resources Needed		
Contingency Plan		
Information Plan		
Estimated Costs		
Post-Burn Evaluation		
Signatures and Date		
Periodic Fire Assessment		
Appendix		

WFIP Stage I:

Strategic Fire Size-Up:

<table>
<tr><td>Fire Name</td><td colspan="4"></td></tr>
<tr><td>Fire Number</td><td colspan="4"></td></tr>
<tr><td>Administrative Unit(s)</td><td colspan="4"></td></tr>
<tr><td>Start Date/Time</td><td colspan="4"></td></tr>
<tr><td>Discovery Date/Time</td><td colspan="4"></td></tr>
<tr><td>Current Date/Time</td><td colspan="4"></td></tr>
<tr><td>Current Size</td><td colspan="4"></td></tr>
<tr><td>Fuel Model</td><td colspan="4"></td></tr>
<tr><td>Current Weather</td><td colspan="4"></td></tr>
<tr><td>Observed Fire Behavior</td><td colspan="4"></td></tr>
<tr><td>Location:
Legal Description(s)
Latitude
Longitude
Local Description</td><td colspan="4"></td></tr>
<tr><td>FMU (circle appropriate FMU situation)</td><td colspan="2">WFU Approved</td><td colspan="2">WFU Not Approved</td></tr>
<tr><td>Cause
(circle fire cause)</td><td colspan="2">Natural ignition</td><td colspan="2">Human Caused Ignition</td></tr>
<tr><td>Suitability for Wildland Fire Use (circle situation, initials of person preparing, date/time)</td><td>Wildland Fire Use Candidate
Continue with Decision Criteria Checklist</td><td>Suppression</td><td>Initials</td><td>Date/Time</td></tr>
</table>

Decision Criteria Checklist

Decision Element	Yes	No
Is there a threat to life, property, or public and firefighter safety that cannot be mitigated?		
Are potential effects on cultural and natural resources outside the range of acceptable effects?		
Are relative risk indicators and/or risk assessment results unacceptable to the appropriate Agency Administrator?		
Is there other proximate fire activity that limits or precludes successful management of this fire?		
Are there other Agency Administrator issues that preclude wildland fire use?		

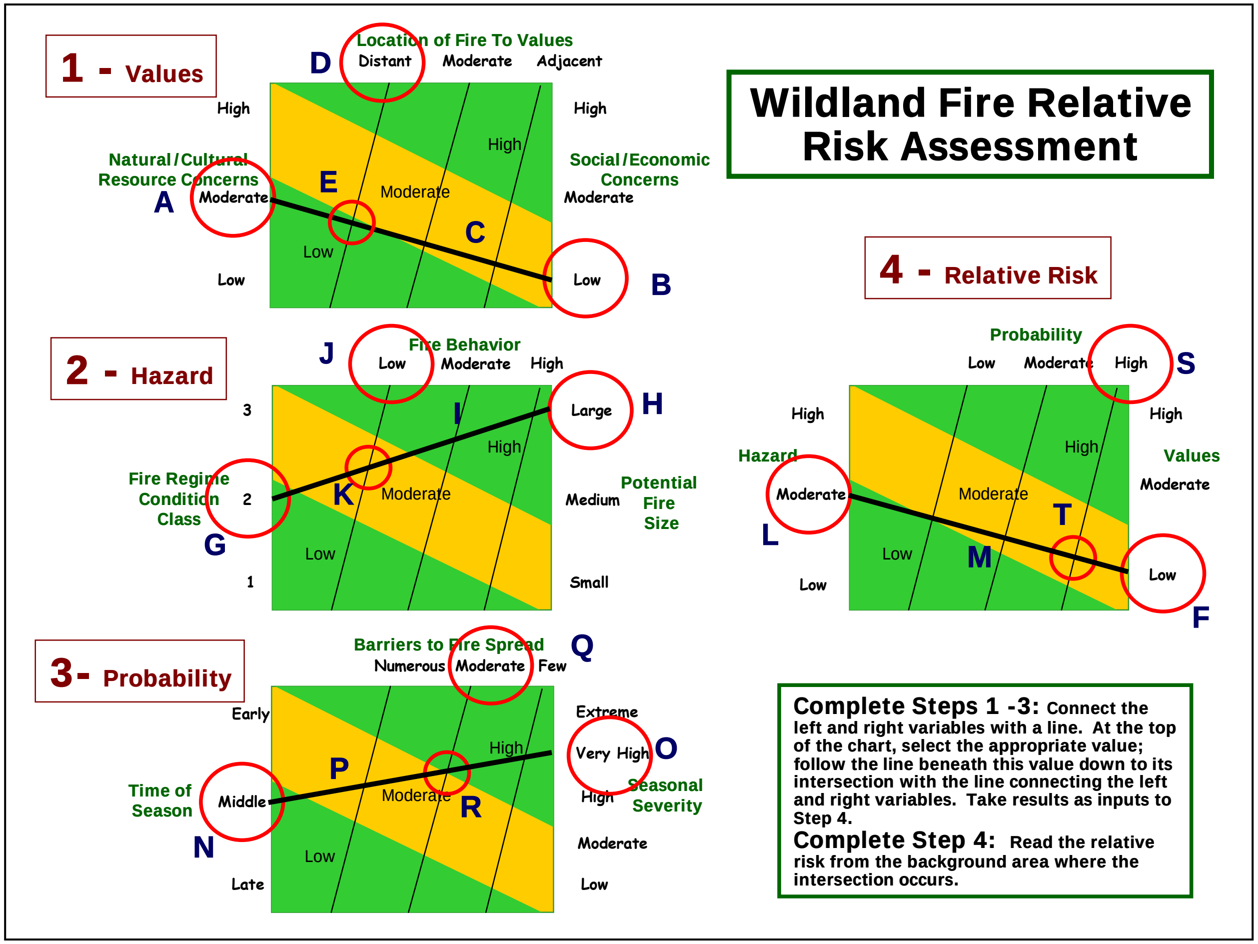
The Decision Criteria Checklist is a process to assess whether or not the situation warrants continued wildland fire use implementation. A "Yes" response to any element on the checklist indicates that the appropriate management response should be suppression-oriented.

Approved Response Action (check one)		Signature/Position	Date
Suppression Response			
Wildland Fire Use Response			

Justification for Suppression Response:

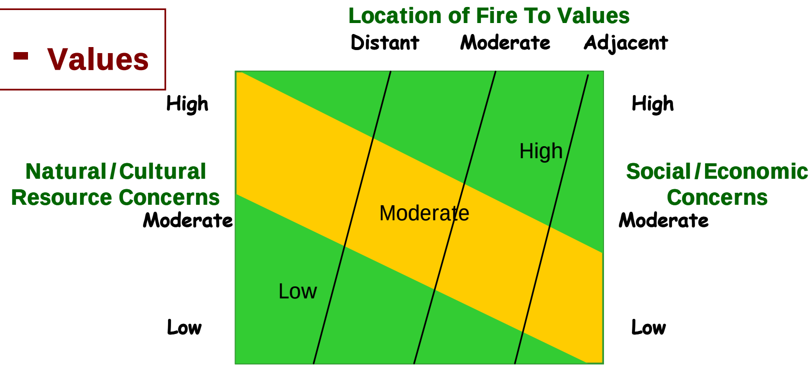
A	Step 1	Locate Natural/Cultural Resource Concern level
B	Step 1	Locate Social/Economic Concern level
C	Step 1	Draw line connecting left and right variables
D	Step 1	Locate Location of Fire to Values level
E	Step 1	Follow interior line down to intersection with line connecting left and right variables, locate Value Assessment output (Low, Moderate, High)
F	Step 4	Take Step 1 - Value Assessment output to Step 4 as Value input
G	Step 2	Locate Fire regime condition class level
H	Step 2	Locate Potential Fire Size level
I	Step 2	Draw line connecting left and right variables
J	Step 2	Locate Fire Behavior level
K	Step 2	Follow interior line down to intersection with line connecting left and right variables, locate Hazard Assessment output (Low, Moderate, High)
L	Step 4	Take Step 2 - Hazard assessment output to Step 4 as Hazard input
M	Step 4	Draw line connecting Value and Hazard levels
N	Step 3	Locate Time of Season level
O	Step 3	Locate Seasonal Severity level
P	Step 3	Draw line connecting left and right variables
Q	Step 3	Locate Barriers to Fire Spread level
R	Step 3	Follow interior line down to intersection with line connecting left and right variables, locate Probability Assessment output (Low, Moderate, High)
S	Step 4	Take Step 3 – Probability assessment output to Step 4 as Probability input
T	Step 4	Follow interior line down to intersection with line connecting left and right variables, locate Relative Risk Assessment (Low, Moderate, High)

Step-By-Step Instructions for Completing the Wildland Fire Relative Risk Assessment

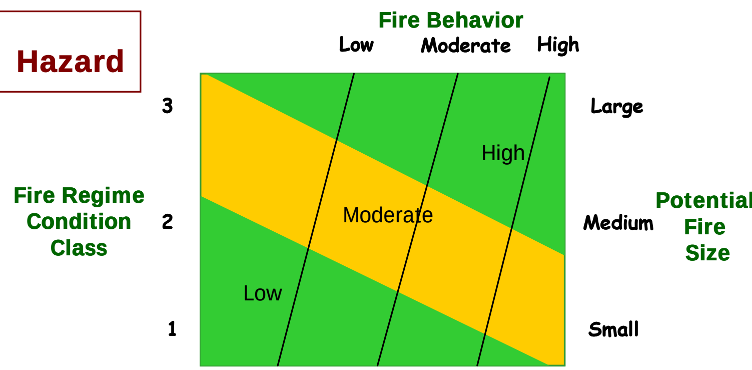


Wildland Fire Relative Risk Assessment

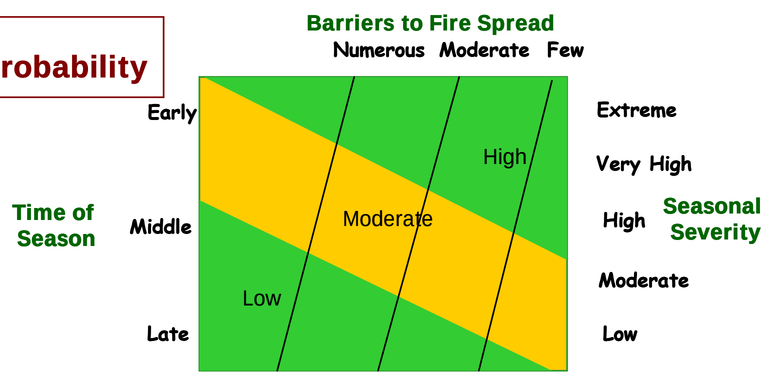
1 - Values



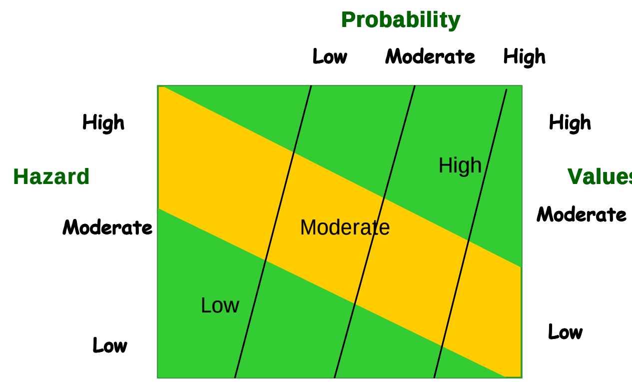
2 - Hazard



3- Probability



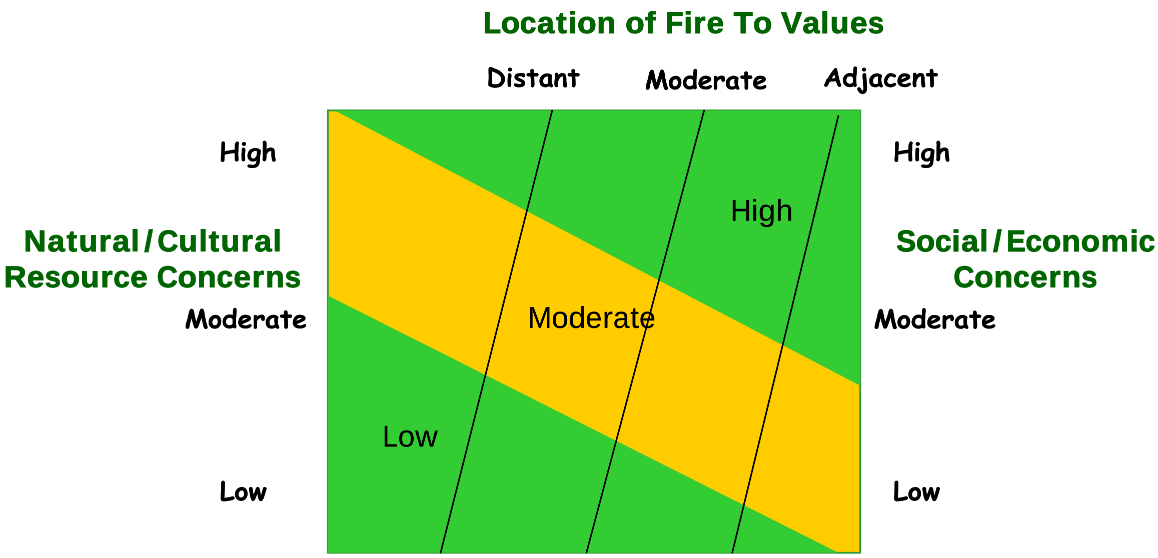
4 - Relative Risk



Complete Steps 1 -3: Connect the left and right variables with a line. At the top of the chart, select the appropriate value; follow the line beneath this value down to its intersection with the line connecting the left and right variables. Take results as inputs to Step 4.

Complete Step 4: Read the relative risk from the background area where the intersection occurs.

Wildland Fire Relative Risk Assessment:
Step 1: Determining Values



Connect the left and right values with a line. At the top of the chart, select the appropriate value; follow the line beneath this value down to its intersection with the line connecting the left and right variables. Read the Value Assessment from the background area where the intersection occurs.

Notes:

PART 1: VALUE ASSESSMENT: Values are those ecologic, social, and economic effects that could be lost or damaged because of a fire. Ecologic values consist of vegetation, wildlife species and their habitat, air and water quality, soil productivity, and other ecologic functions. Social effects can include life, cultural and historical resources, natural resources, artifacts, sacred sites. Economic values make up things like property and infrastructure, economically valuable natural and cultural resources, recreation, and tourism opportunities. This assessment area allows opportunity for the local agency administrator to identify particular local concerns. These concerns may be identified in the fire management plan or other planning documents.

Natural / Cultural Resource Concerns - key resources potentially affected by the fire. Examples include, but are not limited to habitat or populations of threatened, endangered, or sensitive species, water quality, erosion concerns, and invasive species.

Low	*Moderate*	*High*
Resource concerns are few and generally do not conflict with management of the fire. Mitigation measures are effective.	***Significant resource concerns exist, but there is little conflict with management of the fire. Mitigation measures are generally effective.***	***Multiple resource concerns exist, some of which may conflict with management of the fire. The effectiveness of needed mitigation measures is not well established.***

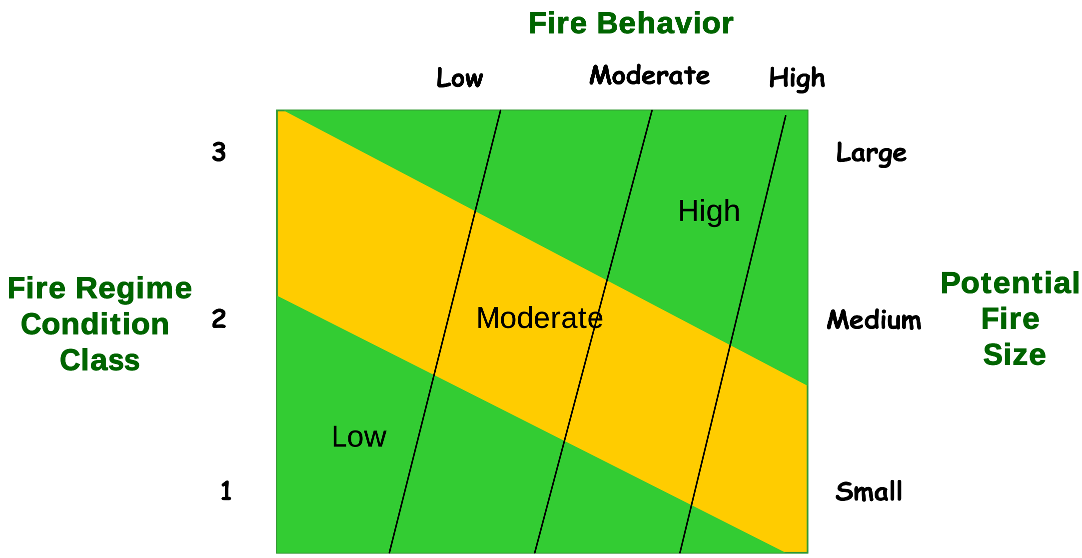
Social / Economic Concerns - the risk of the fire, or effects of the fire, impacting the social or economic concerns of an individual, business, community or other stakeholder involved with or affected by the fire. Social concerns may include degree of support for the Wildland Fire Use program or resulting fire effects, potential consequences to other fire management jurisdictions, impacts to tribal subsistence or gathering of natural resources, air quality regulatory requirements and public tolerance of smoke. Economic concerns may include potential financial impacts to property, business, or infrastructure. Infrastructure impacts may be costs to repair or replace sediment catchments, wildlife guzzlers, corrals, roads, culverts, power lines, domestic water supply intakes, and similar items.

Low	*Moderate*	*High*
Local support for wildland fire use is high. The fire should have little or no impact on subsistence or tribal activities involving treaty rights. The fire is expected to remain within a single jurisdiction or agreements are in place to allow the fire to move across several jurisdictions. Media coverage is favorable. Few structures or business ventures are potentially affected by the fire. There are few impacts to recreation and tourism.	***Local support of wildland fire use is clearly divided between supporters and opponents. The fire will have some impacts on subsistence or tribal activities involving treaty rights. The fire is expected to involve more than one jurisdiction, cooperator, or special interest group and agreements need to be developed. Media coverage tends to be a mix of favorable and unfavorable views. Some structures may be threatened by the fire or some business ventures have been affected by the fire.***	***Local support for wildland fire use is low. The fire will have significant impacts on subsistence activities or tribal activities involving treaty rights. Smoke impacts may become a concern for higher level air quality regulatory agencies. The fire is expected to involve several jurisdictions, cooperators, and special interest groups and agreements requiring significant negotiation need to be developed. Media coverage tends to be unfavorable. Many structures or private properties could be threatened.***

Location of Fire to Values

Distant	*Moderate*	*Adjacent*
Fire location is not proximate to values to be protected or fire is located where it is highly unlikely that it would reach the values.	***Fire location is moderately proximate to values. Location is such that, based on historical data, fire could potentially reach the values but will take multiple burning periods and sustained fire activity to reach the values.***	***Fire location is in close proximity to values. Without mitigation actions, fire will be expected to reach the values.***

Wildland Fire Relative Risk Assessment:
Step 2: Determining Hazard



Connect the left and right values with a line. At the top of the chart, select the appropriate value; follow the line beneath this value down to its intersection with the line connecting the left and right variables. Read the Hazard Assessment from the background area where the intersection occurs.

Notes:

PART 2: HAZARD ASSESSMENT: The hazard in wildland fire is made up of the conditions under which it occurs and exists, its ability to spread and circulate, the intensity and severity it may present, and its spatial extent.

Current Fire Behavior – the current fire behavior or that most recently observed. Changing fire behavior is addressed through repeated completion of the Periodic Fire Assessment.

Low	*Moderate*	*High*
Short duration flaming front with occasional torching. Fuels are uniform and fire behavior can be easily predicted and tactics implemented.	***Short range spotting occurring. Moderate rates of spread are expected with mainly surface fire and torching. Fuels and terrain are varied but don't pose significant problems in holding actions.***	***Long range spotting > ¼ mile. Extreme rates of spread, and crown fire activity are possible. Fuels, elevation, and topography vary throughout the fire area creating high resistance to control.***

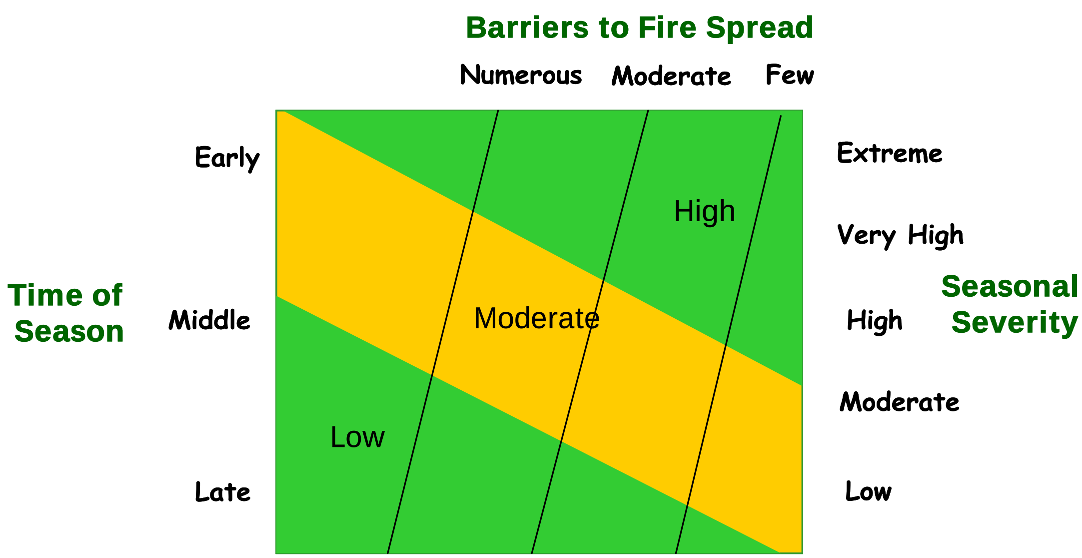
Fire Regime Condition Class – a measure of ecological functions at risk based on changes in vegetation.

1	*2*	*3*
Vegetative composition and structure are resilient and key components are at low risk of loss. Few, if any, fire return intervals have been missed and fuel complexes are similar to historic levels.	***Both the composition and structure of vegetation has shifted towards conditions that are less resilient and more at risk of loss. Some fire return intervals have been missed, stand structure and composition, and fuel complexes have been altered and present potential for fires of severity and intensity levels in excess of historic levels.***	***The highly altered composition and structure of the vegetation predisposes the landscape to fire effects well outside the range of historic variability, potentially producing changed fire environments never before measured.***

Potential fire size - the potential fire size by the end of the season in comparison to historical fire occurrence.

Small	*Medium*	*Large*
Fire size is expected to be small for the dominant fuel type involved	***Fire size is expected to be in the mid-range for the dominant fuel type involved***	***Fire size is expected to be large for the dominant fuel type involved.***

Wildland Fire Relative Risk Assessment:
Step 3: Determining Probability



Connect the left and right values with a line. At the top of the chart, select the appropriate value; follow the line beneath this value down to its intersection with the line connecting the left and right variables. Read the Probability Assessment from the background area where the intersection occurs.

Notes:

PART 3: PROBABILITY ASSESSMENT: Probability refers to the likelihood of a fire becoming an active event having potential to adversely affect values.

Time of Season - the current time in relation to the historical fire season. The chart below the guidelines reinforces the importance of time of season. During the early part of the fire season, the peak of burning activity is still to come, thus the fire could present substantial variation in behavior and activity. In the middle of the season, the peak of burning activity may or may not have occurred while in the late part of the season, the peak of fire activity generally has occurred and managers can reasonably expect diminishing fire activity and behavior as time progresses. As the amount of fire season remaining decreases or as the time of season progresses from early to late, management concerns and issues associated with potential fire activity decrease.

Early	*Middle*	*Late*
The current date is in the early portion of the historic fire season, at least 2/3 of the established fire season remains and the peak of burning activity is still to come.	***The current date is in the middle of the historic fire season, at least 1/3 of that period has passed and no less than 1/3 remains. The peak burning activity period either has occurred, is occurring now, or will occur very soon.***	***The current date is in the latter part of the historic fire season. At least 2/3 of the historic period has passed, the peak burning activity period has occurred, and the probability of a season-ending or fire-ending event is increasing quickly.***

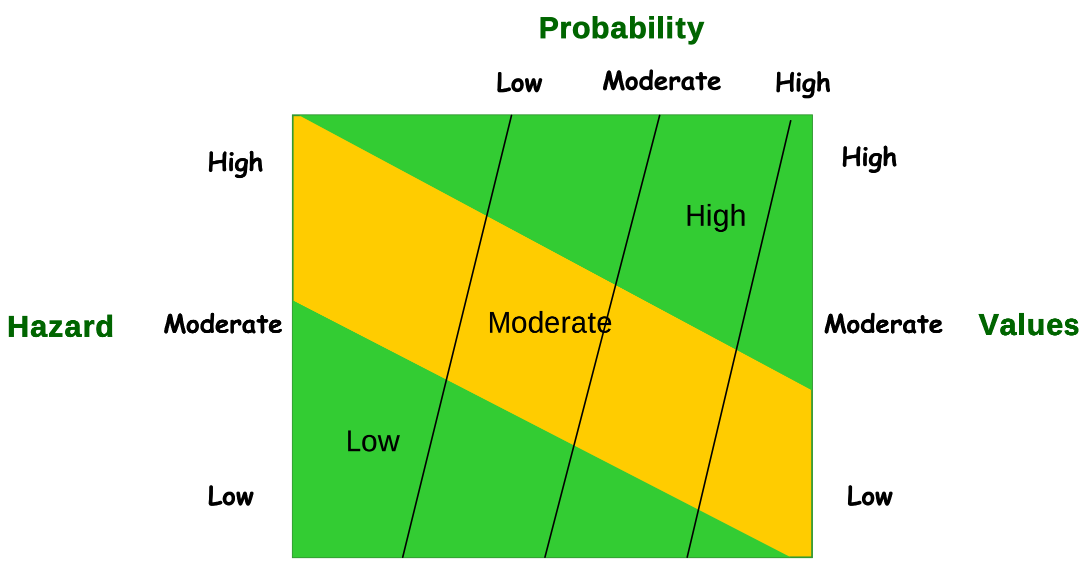
Seasonal Severity - a measure of the potential burning conditions as expressed by factors such as ERC, drought status, live fuel moistures, dead fuels moistures, soil moisture, stream discharge, and similar types of measures.

Low	*High*	*Extreme*
Measures of fire danger are below to somewhat above seasonal averages. Drought status is within seasonal norms with no long-term drought present	***Measures of fire danger are well above seasonal averages but not setting new records. The area is in short-term drought (1-2 years of drought) but not considered to be in long-term drought.***	***Measures of fire danger are setting new records. The area is considered to be in long-term drought (3 or more years of drought).***

Barriers to Fire Spread – a measure of the natural defensibility of the fire location and an indication of degree of potential mitigation actions needed.

Numerous	*Moderate*	*Few*
The location of the fire and presence of natural barriers and fuel breaks limit the horizontal fuel continuity, minimal mitigation actions on-the-ground will be needed.	***The location of the fire and presence of some natural barriers and fuel breaks limit the horizontal fuel continuity on some, but not all fire flanks, some mitigation actions on-the-ground will be needed to protect threats to boundaries and sensitive areas.***	***The location of the fire and presence of only limited natural barriers and fuel breaks will permit fire spread across continuous fuels. Mitigation actions on-the-ground will be needed but are expected to be effective.***

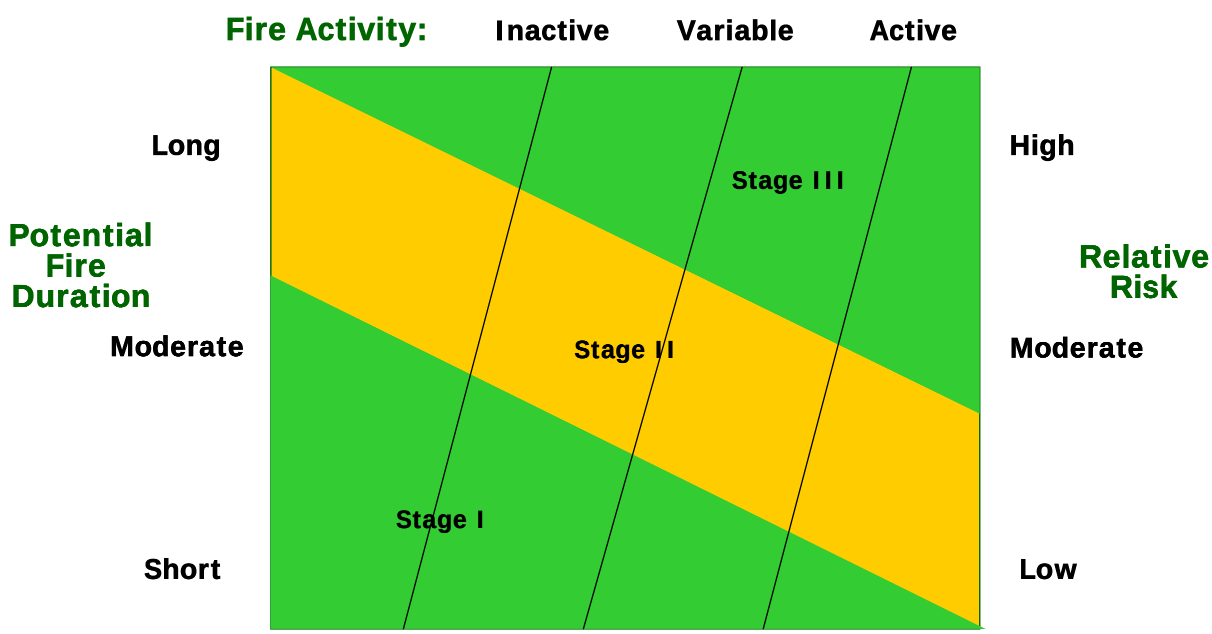
Wildland Fire Relative Risk Assessment:
Step 4: Determining Wildland Fire Relative Risk



Connect the left and right values with a line. At the top of the chart, select the appropriate value; follow the line beneath this value down to its intersection with the line connecting the left and right variables. Read the Relative Risk from the background area where the intersection occurs.

Notes:

Planning Needs Assessment Chart



To complete the chart, connect the left and right variables with a single line (potential fire duration and relative risk, respectively). Select the appropriate level of fire activity at the top of the chart and follow the line beneath that value down to its intersection with the line connecting the left and right variables. Read the planning need from the background area where the intersection occurs. The Relative Risk values are those obtained from the Wildland Fire Relative Risk Assessment process (Wildland Fire Relative Risk Assessment).

M**inimum** interagency qualification requirements for wildland fire use planning at each stage of the WFIP process. This information should be used with the Planning Needs Assessment Chart to determine appropriate levels of planning qualifications. Higher qualified personnel can always be used to complete the various planning levels if desired. Duty Officer qualifications are defined in local unit Fire Management Plans.

WFIP Stage	Minimum Planning Qualifications
WFIP Stage I	Unit Duty Officer
WFIP Stage II	Fire Use Manager Type 2 (FUM2)
WFIP Stage III	Fire Use Manager Type 2 (FUM2)

Guidelines for Planning Needs Assessment Chart.

Potential Fire Duration – the estimated length of time that the fire may continue to burn in comparison to historical fire durations and amount of fire season available for a given area.

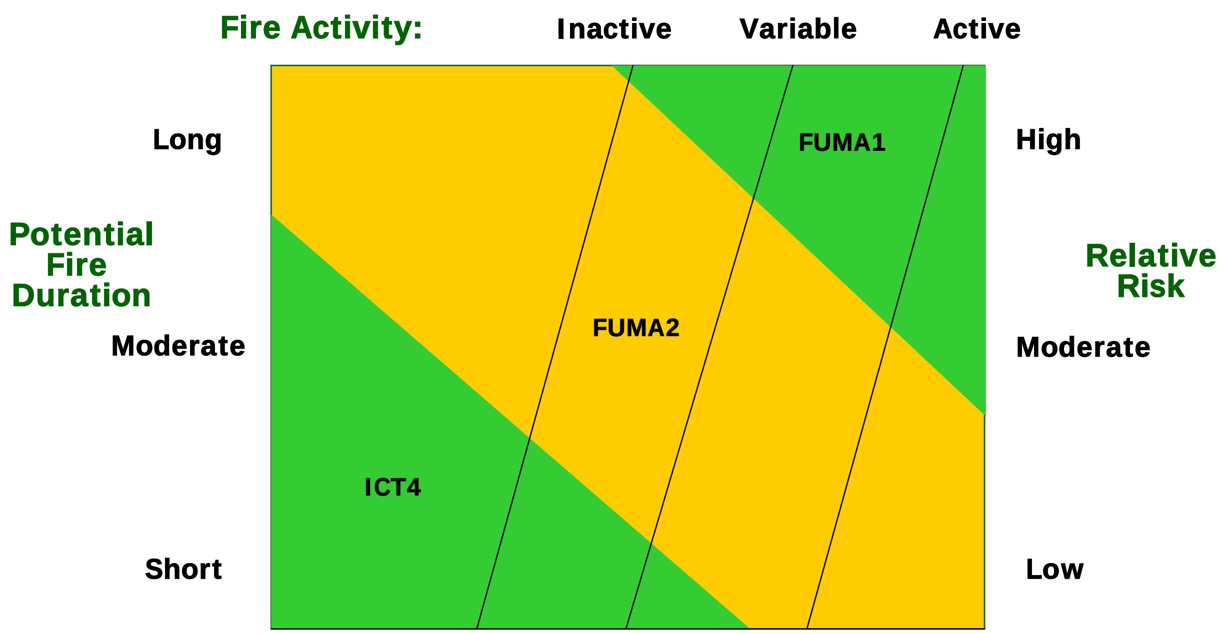
Short	*Moderate*	*Long*
Fire is expected to persist for only the shortest time in comparison to historical fire durations. This may be as short as only a few days. Fuels may be limiting, weather may be limiting, or time of fire season may be limiting. Generally, this could be referenced as less than the historical average fire length for a given area.	***Fire is expected to last for a time period similar to the historical average length of fires.***	***Fire is expected to last for a time period longer than the historical average length of fires.***

Relative Risk – a measure of the relative risk, determined directly from the Wildland Fire Relative Risk Assessment, so no range of values is listed here.

Fire Activity - the relative activity of the fire in terms of intensity and spread over time.

Inactive	*Variable*	*Active*
Fire is burning with very low intensity, little or no spread, and little or no increase in burned area. Fire is confined to surface litter and duff layers.	***Fire is burning predominantly in surface litter and duff layers, with low intensity and little or no spread but has occasional periods of increased intensity and spread. Growth of burned area is not constant but occurs in response to increased activity. Area increase may be static for moderately long periods and then increase for short periods. Fire size usually increases by less than 50% during active periods.***	***Fire is burning in all fuel strata (litter, surface, and crown) with periods of sustained flaming fronts, perimeter growth, and area increases that can exceed 100% at times. Infrequent periods of low activity occur but spread is generally constant.***

Fire Use Manager Decision Chart



To complete the chart, connect the left and right variables with a single line (potential fire duration and relative risk, respectively). Select the appropriate level of fire activity at the top of the chart and follow the line beneath that value down to its intersection with the line connecting the left and right variables. Read the level of Fire Use Manager needed directly from the background area where the intersection occurs. The Relative Risk values are those obtained from the Wildland Fire Relative Risk Assessment process (Wildland Fire Relative Risk Assessment).

Minimum level of implementation qualifications. During implementation, as fire activity and management needs escalate, implementation qualification needs ascend to a higher level. But as conditions moderate and management needs drop, implementation qualifications can descend to lower levels. Table 3 and Figure 8 are used jointly as fire situations and conditions escalate; when conditions are moderating or lessening, Figure 8 provides the necessary qualification levels for implementation.

WFIP Stage	Minimum Implementation Qualifications (Use Fire Use Manager Decision Chart to determine recommended position)
WFIP Stage I	Incident Commander Type 4 (ICT4) **(must have local knowledge or prior experience in implementing WFIPs and managing wildland fire use events)**
WFIP Stage II	Fire Use Manager Type 2 (FUM2)
WFIP Stage III	Fire Use Manager Type 2 (FUM2)

Guidelines for Fire Use Manager Decision Chart.

Potential Fire Duration – the estimated length of time that the fire may continue to burn in comparison to historical fire durations and amount of fire season available for a given area.

Short	*Moderate*	*Long*
Fire is expected to persist for only the shortest time in comparison to historical fire durations. This may be as short as only a few days. Fuels may be limiting, weather may be limiting, or time of fire season may be limiting. Generally, this could be referenced as less than the historical average fire length for a given area.	***Fire is expected to last for a time period similar to the historical average length of fires.***	***Fire is expected to last for a time period longer than the historical average length of fires.***

Relative Risk – a measure of the relative risk, determined directly from the Wildland Fire Relative Risk Assessment, so no range of values is listed here.

Fire Activity - the relative activity of the fire in terms of intensity and spread over time.

Inactive	*Variable*	*Active*
Fire is burning with very low intensity, little or no spread, and little or no increase in burned area. Fire is confined to surface litter and duff layers.	***Fire is burning predominantly in surface litter and duff layers, with low intensity and little or no spread but has occasional periods of increased intensity and spread. Growth of burned area is not constant but occurs in response to increased activity. Area increase may be static for moderately long periods and then increase for short periods. Fire size usually increases by less than 50% during active periods.***	***Fire is burning in all fuel strata (litter, surface, and crown) with periods of sustained flaming fronts, perimeter growth, and area increases that can exceed 100% at times. Infrequent periods of low activity occur but spread is generally constant.***

Management Actions:

Forecasted Weather **(Include an initial assessment of air quality forecasts / allowable burn days as applicable)**	
Forecasted Fire Behavior	
Hazards and Safety Concerns	
Management Actions	
Availability of Resources	

Periodic Fire Assessment

Insert the following sections, either by completing new versions or by using those already completed as part of the WFIP Stage I:

- Decision Criteria Checklist
- Wildland Fire Risk Assessment
  - Part 1: Planning Needs Assessment
  - Part 2: Fire Use Manager Decision Chart
- Signature Page

Periodic Fire Assessment

SIGNATURE TABLE

Assessment Frequency ______________________________

Valid Date(s) ______________________________

Name/Title	Date	Decision Criteria Checklist Valid	WFIP Planning Stage Required	Fire Use Manager Level
		Y/N	I,II,III	I, II, Other

WFIP Stage II:

Attach Stage I information.

Objectives:

Objectives	

Fire Situation:

Current and Predicted Weather	
Current and Predicted Fire Behavior	
Threats	
Safety Considerations	
Environmental Concerns	
External Concerns	

Management Actions:

Management Actions	

Estimated Costs:

Estimated Costs	

Periodic Fire Assessment

Insert the following sections, either by completing new versions or by using those already completed as part of the WFIP Stage I:

- Decision Criteria Checklist
- Wildland Fire Risk Assessment
  - Part 1: Planning Needs Assessment
  - Part 2: Fire Use Manager Decision Chart
- Signature Page

Periodic Fire Assessment

SIGNATURE TABLE

Assessment Frequency ______________________________

Valid Date(s) ______________________________

Name/Title	Date	Decision Criteria Checklist Valid	WFIP Planning Stage Required	Fire Use Manager Level
		Y/N	I,II,III	I, II, Other

WFIP Stage III:

Attach Stage I and Stage II information. Update and/or revise Stage I and II as necessary.

Objectives:

Natural and Cultural Resource Objectives	
Constraints	

Maximum Manageable Area (MMA) – Definition and Maps

Acres in MMA: **Definition of MMA:** **Attach Map of MMA**	

Weather Conditions and Drought Prognosis

Weather Conditions/Drought: Discussion and Prognosis	

Long-term Risk Assessment and Map (if applicable)

Risk Assessment (Describe techniques utilized and outputs, include maps as appropriate)	

Threats

Threats to MMA	
Threats to Public Use and Firefighter Safety	

Smoke Dispersion and Effects	
Other Threats	

Monitoring Actions

Describe Monitoring Actions, Frequency, Duration	

Mitigation Actions

Describe Holding Actions and Other Mitigation Actions, and Management Action Points that initiate these actions, and Key to Map if necessary	

Resources Needed to Manage the Fire Under Expected Weather Conditions

Describe resources necessary to accomplish ignition, holding, other mitigation actions, and monitoring actions	

Contingency Actions

Describe Contingency actions, management action points that initiate them, resources needed, etc.	

Information Plan

Describe Information Plan, Contacts, Responsibilities, etc.	

Estimated Costs of Managing the Fire

Describe costs in terms of resources needed, projected duration, etc.	

Post-burn Evaluation

Describe post-burn evaluation procedures, resource requirements, costs, duration, etc.	

Signatures

Include signatures/titles/dates for preparing, approving, and any concurring individuals	

Periodic Fire Assessment

Insert the following sections, either by completing new versions or by using those already completed as part of the WFIP Stage I:

- Decision Criteria Checklist
- Wildland Fire Risk Assessment
    - Part 1: Planning Needs Assessment
    - Part 2: Fire Use Manager Decision Chart
- Signature Page

Periodic Fire Assessment

SIGNATURE TABLE

Assessment Frequency ______________________________

Valid Date(s) ______________________________

Name/Title	Date	Decision Criteria Checklist Valid	WFIP Planning Stage Required	Fire Use Manager Level
		Y/N	I,II,III	I, II, Other

Appendix E - 1

APPENDIX F.

WILDLAND FIRE SITUATION ANALYSYS (WFSA) FORMS

WILDLAND FIRE SITUATION ANALYSIS

Wildland Fire Situation Analysis (WFSA) is a decision-making process in which the Agency Administrator or representative describes the situation, establishes objectives and constraints for the management of the fire, compares multiple strategic wildland fire management alternatives, evaluates the expected effects of the alternatives, selects the preferred alternative, and documents the decision. The format and level of detail required is dependent on the specific incident and it's complexity. The key is to document the decision.

A. WFSA INITIATION

FIRE NAME	
JURISDICTION(S)	
DATE AND TIME INITIATED	

(i) VI. DECISION
The selected alternative is:
RATIONALE:

AGENCY ADMINISTRATOR
SIGNATURE ________________________

DATE/TIME ________________________

II. I. WILDLAND FIRE SITUATION ANALYSIS

A. JURISDICTION(S):	B. GEOGRAPHIC AREA:
C. UNIT(S):	D. WFSA #:
E. FIRE NAME:	F. INCIDENT #:
G. ACCOUNTING CODE:	

H. DATE/TIME PREPARED:

I. ATTACHMENTS:

- ☐ COMPLEXITY MATRIX/ANALYSIS[1]
- ☐ RISK ASSESSMENT[1]

A. ☐ ***PROBABILITY OF SUCCESS[1]***

- ☐ CONSEQUENCES OF FAILURE[1]
- ☐ MAPS[1]
- ☐ DECISION TREE[2]
- ☐ FIRE BEHAVIOR PROJECTIONS[1]
- ☐ CALCULATIONS OF RESOURCE REQUIREMENTS[1]
- ☐ OTHER (SPECIFY)

[1] Required

[2] Required by the USFS

Section II. Objectives and Constraints

The Agency Administrator completes this page.

II.A.   Objectives: Specify criteria that should be considered in the development of alternatives.

Safety objectives for firefighters, aviation, and public must receive the highest priority, Suppression objectives must relate to resource management objectives in the unit resource management plan.

Economic objectives could include closure of all portions of an area, thus impacting the public, or impacts to transportation, communication and resource values.

Environmental objectives could include management objectives for airshed, water quality, wildlife, etc.

Social objectives could include any local attitudes toward fire or smoke that might affect decisions on the fire, safety, etc.

Other objectives might include legal or administrative constraints which would have to be considered in the analysis of the fire situation, such as the need to keep the fire off other agency lands, etc.

II.B.   Constraints: List constraints on wildland fire action. These could include constraints to designated wilderness, wilderness study areas, environmentally or culturally sensitive areas, irreparable damage to resources or smoke management/air quality concerns. Economic constraints such as public and Agency cost could be considered here.

III. II. OBJECTIVES AND CONSTRAINTS

A. OBJECTIVES (must be specific and measurable):

1. *SAFETY:*

Public

Firefighter

2. *ECONOMIC:*

3. *ENVIRONMENTAL:*

4. *SOCIAL:*

5. *OTHER:*

Section III. Alternatives

The FIRE MANAGER/and or INCIDENT COMMANDER complete(s) this page.

III.A. Wildland Fire Management Strategy: Briefly describe the general wildland fire strategies for each alternative. Alternatives must meet resource management plan objectives.

III.B. Narrative: Briefly describe each alternative with geographic names, locations, etc., that would be used when implementing a wildland fire strategy. For example, "Contain within the Starvation Meadows' watershed by the first burning period".

III.C. Resources Needed: Resources listed must be reasonable to accomplish the tasks described in Section III.B. It is critical to also look at the reality of the availability of these needed resources.

III.D. Estimated Final Fire Size: Estimated final size for each alternative at time of containment.

III.E. Estimated Contain/Control Date: Estimates for each alternative shall be made based on predicted weather, fire behavior, resource availability and the effects of wildland fire management efforts.

III.F. Cost: Estimate all fire costs for each alternative. Consider mopup, rehabilitation, and other costs as necessary.

III.G. Risk Assessment: Probability of success/Consequences of failure: Describe probability as a % and associated consequences for success and failure. Develop this information from models, practical experience or other acceptable means. Consequences described will include fire size, days to contain, days to control, costs and other information such as park closures and effect on critical habitat. Include fire behavior and long-term fire weather forecasts to derive this information.

III.H. Complexity: Assign the complexity rating calculated in the Guide for Assessing Fire Complexity.

III.I. Maps: A map for each alternative must be prepared. The map shall be based on the "Probability of success/Consequences of Failure" and include other relative information.

IV.

V. III. ALTERNATIVES

A. WILDLAND FIRE STRATEGY:			
B. NARRATIVE:			
C. RESOURCES NEEDED: HANDCREWS			
ENGINES			
DOZERS			
AIRTANKERS			
HELICOPTERS			
D. ESTIMATED FINAL FIRE SIZE:			
E. ESTIMATED CONTAIN/ CONTROL DATE			

F. COSTS:			
G. RISK ASSESSMENT: PROBABILITY OF SUCCESS/ CONSEQUENCES OF FAILURE			
H. COMPLEXITY:			
I. ATTACH MAPS FOR EACH ALTERNATIVE			

Section IV. Evaluation of Alternatives

The Agency Administrator(s), FMO and/or Incident Commander(s) completes this page.

IV.A. Evaluation Process: Conduct an analysis for each element of each objective and each alternative. Objective shall match those identified in section II.A. Use the best estimates available and quantify whenever possible. Provide ratings for each alternative and corresponding objective element. Fire effects may be negative, cause no change or may be positive. Examples are: 1) a system which employs a ”-“ for negative effect, a “0” for no change, and a “+” for positive effect; 2) a system which uses a numeric factor for importance of the consideration (soils, watershed, political, etc.) and assigns values (such as -1 to +1, -100 to +100, etc.) to each consideration, then arrives at a weighted average. If you have the ability to estimate dollar amounts for natural resource and cultural values this data is preferred. Use those methods which are most useful to managers and most appropriate for the situation and agency. To be able to evaluate positive fire effects, the area must be included in the resource management plan and be consistent with prescriptions and objectives of the Fire Management Plan.

Sum Of Economic Values: Calculate for each element the net effect of the rating system used for each alternative. This could include the balance of: pluses (+) and minuses (-), numerical rating (-3 and +3), or natural and cultural resource values in dollar amounts. (Again resource benefits may be used as part of the analysis process when the wildland fire is within a prescription consistent with approved Fire Management Plans and in support of the unit’s Resource Management Plan.)

VI.

VII. IV. EVALUATION OF ALTERNATIVES

A. EVALUATION PROCESS	A	B	C
SAFETY			
Firefighter			
Aviation			
Public			
Sum of Safety Values			
ECONOMIC			
Forage			
Improvements			
Recreation			
Timber			
Water			
Wilderness			
Wildlife			
Other (specify)			
Sum of Economic Values			
ENVIRONMENTAL			
Air			
Visual			
Fuels			

T & E Species Other (specify)			
Sum of Environmental Values			
SOCIAL Employment Public Concern Cultural Other (Specify)			
Sum of Social Values			

Section V. Analysis Summary

The Agency Administrator(s), FMO and/or Incident Commander(s) complete this page.

V.A. Compliance with Objectives: Prepare narratives that summarize each alternative's effectiveness in meeting each objective. Alternatives that do not comply with objectives are not acceptable. Narratives could be based on effectiveness and efficiency. For example: "most effective and least efficient", "least effective and most efficient", "or "effective and efficient". Or answers could be based on a two-tiered rating system such as "complies with objective" and "fully complies with or exceeds objective". Use a system that best fits the manager's needs.

V.B. Pertinent Data: Data for this section has already been presented and is duplicated here to help the Agency Administrator(s) confirm their selection of an alternative. Final Fire Size is displayed on page three, section III.D. Complexity is calculated in the attachments and displayed on page three, section III.H. Costs are displayed on page three, section

III.F. Economic Values have been calculated and displayed on page four. Probability of Success/Consequences of Failure are calculated in the attachments and displayed on page three, section III.G.

V.C. External and Internal Influences: Assign information and data occurring at the time the WFSA is signed. Identify the Preparedness Index (1 through 5) for the National and Geographic levels. If available, indicate the Incident Priority assigned by the MAC group. Designate the Resource Availability status. This information is available at the Geographic Coordination Center and needed to select a viable alternative. Designate "yes" indicating an up-to-date weather forecast has been provided to, and used by, the Agency Administrator(s) to evaluate each alternative. Assign information to the "other" category as needed by the Agency Administrator(s).

Section VI. Decision

Identify the alternative selected. Must have clear and concise rationale for the decision, and a signature with date and time. Agency Administrator(s) signature is mandatory.

VIII. V. ANALYSIS SUMMARY

A. COMPLIANCE WITH OBJECTIVES: **SAFETY** *ECONOMIC* *ENVIRONMENTAL* *SOCIAL* *OTHER*			
B. PERTINENT DATA:			
FINAL FIRE SIZE			
COMPLEXITY			
COST			
RESOURCE VALUES			
PROBABILITY of SUCCESS			
CONSEQUENCES of FAILURE			

C. EXTERNAL/INTERNAL INFLUENCES:

NATIONAL AND GEOGRAPHIC PREPAREDNESS LEVEL ____________________

INCIDENT PRIORITY ____________________

RESOURCE AVAILABILITY ____________________

WEATHER FORECAST (LONG-RANGE) ____________________

FIRE BEHAVIOR PROJECTIONS

(v)

Section VII. Daily Review

The Agency Administrator(s), or designate complete(s) this page.

The date, time and signature of reviewing officials are reported in each column for each day of the Incident. The status of Preparedness Level, Incident Priority, Resource Availability, Weather Forecast, and WFSA Validity is completed for each day reviewed. Ratings for the Preparedness Level, Incident Priority, Resource Availability, Fire Behavior, and Weather Forecast are addressed on page five, section V.C. Assign a “yes” under “WFSA Valid” to continue use of this WFSA. A “no” indicates this WFSA is no longer valid and another WFSA must be prepared or the original revised.

IX.

VII. DAILY REVIEW

SELECTED ALTERNATIVE TO BE REVIEWED DAILY TO DETERMINE IF STILL VALID UNTIL CONTAINMENT OR CONTROL

			PREPAREDNESS LEVEL	INCIDENT PRIORITY	RESOURCE AVAILABILITY	WEATHER FORECAST	FIRE BEHAVIOR PROJECTIONS	WFSA VALID
		(iii Y						

(iv) IF WFSA IS NO LONGER VALID, A NEW WFSA WILL BE COMPLETED

WFSA COMPLETION/FINAL REVIEW

THE SELECTED ALTERNATIVE ACHIEVED DESIRED OBJECTIVES ON (DATE/TIME):	
THE SELECTED ALTERNATIVE DID NOT ACHIEVE THE DESIRED OBJECTIVES AND A NEW WFSA WAS PREPARED ON (DATE/TIME):	
AGENCY ADMINISTRATOR OR REPRESENTATIVE SIGNATURE:	

A GUIDE FOR ASSESSING FIRE COMPLEXITY

The following questions are presented as a guide to assist the Agency Administrator and staff in analyzing the complexity or predicted complexity of a fire situation. Because of the time required to assemble or move an Incident Management Team to a fire, this checklist should be completed when a fire escapes initial attack and be kept as part of the fire records. This document is prepared concurrently with the preparation of and attached to a new or revised Wildland Fire Situation Analysis. It must be emphasized that this analysis should, where possible, be based on predications to allow adequate time for assembling and transporting the ordered resources.

Use of the Guide:

1. Analyze each element and check the response yes or no.

2. If positive responses exceed, or are equal to, negative responses within any primary factor (A through G), the primary factor should be considered as a positive response.

3. If any three of the primary factors (A through G) are positive response, this indicates the fire situation is or is predicted to be Type I.

4. Factor H should be considered after all above steps. If more than two of these items are answered yes, and three or more of the other primary factors are positive responses, a Type I team should be considered. If the composites of H are negative, and there are fewer than three positive responses in the primary factors (A-G) a Type II team should be considered. If the answers to all questions in H are negative, it may be advisable to allow the existing overhead to continue action on the Fire.

GLOSSARY OF TERMS

Potential for blow-up conditions - **Any combination of fuels, weather and topography excessively endangering personnel.**

Threatened and endangered species - **Threat to habitat of such species, or in the case of flora, threat to the species itself.**

Smoke Management - **Any situation which creates a significant public response, such as smoke in a metropolitan area or visual pollution in high-use scenic areas.**

Extended exposure to unusually hazardous line conditions - **Extended burnout or backfire situations, rock slides, cliffs extremely steep terrain, abnormal fuel situations such as frost killed foliage, etc.**

Disputed Fire Management responsibility - **Any wildland fire where responsibility for management if not agreed upon due to lack of agreements or different interpretations, etc.**

Disputed fire policy - **Differing fire policies between suppression agencies when the fire involves multiple ownership is an example.**

Pre-existing controversies - **These may or may not be fire management related. Any controversy drawing public attention to an area may present unusual problems to the fire overhead and local management.**

Have overhead overextended themselves mentally or physically -

This is a critical item that requires judgment by the responsible agency. It is difficult to write guidelines for this judgment because of the wide differences between individuals. If, however, the Agency Administrator feels the existing overhead cannot continue to function efficiently and take safe and aggressive action due to mental or physical reasons, assistance is mandatory.

FIRE COMPLEXITY ANALYSIS

A. FIRE BEHAVIOR: Observed or Predicted — Yes/No

1. Burning Index (from on-site measurement of weather conditions). Predicted to be above the 90% level using the major fuel model in which the fire is burning. ___ ___
2. Potential exists for “blowup” conditions (fuel moisture, winds, etc). ___ ___
3. Crowning, profuse or long-range spotting. ___ ___
4. Weather forecast indicating no significant relief or worsening conditions. ___ ___

Total . . . . ___ ___

B. RESOURCES COMMITTED:

1. 200 or more personnel assigned. ___ ___
2. Three or more divisions. ___ ___
3. Wide variety of special support personnel. ___ ___
4. Substantial air operation which is not properly staffed. ___ ___
5. Majority of initial attack resources committed. ___ ___

Total . . . . ___ ___

C. RESOURCES THREATENED:

1. Urban interface. ___ ___
2. Developments and facilities. ___ ___
3. Restricted, threatened or endangered species habitat. ___ ___
4. Cultural sites. ___ ___
5. Unique natural resources, special designation zones or wilderness. ___ ___
6. Other special resources. ___ ___

Total . . . . ___ ___

D. SAFETY:

1. Unusually hazardous fire line conditions. ___ ___
2. Serious accidents or fatalities. ___ ___
3. Threat to safety of visitors from fire and related operations. ___ ___
4. Restrictions and/or closures in effect or being considered. ___ ___
5. No night operations in place for safety reasons. ___ ___

Total . . . . ___ ___

E. OWNERSHIP: Yes/No

1. Fire burning or threatening more than one jurisdiction. ___ ___
2. Potential for claims (damages). ___ ___
3. Different or conflicting management objectives. ___ ___
4. Dispute over fire management responsibility. ___ ___
5. Potential for unified command. ___ ___

Total . . . .

F. EXTERNAL INFLUENCES:

1. Controversial wildland fire management policy. ___ ___
2. Pre-existing controversies/relationships. ___ ___
3. Sensitive media relationships. ___ ___
4. Smoke management problems. ___ ___
5. Sensitive political interests. ___ ___
6. Other external influences. ___ ___

Total . . . .

G. CHANGE IN STRATEGY

1. Change in strategy (from lower to higher intensity management). ___ ___
2. Large amounts of unburned fuel within planned perimeter. ___ ___
3. WFSA invalid or requires updating. ___ ___

Total . . . .

H. EXISTING OVERHEAD:

1. Worked two operational periods without achieving initial objectives.
2. Existing management organization ineffective.
3. Overhead/IMT overextended mentally and/or physically.
4. Incident actions plans, briefings, etc., missing or poorly prepared.

Total . . . .

Signature	
Date	Time

WFSA INSTRUCTIONS

(i) Section I. WFSA Information Page

The Agency Administrator completes this page.

I.A. Jurisdiction(s): Assign the agency that have or could have fire protection responsibility, e.g., USFWS, Forest Service, BLM, etc.

I.B. Geographic Area: Assign the recognized "Geographic Coordination Area" in which the fire is located, e.g., Northwest, Northern Rockies, etc.

I.C. Unit: Designate the local administrative unit, e.g., Hart Mountain Refuge Area, Flathead Indian Reservation, etc.

I.D. WFSA #: Identify the number assigned to the most recent WFSA for this fire.

I.E. Fire Name: Self-explanatory.

I.F. Incident Number: Identify the agency number assigned to the fire, e.g., BOD 296, BNF 001.

I.G. Accounting Code: Insert the local unit's accounting code.

I.H. Date/Time Prepared: Self-explanatory.

I.I. Attachments: Check here to designate attachments used in the completion of the WFSA. "Other" could include data or models used in the development of the WFSA. Briefly describe the "other" items used.

APPENDIX G:

WILDLAND
FIRE
PREVENTION
PLAN

PREPARED BY:

____

Supervisory Forestry Technician, Wind Cave NP

APPROVED BY:

____

Superintendent, WindCave NP

____

Chief Ranger, Wind Cave NP

____

Northen Great Plains Area Fire Management Officer

OBJECTIVES:

Protection of high value resources from wildfire.

Reduce the threat of human-caused fires through visitor and employee education.

3. Integrate the prevention message into interpretive programs.

General Actions:

Since the establishment of Wind Cave National Park in 1903 a total of 317 fires have occurred. Of this total, 223 (70%) were lightning caused; 70 (22%) were human caused, and 24 (8%) were of undetermined origins. The size of these fires, including those that burned beyond the boundaries, ranged from one/one hundredth of an acre to 13,500 acres. The following General Action Items have been identified as elements in the park's overall Fire Prevention Program. They are designed to protect high value resources from wildfire and address the threat of human-caused fires at Wind Cave National Park.

- Develop cooperative agreements and/or memoranda of understanding with local land management agencies and wildland fire protection groups to coordinate wildland fire prevention/ education programs.

  Responsible person: Superintendent, Fire Management Officer

- All members of the park's staff will be familiar with this plan and be able to explain it to other interested parties.

  Responsible person: All Division Chiefs, ongoing

- Fire prevention will be discussed at park safety meetings. Proper use of equipment by park staff will be emphasized.

  Responsible person: Park Safety Officer, ongoing

- Front desk will include brief fire prevention messages to arriving visitors during periods of high fire danger. Additionally, "NO FIREWORKS ALLOWED" signs will be posted for Independence Day.

  Responsible person: Chief of Interpretation and Chief of Resource and Visitor Protection, ongoing

- Enforcement rangers will include fire prevention messages in their routine visitor contacts, particularly campground and back-country users.

  Responsible person: Chief of Resource and Visitor Protection, ongoing.

Fire Prevention Analysis:

The fire prevention analysis is included in the following pages. The analysis contains the detailed prevention actions identified for specific areas or fire problems in five Fire Prevention Zones. It will be reviewed annually and updated if changes occur which alter the identified Risks, Hazards, and Values.

Fire Prevention Zone #1: Visitor Center/Housing Areas

Hazard = *low*	Fine, flashy fuels adjacent to mowed developed area.
Value = *high*	Government buildings, residence.

Risk = *high*	Moderate visitor activity, major traffic corridor on two exposures, residents include children.

Specific Prevention Actions Required:

1. Ongoing hazard fuel reduction.
2. Education/enforcement.
3. Continued internal communications with residents, employees and visitors.

Responsible persons: Chief of Resource and Visitor Protection, Residence occupants, seasonal staff, ongoing

<u>Fire Prevention Zone #2: Elk Mountain Campground</u>

Hazard = *high*	Fine, flashy fuels continuous throughout campground with timber over-story. Some pockets of heavy downed fuel exist. Moderate slopes on west side leading toward park boundary.
Value = *high*	Visitor safety and property, Q-101 (campground house), amphitheater, comfort stations, bulletin board, refuse collection, firewood shed.
Risk = *high*	Camp fires are permitted and firewood provided. Minimal history of unattended campfires.

Specific Prevention Actions Required:

1. Campground bulletin board will contain fire prevention messages.
2. Education/enforcement in campground.
3. Fireworks enforcement.
4. General fire prevention actions.

Responsible persons: Chief of Resource and Visitor Protection and staff, and Chief of Maintenance and staff, ongoing

<u>Fire Prevention Zone #3: Buffalo Corrals</u>

Hazard = *low*	Fine, flashy fuels adjacent to mowed areas. Located on gentle upslope.
Value = *high*	Extensive corral complex of wood and steel construction.
Risk = *moderate*	Risks are associated with bison round-up activities and American Indian ceremonies. Area closed to public, but some "curiosity" use occurs.

Specific Prevention Actions Required:

1. Proper use of equipment during work activities.
2. Safety message on smoking given prior to work activities.
3. Enforcement of closed area regulations.

Responsible persons: Chief of Maintenance, Chief of Resource Management, ongoing

Chief of Resource and Visitor Protection, during round-up operations and ceremonies.

Fire Prevention Zone #4: Highway 385 and Hwy 87 Corridor

Hazard = *moderate*	Fine, flashy fuels and timber with pockets of heavy downed fuel.
Value = *moderate*	Adjacent landowners would be significantly threatened by wildfire.
Risk = *moderate*	Major traffic corridor.

Specific Prevention Actions Required:

1. General fire prevention actions.
2. Education/enforcement.

Responsible persons: Resource and Visitor Protection rangers, ongoing

Fire Prevention Zone #5: Mixing Circle

Hazard =*moderate*	Fine, flashy fuels and timber over-story with pockets of heavy downed fuel. Mowed and impacted areas around some equipment and buildings.
Value = *moderate*	Maintenance heavy equipment, outpost building, maintenance materials (wooden and metal posts, wooden pallets), debris piles (metals, treated and untreated wood, old tires), slash pile, and campground firewood supply.
Risk = *moderate*	No fires on record to substantiate risk.

Specific Prevention Actions Required:

1. General fire prevention actions.
2. Education/enforcement.

Responsible persons: Chief of Maintenance and Chief of Resource and Visitor Protection, ongoing.

I.

II.

III. FIRE PREVENTION ZONES

1. **Visitor Center/Housing Areas Zone**

   hazard: *low*

   value: *high*

   risk: *high*

2. **Elk Mountain Campground Zone**

   hazard: *high*

   value: *high*

   risk: *high*

3. **Buffalo Corrals Zone**

   hazard: *low*

   value: *high*

   risk: *moderate*

4. **Hwy 385 and Hwy 87 Corridor Zone**

   hazard: *moderate*

   value: *moderate*

   risk: *moderate*

5. **Mixing Circle Zone**

   hazard: *moderate*

   value: *moderate*

   risk: *moderate*

Appendix H. PRE-ATTACK PLAN

Function/Item	Available	Needed	Not Needed
Command			
Pre-attack WFSA			x
Pre-positioning Needs			x
Draft Delegation of Authority	X		
Management Constraints	X		
Interagency Agreements	X		
Evacuation Procedures	x		
Structural Protection Needs	X		
Closure Procedures	x		
Operations			
Water Sources	X		
Control Line Locations			X
Natural Barriers	X		
Safety Zones			X
Flight Routes/Restrictions	X		
Staging Area Locations	x		
Helispot/Helibase Locations	x		
Logistics			
ICP Location			x
Roads/Trails with Limitations	X		
Utilities	X		
Medical Facilities	X		
Stores/Restaurants/Services	X		
Rental Equipment Sources	x		
Construction Contractors	x		
Sanitary Facilities	X		
Law Enforcement/Fire Departments	X		
Communications (availability)	x		
Maintenance Facilities	X		
Sanitary Landfills	X		
Planning			
Park Base Map	X		
Area Topographic Maps	X		
Infrared Imagery	x		
Vegetation/Fuel Maps	x		
Hazard Maps (ground and aerial)	X		
Special Visitor Use Areas			x
Land Ownership Status			X
Archeological/Cultural Resource Maps	X		
Sensitive Plant Area Maps	x		

Appendix I

Long – Term Prescribed Fire and Hazard Fuel Reduction Plan

Name	APPROX. ACRES	SEASON	APPROX. YEAR	ACRES TOTAL
Cold Brook South	1012	Fall	2005	
Northwest	432	Spring	2005	
Tower	1231	Fall	2005	Total 2675
Centennial	508	Spring	2006	
Cold Brook North	1063	Fall	2006	Total 1571
Pigtail	667	Spring	2007	
Curly	738	Fall	2007	Total 1405
Headquarters West	1066	Spring	2008	
Headquarters East	308	Fall	2008	Total 1374
Hidden Valley	2427	Spring	2009	Total 2427
Dry Creek	1486	Spring	2010	Total 1486

The Following units are being considered in the next 6 years.

NAME	ACRES
Bison Flats	1681
Hidden Valley	2427
Canyon	913
Dry Creek	1486
Gobbler	123
Keyhole	1355
Limestone Canyon	1195
Beaver (old pigtail)	959
Prairie Dog Canyon	1546
Boundary	113
Red Valley	2411
Highland Creek	1169
Boland Ridge	3168
South Boland Ridge	1303
North Canyon	913

Multi-year mechanical fuel treatment schedule

This schedule will be developed as needed, currently, it is expected to be developed, including proposed treatment techniques,

APPENDIX J.

Wildland and Prescribed Fire Effects Monitoring Plan

National Park Service

Wind Cave National Park, South Dakota

Draft Fire Effects Monitoring Plan

INTRODUCTION

Prescribed fire will be used to maintain and restore the fire adapted ecosystems at Wind Cave. National Park Service (NPS) Reference Manual 18 states, “Monitoring is a critical component of fire management and the Fire Monitoring Plan is important to identify why monitoring will be done, what will be monitored, how it will be monitored, where it will be done, and how often it will be completed.” Monitoring of these fires is mandated in Director’s Order #18: Wildland Fire Management issued in 1998. Section 5.2, *Fire Management Plans* (no. 10) states, “Include procedure for short and long term monitoring to document that overall program objectives are being met and undesired effects are not occurring”. Section 5.8 directly addresses *Prescribed Fire Monitoring*:

a) Fire effects monitoring must be done to evaluate the degree to which objectives are accomplished.
b) Long-term monitoring is required to document that overall programmatic objectives are being met and undesired effects are not occurring.
c) Evaluation of fire effects data is the joint responsibility of fire management and natural resource management personnel.

MONITORING DESIGN

SAMPLING DESIGN

Most plots established at Wind Cave follow standard Fire Monitoring Handbook (FMH) (2003) protocols. The sampling design for the FMH plots are contained in the individual monitoring unit description sheets found in Appendix 1. Long-term photo monitoring points have also been established (see Appendix 2). Protocols have been established for collecting short-term tree data. Descriptions and sample data sheets can be found in Appendix 3.

FIELD MEASUREMENT

The individual variables to be measured are defined in the monitoring unit descriptions found in Appendix 1. All plots are marked with steel rebar approximately half a meter in height. Each piece of rebar has a brass tag indicating its location within the plot. The rebar at the zero end of each plot has a tag with complete plot data as specified by the handbook. All locations have been georeferenced with a GPS unit. A hard copy of each plot location is retained in the Northern Great Plains Fire Management Office (NGP) at Wind Cave National Park. A digital text file with UTM coordinates and ArcView ‘shape’ file are also on file at the NGP. The Northern Great Plains Fire Monitoring Crew will retain copies and backups and will be responsible for providing updated versions to Wind Cave as needed.

MONITORING LOCATION

Currently there are thirty-one monitoring plots and four photo points at Wind Cave (Fig. 1).

PRESCRIBED FIRE MONITORING PARAMETERS

Wind Cave has adopted the NPS FMH (2003) as a guide for fire effects monitoring. The handbook identifies four monitoring levels:

Level 1 – Reconnaissance	Fire Cause, location, size, fuel and vegetation types, relative fire activity, potential for spread, current and forecasted weather, resource or safety threats and constraints, and smoke volume and movement
Level 2 – Fire Conditions	Fire monitoring period, ambient conditions – topographic and fire weather, fuel model, fire characteristic, and smoke characteristic
Level 3 – Immediate Post fire Effects	Fuel reduction, vegetative change or other objective dependent variables with in 1 to 5 years after a prescribed fire
Level 4 – Long-term Change	Continued monitoring of Level 3 variables to measure trends and change over time

The FMH plots that have been described in this document thus far are being used to examine levels 3 and 4.

Wildland fires that are suppressed will be monitored at levels 1 and 2 with observations entered into the park's monitoring database. In the event that long-term fire effects plots are burned in a wildland fire, they will be read by the NGP Fire Monitoring Crew, according to the schedule of plot rereads following a prescribed fire treatment. Level 1 and 2 monitoring observations will be filed with the final fire package and a copy placed with the records for the Fire Management Unit that was burned.

Prescribed fires will meet at least the Level 1 and 2 recommended standards. If there are FMH plots in a unit, information on Level 3 and 4 Variables will be collected.

Level 1 variables

Reconnaissance monitoring provides a basic overview of the fire event. The following variables will be collected on all fires.

- Fire cause (origin), location and size
- Fuels and vegetation type
- Relative fire activity
- Potential for further spread
- Current and forecasted weather
- Resource or safety threats and constraints
- Smoke volume and movement

Specific information on the collection of these variables can be found in the NPS Fire Monitoring Handbook (2003) or the RX-91 – 'Monitoring Prescribed and Wildland Fire' text.

Level 2 variables

Fire conditions monitoring provides information on fire weather, fire behavior and resource values at risk. The following variables will be collected and summarized in a monitoring report on all prescribed fires.

- Fire monitoring period
  - fire number and name
  - observations data and time
  - monitor's name
- Ambient conditions
  - topographic variables
  - slope (%)
  - aspect
- Fire weather variables
  - dry bulb temperature
  - relative humidity
  - wind speed
  - wind direction
  - fuel shading and/or cloud cover
  - time-lag fuel moisture
  - live fuel moisture
- Soil moisture
- Fuel model
- Fire characteristics
  - linear rate of spread
  - perimeter or area growth
  - flame length
  - fire spread directions
- Smoke characteristics (based on state and local requirements)

INTENDED DATA ANALYSIS

Plot installations will be based on prescribed fire priorities and with the intention of achieving a statistically valid sample size within five years for the priority monitoring units. The Northern Great Plains Fire Ecologist will be responsible for checking the minimum plot numbers in all units that have more than five plots installed. Each monitoring unit description delineates the variables that will be analyzed. When minimum plot numbers have been reached, objectives will be evaluated after the data have been checked to meet the assumptions of the statistical test. If the data meet the assumptions, including normality, then confidence intervals will be used for change over time comparisons. If data do not meet the assumptions, a statistician will be consulted. Correlation of Level 2 data with vegetation data can be done with either regression or multivariate analysis.

The Northern Great Plains Fire Ecologist will compare data with fire effects research that has been completed in the park and area. Inconsistencies should lead the ecologist to examine different methodologies, data interpretation, and potential research questions.

MONITORING IMPLEMENTATION SCHEDULE

Timing of monitoring

All plots are currently monitored at peak diversity for the native vegetation approximately halfway between the peak in cool and warm season grasses. This will need to be examined after pilot sampling. All plots are currently being read pre-burn, immediately post-burn, and 1, 2, 5, 10, and 20 years post-burn.

Pre-burn Sampling

Pre-burn sampling will be done during peak phenology. Plots should be installed the growing season before prescribed fires. All plots that have not burned within 2 years of installation will not be reread until that unit is again scheduled to burn. These plots can also be considered for control plots depending on long-term prescribed fire planning.

Post-burn sampling

Post-burn sampling will be done immediately post-burn and 1, 2, 5, 10, and 20 years after the prescribed fire. Plots that burn in the spring will be read at peak phenology that summer, and then at the regular schedule (1, 2, 5, 10, and 20 year). The 1-Year reads for grassland plots burned in the spring are during the growing season the same year as the prescribed fire, and the 2-year read occurs in the following year. The 1-year reads for forest plots burned in the spring are during the growing season one year after the prescribed fire. Fall prescribed fires will be read the following summer as 1 year post-burn reads. If a unit is scheduled to be burned for a second or third time between reads, an additional pre-burn read will be added. For example, a unit burned in the spring of 2000 would be sampled within a week following the fire, 1 year read summer 2000, 2 year read summer 2001, and 5 year read summer 2004. The unit is then scheduled to burn again in 2008. A second pre-burn read should be added summer 2007.

DATA MANAGEMENT

Other monitoring programs have shown that between 25-40% of the time associated with monitoring should be on data management. The data for Wind Cave is collected and managed by the Northern Great Plains Fire Monitoring Crew located at Wind Cave National Park, Hot Springs, South Dakota. All data collected at Wind Cave will be entered and checked by this crew at their office. Generally the seasonal field staff enters and checks data. This process is supervised the NGP Lead Monitor and Fire Ecologist. Original copies of all data will be kept at the crew's office. Hard copies of the Plot Location Data Sheets will be archived at Wind Cave in the Resource Management files. The Lead Monitor will provide monitoring data to the Wind Cave Resource Management staff annually on CD for archiving. Data are currently entered and analyzed in the FMH software. It is backed up to the server at Wind Cave. It will be sent annually to Wind Cave and the Midwest Regional Ecologist in conjunction with the annual report. Global positioning data of plot locations are stored on CD at the Fire Monitoring Office at Wind Cave.

QUALITY CONTROL

Data quality will be ensured through proper training of the crew in data collection and a system of checks in the data entry process. All data sheets will be checked by the lead crewmember before leaving a plot for data accuracy and completeness. Data will be summarized annually and results reported to the park and regional fire ecologist. A program review should happen every 3-5 years to maintain consistency of data collection and analysis and re-assessment of program requirements. More frequent review may be necessary if there are significant staffing changes, additional ecological concerns, or by request of the park or monitoring crew.

SOURCES OF DATA ERRORS

Errors in recording can be reduced by checking all data sheets for completeness and accuracy before leaving the plot. Standardized crew training at the beginning of the season will insure all data are being collected in the same manner by all crewmembers. Transcription errors will be corrected by checking all data once entered in the computer. Collecting voucher specimens and using the study collection to verify plant identifications can minimize incorrect identification of plant species. All unknown plant species will be photographed and added to the unknown plant database. These photos can be used as a field reference to insure that all unknowns are consistently observed. Wind Cave Resource Management personnel will be notified of unknowns of particular concern so special attention can be given to identify it. Undersampling of less-frequently occurring species is a large problem in the grass types. An additional sampling technique, nested frequency, will be added after consulting with the regional fire ecologist to better sample the species richness found in these types.

The impacts of monitoring include compacting of fuels and vegetation and the collection of voucher plant specimens. Compaction can be minimized by crew awareness as to where data are collected. Voucher specimens are not collected in the plot – if no other specimen is found, the unknown plant will be photographed and added to the unknown plant photo database. Accurate plot locations including GPS data will aid in plot location and minimize vegetative compaction. Test all directions by having new crewmembers use previously written directions to ensure accuracy. Incomplete or missing data will be corrected as soon as possible. Plot protocols need to be reviewed annually with the seasonal crew prior to beginning work to insure that data are accurately collected. Problems encountered by the field crew must be brought to the attention of the lead monitor and fire ecologist.

RESPONSIBLE PARTIES

Administrative duties will be assigned as follows:

- *Northern Great Plains Fire Ecologist*: Plan revision, crew supervision, data management and data analysis
- *Superintendent, Wind Cave National Park*: Park liaison
- *Northern Great Plains Lead Monitor*: Data collection, data entry, data management and field crew supervision
- *Midwest Regional Fire Ecologist*: Coordinate program reviews

MANAGEMENT IMPLICATIONS OF MONITORING RESULTS

Monitoring results will be summarized and presented to the park in the fall meeting of the Fire Committee with the NGP Fire management Officer, Prescribed Fire Specialist and Fire Ecologist. This meeting helps coordinate fire activities including prescribed fire for the park in the coming year. The annual report information can be conveyed to Wind Cave Resource Management in an additional meeting as requested.

Review of the data summary and analysis by the NGP Fire Ecologist, Prescribed Fire Specialist, and Wind Cave Resource Management staff should determine if the current program is moving the vegetation towards the desired conditions and/or having unwanted results. Targets should be reviewed and refined, and prescribed fire prescriptions and other vegetation management techniques could be adjusted to compensate. This review could also generate questions that may lead to fire effects research being conducted in the park. Information from the Wind Cave program could be analyzed with other parks from the NGP group as appropriate and should be presented to other parks and at scientific meetings and publications.

CONSULTATION AND COORDINATION

The Northern Great Plains Fire Monitoring Crew is responsible for coordination and consultation with other parks in the group, fire management personnel, and the Midwest Regional Fire Ecologist. Wind Cave Resource Management staff will be responsible for coordination and consultation with the park and all other cooperators.

LITERATURE CITED

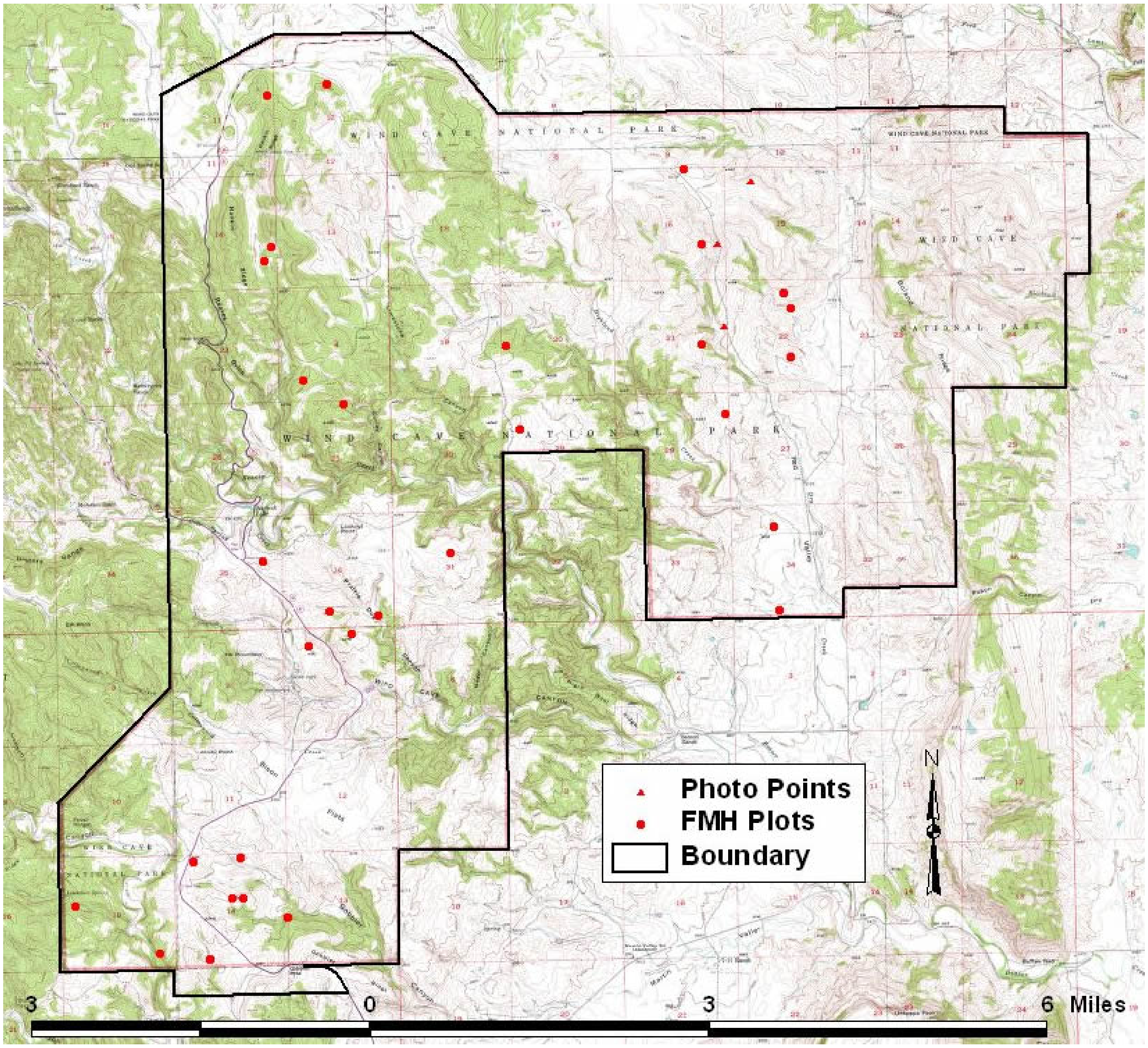
USDI National Park Service. 1998. Directors order #18: wildland fire management.

USDI National Park Service. 1999. Reference manual 18.

USDI National Park Service. 2003. Fire monitoring handbook. National Interagency Fire Center, Boise, ID. 274 pp.

FIGURES

FIGURE 1. LOCATION OF FIRE EFFECTS MONITORING PLOTS.



APPENDICES

FMH-4 **MONITORING TYPE DESCRIPTION SHEET** Park: **WICA**

Monitoring Type Code: GAGSM1D01 **Date Described:** 6 /21/96

Monitoring Type Name: Wheatgrass-Needlegrass Mixed-grass Prairie

Prepared by: R. Rice, D. Kinney, B. Adams, C. Hull Sieg, G. Kemp, P. Reeberg

Updated: November 2000 – D. Roddy, A. Thorstenson, K. Rehman, J. DeCoster

Physical Description

Level to hilly uplands. All aspects are acceptable, slopes <40%, elevation 3,500 to 5,000 feet. Soils are loamy, shallow to deep, and well drained. Soil types include: Canyon-Rockoa Rock Outcrop, Nevee-Gypnevee-Rekop, Vanocker-Sawdust-Paunsaugunt, and Buska-Mocmont-Rock Outcrop Associations

Biological Description

A blend of tall-grass and short-grass prairies, typical dominant grasses include: western wheatgrass (*Pascopyrum smithii*), big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), needle-and-thread (*Hesperostipa comata*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), hairy grama (*B. hirsuta*), sideoats grama (*B. curtipendula*), downy brome (*Bromus tectorum*), Japanese brome (*B. japonicus*), buffalo grass (*Buchloe dactyloides*), and Kentucky bluegrass (*Poa pratensis*). Sedges such as threadleaf sedge (*Carex filifolia), needleleaf sedge (Carex duriuscula*) may also be present. Forbs such as: sageworts (*Artemisia* spp.), scurfpea (*Psoralidium tenuiflorum*), dotted gayfeather (*Liatris punctata*), purple coneflower (*Echinacea angustifolia*), and upright prairie coneflower (*Ratibida columnifera*), are common. Low shrubs include: leadplant (*Amorpha canescens*) and Woods' rose (*Rosa woodsii*).

Rejection Criteria

Large outcroppings or barren areas >20% of the plot; areas with anomalous vegetation; monitoring type boundaries; riparian areas or areas dominated by trees; bio-control areas; areas within 20 meters of roads, man-made trails, or human created clearings are to be rejected.

Notes: Brush density will be collected for rhizomatous brush species, (lead plant, snowberry, wild rose) by stem count and for non-rhizomatous species by individual count to determine brush density.

Desired Future Condition

The community when maintained by fire would have reduced numbers of exotic species, particularly cool-season non-native grasses. The natural diversity of associated native species would be preserved or increased. The forage value for large ungulates (and small rodents) would be improved with periodic burning. There would be short-term (2-4 years post burn) increase in native forbs, especially milkweed and other target species for butterflies. With continued burning we will improve knowledge of fire effects in this community.

The community would have 25-50% of the area burned with in 7-10 years depending on topography to generate a mosaic of different aged stands across the type. Generate a fire disturbance pattern of varying intervals and differing seasons.

Burn Prescription

Units will be burned between late winter until green-up, or late summer through late fall

i. **Fire Prescription Elements**	
RH - **25 - 55%**	Average Rate of Spread - **0 - 40 ch/hr**
Bulb - **30°- 85°F**	Average Flame Length – **0.4-1.5 ft**
Average Mid-flame Winds - **0-15 mph**	1 hour TLFM - **6-14%**
Fuel Loading - **1.5-4 tons/acre**	10 hour TLFM – **n/a**
Live Fuel Moisture - n/a	100 hour TLFM **– n/a**

Monitoring Variables

- Cover of native grasses and forbs
- Cover of non-native grasses and forbs
- Shrub Density

Prescribed Fire Objectives

<u>Immediate Post Burn</u>

- Burn 60-80% of the burnable project area.

<u>Two Years Post Burn</u>

- Reduce cover of non-native grasses by at least 20%
- Increase cover of native grasses by at least 10%
- Increase cover of native forbs by at least 30%

Fire Monitoring Objectives

- Install enough plots to be 80% confident that the cover for native grasses and forbs, and non-native grasses and forbs is within 25% of the true population mean.
- Install enough plots to be 80% confident that the average density of all shrub species is within 25% of the true population mean.

Data Analysis

- Assess cover of native grasses and forbs after sampling years 1, 2, and 5.
- Assess cover of non-native grasses and forbs after sampling years 1, 2, and 5.
- Assess shrub density after sampling years 1,2, and 5.

Relevant Literature

Brown, P. M. and C. H. Sieg. 1996. Fire history of interior ponderosa pine communities of the Black Hills, South Dakota, USA. International Journal of Wildland Fire **6**(3):97-105.

Gartner, F. R. 1975. Final report: Wind Cave National Park grassland ecology. Unpublished paper on file at: USDI, National Park Service, Wind Cave National Park, Hot Springs, SD.

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Parrish, J. B., D. J. Herman, and D. J. Reyher. 1996. A century of change in Black Hills forest and riparian ecosystems. U.S. Forest Service and South Dakota Agriculture Experiment Station B 722, South Dakota State University, Brookings, South Dakota, USA.

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Stubbendieck, J., and G. Willson. 1986. An identification of prairie in National Park units in the Great Plains. USDI National Park Service Occasional Paper No. 7, Washington, DC.

USDA, NRCS. 2002. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA.

USDI National Park Service. 2003. Fire monitoring handbook. National Interagency Fire Center, Boise, ID. 274 pp.

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FMH-4 **PLOT PROTOCOLS**

GENERAL PROTOCOLS		YES	NO		YES	NO
Preburn	Control Plots		•	Herb Height	•	
	Herbaceous Density		•	Belt Transect Width: **5m**		
	OP/Origin Buried		•	Abbreviated Tags	•	
	Voucher Specimens	•		Stakes Installed: **0P & 30P**		
	Stereo Photography		•	Crown Intercept		•
	Brush Individuals	•		Herb. Fuel Load	•	
	Herbaceous Data Collected at: **0P-30P**					
Burn	Duff Moisture		•	Flame Zone Depth	•	
Postburn	Herbaceous Data: Not Collected			Herb. Fuel Load	•	
	100 Pt. Burn Severity		•			

FMH-4 **MONITORING TYPE DESCRIPTION SHEET** Park: **WICA**

Monitoring Type Code: GANSCD01 **Date Described:** 6 /12/97

Monitoring Type Name: Bluestem-Needlegrass Mixed-grass Prairie

Preparer: A. Powers, G. Bradshaw, B. Braudis, D. Roddy, B. Adams, G. Kemp, P. Reeberg

Physical Description

Level to hilly uplands. All aspects are acceptable, slopes <40%, elevation 3,500 to 5,000 feet. Soils are loamy, shallow to deep, and well drained. Soil types include the: Canyon-Rockoa-Rock Outcrop Outcrop, Nevee-Gypnevee-Rekop, Vanocker-Sawdust-Paunsaugunt, and Buska-Mocmont-Rock Outcrop Associations

Biological Description

A blend of tall-grass and short-grass prairies, typical dominant grasses include: little bluestem (*Schizachyrium scoparium*), needle-and-thread (*Hesperostipa comata*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), hairy grama (*B. hirsuta*), sideoats grama (*B. curtipendula*), buffalo grass (*Buchloe dactyloides*), and Kentucky bluegrass (*Poa pratensis*). Sedges such as threadleaf sedge (*Carex filifolia)*, needleleaf sedge (*Carex duriuscula*) may also be present. Forbs such as: sageworts (*Artemisia* spp.), scurfpea (*Psoralidium tenuiflorum*), dotted gayfeather (*Liatris punctata*), purple coneflower (*Echinacea angustifolia*), and upright prairie coneflower (*Ratibida columnifera*), are common. Low shrubs include: leadplant (*Amorpha canescens*) and Woods' rose (*Rosa woodsii*).

Rejection Criteria

Large outcroppings or barren areas >20% of the plot; areas with anomalous vegetation; monitoring type boundaries; riparian areas or areas dominated by trees; bio-control areas; areas within 20 meters of roads, man-made trails, or human created clearings are to be rejected.

Desired Future Condition

The community when maintained by fire would have reduced numbers of exotic species, particularly cool-season non-native grasses. The natural diversity of associated native species would be preserved or increased. The forage value for large ungulates (and small rodents) would be improved with periodic burning. There would be short-term (2-4 years post burn) increase in native forbs, especially milkweed and other target species for butterflies. With continued burning we will improve knowledge of fire effects in this community.

The community would have 25-50% of the area burned with in 7-10 years depending on topography to generate a mosaic of different aged stands across the type. Generate a fire disturbance pattern of varying intervals and differing seasons.

Burn Prescription

This monitoring type will be burned between early-April and green-up, or late-August to the end of September.

7. Fire Prescription Elements	
RH **- 25 - 55%**	Average Flame Length **- 0.4-1.5 ft**
Bulb **- 30°- 85°F**	Average Rate of Spread **- 0 - 3 ch/hr**
Average Mid-flame Winds **- 0-20 mph**	1 hour TLFM **- 6-14 %**
Fuel Loading **- 3-5 tons/acre**	10 hour TLFM – **n/a**
Live Fuel Moisture – **n/a**	100 hour TLFM – **n/a**

Fire Monitoring Variables

- Cover of native grasses and forbs
- Cover of non-native grasses and forbs
- Total shrub density

Prescribed Fire Objectives

<u>Immediate Post Burn</u>

- Burn 60-80% of the burnable project area.

<u>Two Years Post Burn</u>

- Reduce cover of non-native grasses by at least 20%
- Increase cover of native grasses by at least 10%
- Increase cover of native forbs by at least 30%

Fire Monitoring Objectives

- Install enough plots to be 80% confident that the cover for native grasses and forbs, and non-native grasses and forbs is within 25% of the true population mean.
- Install enough plots to be 80% confident that the average density of all shrub species is within 25% of the true population mean.

Data Analysis

- Assess cover of native grasses and forbs after sampling years 1, 2, and 5.
- Assess cover of non-native grasses and forbs after sampling years 1, 2, and 5.
- Assess shrub density after sampling years 1,2, and 5.

Notes: Shrub density will not be collected for *Opuntia polyacantha*, lead plant, wild rose, or snowberry because they are rhizomatous.

Relevant Literature

Brown, P. M. and C. H. Sieg. 1996. Fire history of interior ponderosa pine communities of the Black Hills, South Dakota, USA. International Journal of Wildland Fire **6**(3):97-105.

Gartner, F. R. 1975. Final report: Wind Cave National Park grassland ecology. Unpublished paper on file at: USDI, National Park Service, Wind Cave National Park, Hot Springs, SD.

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Gartner, F. R., and W. W. Thompson. 1972. Fire in the Black Hills forest-grass ecotone. Pages 37-68 *in* Proceedings of the 12th annual Tall Timbers Fire Ecology Conference. Tall Timbers Research Station, Tallahassee, Florida, USA.

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	GENERAL PROTOCOLS	YES	NO		YES	NO
Preburn	Control Plots		•	Herb Height	•	
	Herbaceous Density		•	Belt Transect Width: **5 m**		
	OP/Origin Buried		•	Abbreviated Tags	•	
	Voucher Specimens	•		Stakes Installed: **0P & 30P**		
	Stereo Photography		•	Crown Intercept		•
	Brush Individuals		•	Herb. Fuel Load		•
	Herbaceous Data Collected at: **0P-30P**					
Burn	Duff Moisture		•	Flame Zone Depth	•	
Postburn	Herbaceous Data: Not collected.			Herb. Fuel Load		•
	100 Pt. Burn Severity		•			

FMH-4 **MONITORING TYPE DESCRIPTION SHEET** Park: **WICA**

Monitoring Type Code: FPIPO1D02 **Date Described:** 6/11/97

Monitoring Type Name: Ponderosa Pine/Mixed-grass Savannah

Prepared by: Brian Braudis, B. Adams, G. Kemp, Andrea Powers, Ginger Bradshaw, Dan Roddy.

Physical Description

Soils include: Alice fine sandy loam, Alice Theda Lund complex, Lakoa-Butche complex, Nunn clay loam and Samsil-Gaynor complex. Characteristic soils consist of loamy soils, shallow to deep, well drained, alluvial fans, uplands and terraces, slopes >40%, elevation 3,500 to 5,000 feet, with lower to mid slopes and valleys

Biological Description

Open canopy ponderosa pine (*Pinus ponderosa*) with occasional Rocky Mountain juniper (*Juniperus scopulorum*). Understory trees include bur oak (*Quercus macrocarpa*), chokecherry (*Prunus virginiana*), and American plum (*Prunus americana*). Shrubs include: Oregon grape (*Mahonia repens*), common juniper (*Juniperus communis*), western red current (*Ribes cereum*). Herbaceous species include: poverty oat grass (*Danthonia spicata*), needle-and-thread (*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*), big bluestem (*Andropogon gerardii*), and Kentucky bluegrass (*Poa pratensis*).

Rejection Criteria

Large outcroppings or barren areas >20% of the plot; areas with anomalous vegetation; monitoring type boundaries; riparian areas or areas dominated by deciduous trees (> 30% cover); areas within 30 meters of roads, man-made trails, or human created clearings.

Desired Future Condition

- Decrease non-native species.
- Maintain open-canopy ponderosa pine stands with overstory tree density in a range of 150-250 stems/ha (60-100 stems/acre).
- Fuel load levels that are consistent with frequent, low intensity fires
- Decrease density of seedling and pole-sized trees.
- The community would have 50-80% of the area burned within 7-15 years depending on topography to generate a mosaic of different aged stands across the type.
- Generate a fire disturbance pattern of varying intervals and differing seasons.

Burn Prescription:

Units will be burned from April to green-up, or Labor Day to the end of September.

Fire Prescription Elements	
RH: **25-55%**	Average Rate of Spread: **0-3 ch/hr**
Temp: **50-85°F**	Live Fuel Moisture: **n/a**
Average Mid-flame Winds: **0-20 mph**	1-hour TLFM: **6-14%**
Fuel Loading: **3-5 tons/acre**	10-hour TLFM: **8-15%**
Average Flame Length: **0.4-1.5 ft**	100-hour TLFM: **10-30%**

Monitoring Variables

- Density of overstory, pole-size, and seedling ponderosa pine
- Cover of native herbaceous species
- Cover of non-native herbaceous species
- Total dead and down fuel load

Prescribed Fire Project Objectives

Immediate Post-burn

- Reduce dead and down fuel loading by at least 30%
- Burn at least 80% of the project area

One Year Post-burn

- Achieve at least 70% mortality on seedling ponderosa pine

Two Years Post-burn

- Achieve at least 30% mortality in overstory ponderosa pine
- Achieve at least 50% mortality in pole-size ponderosa pine
- Increase relative cover of native herbaceous species by at least 25%
- Reduce relative cover of non-native herbaceous species by at least 25%

Five Year Post Burn

- Maintain increase in relative cover of native herbaceous species
- Maintain decrease in relative cover of non-native species
- Monitor accumulation of dead and down fuels

Fire Monitoring Objectives:

- Install enough plots to be 80% confident that density of overstory, pole-size, and seedling ponderosa pine are within 20% of the true population mean.
- Install enough plots to be 80% confident that relative cover of native and non-native herbaceous

species is within 20% of the true population mean.
- Install enough plots to be 80% confident that the total dead and down fuel load is within 20% of the true population mean.

Data Analysis

- Assess density of overstory and pole-size ponderosa pine after sampling years 1, 2, and 5.
- Assess cover of native herbaceous species after sampling years 2 and 5.
- Assess total dead and down fuel load after sampling immediate post-burn, years 2 and 5.

Relevant Literature

Arno, S. F. 1988. Fire ecology and its management implications in ponderosa pine forests. Pages 133-139 *in* D. M. Baumgartner and J. E. Lotan, editors. Ponderosa pine: the species and its management. Symposium Proceedings, Washington State University, Spokane.

Brown, P. M., and C. H. Sieg. 1999. Historical variability in fire at the ponderosa pine - Northern Great Plains prairie ecotone, southeastern Black Hills, South Dakota. Ecoscience 6(4):539-547.

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8. FMH- 4 PLOT PROTO

GENERAL PROTOCOLS		YES	NO		YES	NO
Preburn	Control Plots		•	Herb Height	•	
	Herbaceous Density		•	Belt Transect Width:	**2 meters ***	
	OP/Origin Buried		•	Abbreviated Tags	•	
	Voucher Specimens	•		Stakes Installed: All		
	Stereo Photography		•	Crown Intercept		•
	Brush Individuals		•	Herb. Fuel Load		•
	Herbaceous Data Collected at: **Q4-Q1**					
	* *Symphoricarpos occidentalis* is measured in 0.5 m belt transect.					
Burn	Duff Moisture		•	Flame Zone Depth	•	
Postburn	Herbaceous Data: Not Recorded			Herb. Fuel Load		•
	100 Pt. Burn Severity		•			

FOREST PLOT PROTOCOLS		YES	NO		YES	NO
Overstory	Area sampled: **50 x 20m**			Quarters Sampled: **Q1-Q4**		
	Tree Damage	•		Crown Position	•	
	Dead Tree Damage		•	Dead Crown Position		•
Pole-size	Area Sampled: **25 x 10m**			Quarters Sampled: **Q1**		
	Height	•		Poles Tagged		•
Seedling	Area Sampled: **5 x 10m**			Quarters Sampled: **Subset of Q1**		

	Height	•		Seedlings Mapped		•
Fuel Load	Sampling Plane Length: **6, 6, 12, 100, 100**			Fuel Continuity		•
	Aerial Fuel Load		•			
Postburn	Char Height	•		Mortality	•	

Notes: Brush density will not be collected for *Opuntia polyacantha*.

FMH-4 **MONITORING TYPE DESCRIPTION SHEET** Park: **WICA**

Monitoring Type Code: FPIPO1D09 **Date Described:** 6/11/97

Monitoring Type Name: Ponderosa Pine Forest

Preparer: Dan Roddy, Brian Braudis, B. Adams, G. Kemp, Andrea Powers, Ginger Bradshaw.

Updated: 25 January 2005 – C. Wienk

Physical Description

Strongly sloping areas to steep canyons. Elevation 3,500-6,200 ft. Soils are loamy fine sand, shallow to deep, well to excessively drained. Soil types include: Sawdust-Hopdraw-Paunsaugunt, Citadel, Vanocker and areas of rock outcrop.

Biological Description

Overstory dominated by ponderosa pine (*Pinus ponderosa*). Understory is predominantly little bluestem (*Schizachyrium scoparium*), western snowberry (*Symphoricarpos occidentalis*), mountain mahogany (*Cercocarpus montanus*), golden currant (*Ribes aureum*), skunkbush sumac (*Rhus trilobata* Nutt. var. *trilobata*), Woods' rose (*Rosa woodsii*) and common chokecherry (*Prunus virginiana*). Common forbs include downy paintbrush (*Castilleja sessiliflora*), Hood's phlox (*Phlox hoodii*), prairie groundsel (*Packera plattensis*), stemless four-nerve daisy (*Tetraneuris acaulis* [Pursh] Greene var. *acaulis*), common starlily (*Leucocrinum montanum*) and darkthroat shootingstar (*Dodecatheon pulchellum*).

Rejection Criteria

Large outcroppings or barren areas >20% of the plot; slopes >60%; areas with anomalous vegetation; monitoring type boundaries; riparian areas or areas dominated by deciduous trees (> 30% cover); areas within 30 meters of roads, man-made trails, or human created clearings; and areas within 20 meters of Woodlands Research exclosures are to be rejected.

Desired Future Condition

- Decrease non-native species.
- Maintain open-canopy ponderosa pine stands with overstory tree density in a range of 200-350 stems/ha (80-140 stems/acre).
- Decrease density of seedling and pole-sized trees.
- Fuel load levels that are consistent with frequent, low intensity fires
- The community would have 50-80% of the area burned within 7-15 years depending on topography to generate a mosaic of different aged stands across the type.
- Generate a fire disturbance pattern of varying intervals and differing seasons.

Burn Prescription:

Units will be burned from April to green-up, or Labor Day to the end of September.

Fire Prescription Elements	
RH: **25-55%**	Average Rate of Spread: **0-3 ch/hr**
Temp: **50-85°F**	Live Fuel Moisture: **n/a**
Average Mid-flame Winds: **0-20 mph**	1-hour TLFM: **6-14%**
Fuel Loading: **3-5 tons/acre**	10-hour TLFM: **8-15%**
Average Flame Length: **0.4-1.5 ft**	100-hour TLFM: **10-30%**

Fire Monitoring Variables

- Density of overstory, pole-size, and seedling ponderosa pine
- Cover of native and non-native herbaceous species
- Shrub Density
- Total dead and down fuel load

Prescribed Fire Project Objectives

Immediate Post-burn

- Reduce dead and down fuel loading by at least 60%
- Burn at least 80% of the project area

Two Years Post-burn

- Achieve at least 30% mortality in overstory ponderosa pine
- Achieve at least 50% mortality in pole-size ponderosa pine
- Achieve at least 70% mortality on seedling ponderosa pine
- Increase relative cover of native herbaceous species by at least 25%
- Reduce relative cover of non-native herbaceous species by at least 25%

Five Year Post Burn

- Maintain increase in relative cover of native herbaceous species
- Maintain decrease in relative cover of non-native species
- Monitor accumulation of dead and down fuels

Fire Monitoring Objectives:

- Install enough plots to be 80% confident that density of overstory, pole-size, and seedling ponderosa pine are within 20% of the true population mean.
- Install enough plots to be 80% confident that relative cover of native and non-native herbaceous species is within 20% of the true population mean.
- Install enough plots to be 80% confident that the total dead and down fuel load is within 20% of the true population mean.

Data Analysis

- Assess density of overstory and pole-size ponderosa pine after sampling years 1, 2, and 5.
- Assess cover of native herbaceous species after sampling years 2 and 5.
- Assess total dead and down fuel load after sampling immediate post-burn, years 2 and 5.

Relevant Literature

Arno, S. F. 1988. Fire ecology and its management implications in ponderosa pine forests. Pages 133-139 *in* D. M. Baumgartner and J. E. Lotan, editors. Ponderosa pine: the species and its management. Symposium Proceedings, Washington State University, Spokane.

Brown, P. M., and C. H. Sieg. 1999. Historical variability in fire at the ponderosa pine - Northern Great Plains prairie ecotone, southeastern Black Hills, South Dakota. Ecoscience 6(4):539-547.

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Gartner, F. R., and W. W. Thompson. 1972. Fire in the Black Hills forest-grass ecotone. Pages 37-68 *in* Proceedings of the 12th annual Tall Timbers Fire Ecology Conference. Tall Timbers Research Station, Tallahassee, Florida, USA.

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9. FMH- 4 PLOT PROTOCOLS

GENERAL PROTOCOLS		YES	NO		YES	NO
Preburn	Control Plots		•	Herb Height	•	
	Herbaceous Density		•	Belt Transect Width: **2 meters ***		
	OP/Origin Buried		•	Abbreviated Tags	•	
	Voucher Specimens	•		Stakes Installed: All		
	Stereo Photography		•	Crown Intercept		•
	Brush Individuals		•	Herb. Fuel Load		•
	Herbaceous Data Collected at: **Q4-Q1**					
	* *Symphoricarpos occidentalis* is measured in 0.5 m belt transect.					
Burn	Duff Moisture		•	Flame Zone Depth	•	
Postburn	Herbaceous Data: Not Recorded			Herb. Fuel Load		•
	100 Pt. Burn Severity		•			

FOREST PLOT PROTOCOLS		YES	NO		YES	NO
Overstory	Area sampled: **50 x 20m**			Quarters Sampled: **Q1-Q4**		
	Tree Damage	•		Crown Position	•	
	Dead Tree Damage		•	Dead Crown Position		•
Pole-size	Area Sampled: **25 x 10m**			Quarters Sampled: **Q1**		
	Height	•		Poles Tagged		•

Seedling	Area Sampled: **5 x 10m**			Quarters Sampled: **Subset of Q1**		
	Height	•		Seedlings Mapped		•

Fuel Load	Sampling Plane Length: **6, 6, 12, 100, 100**			Fuel Continuity		•
	Aerial Fuel Load		•			

Postburn	Char Height	•		Mortality	•	

Notes: Brush density will not be collected for *Opuntia polyacantha*, lead plant, wild rose, and snowberry because they are all rhizomatous.

FMH-4 **MONITORING TYPE DESCRIPTION SHEET** Park: **WICA**

Monitoring Type Code: GPOPR1D01 **Date Described:** 5/11/99

Monitoring Type Name: Non-native Perennial Grass

Prepared by: A. Thorstenson, A. Powers, B. Kobza, K. Paintner

Physical Description

Level to hilly uplands. All aspects are acceptable, slopes <40%, elevation 3,500 to 5,000 feet. Soils are loamy, shallow to deep, and well drained. Soil types include the: Canyon-Rockoa-Rock Outcrop Outcrop, Nevee-Gypnevee-Rekop, Vanocker-Sawdust-Paunsaugunt, and Buska-Mocmont-Rock Outcrop Associations

Biological Description

Grassy areas dominated by Kentucky bluegrass (*Poa pratensis*) with some native intermingled. Native grasses include little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), needle-and-thread (*Hesperostipa comata*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), hairy grama (*B. hirsuta*), sideoats grama (*B. curtipendula*), buffalo grass (*Buchloe dactyloides*), and western wheatgrass (*Pascopyrum smithii*). Sedges such as threadleaf sedge (*Carex filifolia*) may also be present. Forbs such as sageworts (*Artemisia* spp.), slimflower scurfpea (*Psoralidium tenuiflorum*), dotted blazing star (*Liatris punctata*), purple coneflower (*Echinacea angustifolia*), and upright prairie coneflower (*Ratibida columnifera*), are common. Low shrubs include leadplant (*Amorpha canescens*) and Woods' rose (*Rosa woodsii*).

Rejection Criteria

Large outcroppings or barren areas greater than 25% of the plot; slopes >15%; areas with anomalous vegetation; areas dominated by deciduous trees (> 30% cover); areas within 30 meters of roads, man-made trails, or human created clearings.

Desired Future Condition

Areas currently dominated by non-native cool-season grasses are thought to have been mixed-grass prairie, though the exact pre-settlement vegetative composition is not known. The vision for this community is to reduce the cover of non-native grasses and forbs and increase the cover of native grasses and forbs.

Burn Prescription:

Units will be burned between early spring and green-up.

Fire Prescription Elements	
RH: **25 - 55%**	Average Flame Length: **0.4 - 1.5 ft**.
Temperature: **50 – 85 °F**	Average Rate of Spread: **0 - 3 ch/hr**
Average Mid-flame Winds: **0 - 20 mph**	1 hour TLFM: **6-14 %**
Fuel Loading: **3 - 5 tons/acre**	10 hour TLFM: **n/a**
Live Fuel Moisture: **n/a**	1000 hour TLFM: **n/a**

Monitoring Variables

- Cover of non-native grass and forbs
- Cover of native grass and forbs

Prescribed Fire Objectives

Immediate Post-burn

- Burn at least 60% of the burnable project area.

Two Years Post-burn

- Reduce relative cover of non-native grasses by at least 30%.
- Increase relative cover of native grasses by at least 20%.
- Increase relative cover of native forbs by at least 20%.

Fire Monitoring Objectives

- Install enough plots to be 80% confident that relative cover of native and non-native grasses will be within 25% of the population mean.

Data Analysis

- Assess cover of native grasses and forbs after sampling years 1, 2, and 5.
- Assess cover of non-native grasses and forbs after sampling years 1, 2, and 5.

Relevant Literature

Gartner, F. R. 1975. Final report: Wind Cave National Park grassland ecology. Unpublished paper on file at: USDI, National Park Service, Wind Cave National Park, Hot Springs, SD.

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Kuchler, A.W. 1964. Potential natural vegetation of the coterminous Untied States. Am. Geogr. Soc. Spec. Publ. 36 (Manual), New

York.

Stubbendieck, J., and G. Willson. 1986. An identification of prairie in National Park units in the Great Plains. USDI National Park Service Occasional Paper No. 7, Washington, DC.

USDA, NRCS. 2002. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA.

USDI National Park Service. 2001. Fire monitoring handbook. National Interagency Fire Center, Boise, ID. 288 pp.

USGS. 1999. Wind Cave National Park, USGS-NPS Vegetation Mapping Program Products (http://biology.usgs.gov/npsveg/wica/index.html). USGS-NPS Vegetation Mapping Program, USGS Center for Biological Informatics, Denver, CO.

FMH-4 PLOT PROTOCOLS

GENERAL PROTOCOLS		YES	NO		YES	NO
Preburn	Control Plots		•	Herb Height	•	
	Herbaceous Density		•	Belt Transect Width: **5m**		
	OP/Origin Buried		•	Abbreviated Tags	•	
	Voucher Specimens	•		Stakes Installed: **0P & 30P**		
	Stereo Photography		•	Crown Intercept		•
	Brush Individuals	•		Herb. Fuel Load	•	
	Herbaceous Data Collected at: **0P-30P**					
Burn	Duff Moisture		•	Flame Zone Depth	•	
Postburn	Herbaceous Data: Not Collected			Herb. Fuel Load	•	
	100 Pt. Burn Severity		•			

Notes: Shrub density will not be collected for *Opuntia polyacantha*.

Appendix 2 – Long-term Photo Monitoring

LONG TERM PHOTO MONITORING SHEET

Plot # ______________ **Park: ____________** **Date: __________**

Burn Unit: ______________ **Recorders: _________________**

UTM Zone:________	**Camera height: ________ft.**	**Elevation: ___________ft**
		Slope along transect: _____%
UTMN:___________	**Lens size: _________mm**	**Slope of terrain: ________%**
		No. of Photos Taken: ________
UTME:___________	**Distance from pole: __________ft.**	**Compass Bearing(s):**
Datum:_____________	**Azimuth from camera to pole: ____**	
EPE:___________	**Height on pole used for shot: _____ft**	

Describe the route to the plot, include or attach a hand drawn map illustrating these directions, including the plot layout, and significant features:

Visit	Initial/ Date	Comments
Install/Pre		
Immediate Post		
1 Year Post		
2 Year Post		
5 Year Post		
10 Year Post		

APPENDIX 3 – ALTERNATIVE PROTOCOLS

Protocols for PIPO Seedling Monitoring in Northwest

Circular plots with 10 m radius will be randomly located within areas of seedling establishment in the Northwest prescribed fire unit. Within these circular plots, the number of ponderosa pine seedlings will be tallied and recorded. Seedlings are defined as those trees with dbh <2.5 cm. Seedling densities pre- and post-burn will be summarized from this data. UTM coordinates and datum used will be recorded. Photos will be taken from two end points looking toward the center.

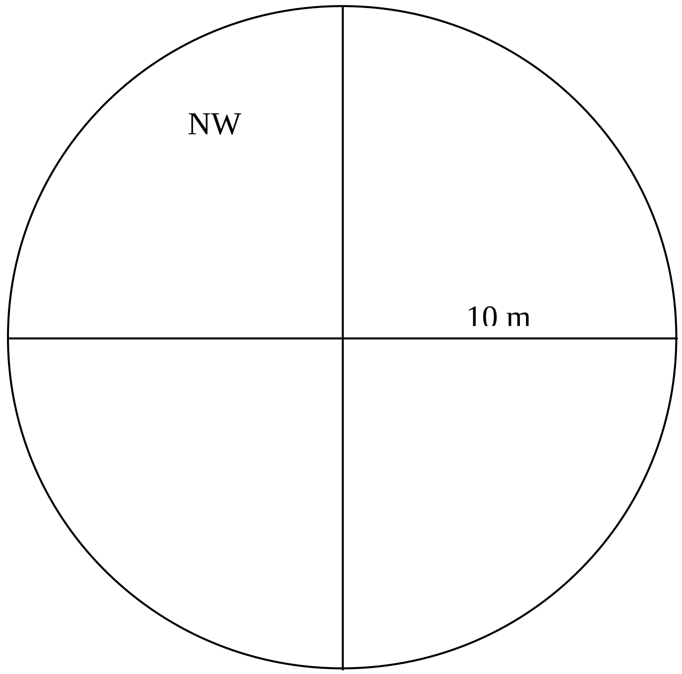
Plots will be divided into quadrants using 2 tapes laid out on cardinal directions. One 36” rebar will be located at the center of the plot and tagged with the plot identifier. Seedlings will be tallied by quadrant (i.e. NE, SE, SW, NW). Analysis of density and resulting mortality will be done at Year 2. Rebar will be removed after Year 2.

Rejection criteria: If a random point falls adjacent to a rock outcrop the point will be moved ten meters in a direction perpendicular to the face of the rock outcrop. If the location is still not suitable, the point will be rejected. Other areas that would justify rejection of random points include drainages dominated by deciduous trees and shrubs, man-made features such as roads, and areas that have recently been thinned or other human-caused disturbance.

Equipment:

____ GPS unit
____ map of random points
____ 2 30-m tapes
____ DBH tape
____ compass
____ data sheets
____ pencils

____ 1 rebar
____ UTM coordinates
____ 4 chaining pins
____ Hammer
____ clinometer
____ clipboard



Seedling Mortality Data Sheet – WICA

Burn Unit: _______________ Date: _____________

Burn Status: ______________ Recorders: _____________

Plot ID: __________________ Plot Radius: _____________

UTM Coordinates: Datum: ____________ N _________________ E _________________

Live Ponderosa Pine Seedling Tally

Quarter 1: Quarter 2:

Quarter 3: Quarter 3:

Comments:

Plot ID: __________________ Plot Radius: _____________

UTM Coordinates: Datum: ____________ N _________________ E _________________

Live Ponderosa Pine Seedling Tally

Quarter 1: Quarter 2:

Quarter 3: Quarter 3:

Comments:

Protocols for Tree Monitoring in Red Valley

Circular plots with 10 m radius will be randomly located within the forested areas of the Red Valley unit. Within this circular plot, size class and live or dead will be measured and recorded for all ponderosa pine trees. Trees will be separated into 3 classes based on diameter at breast height (dbh). Seedlings with dbh <2.5 cm, Poles with dbh $\geq$ 2.5 cm and $\leq$15.0 cm, and Overstory trees with dbh > 15.0 cm. Basic stand structure information, such as number of trees per size class, will be summarized from this data. UTM coordinates and datum used will be recorded. Photos will be taken from two end points looking toward the center, and an overview photo will be taken at a location that best captures the sampling area.

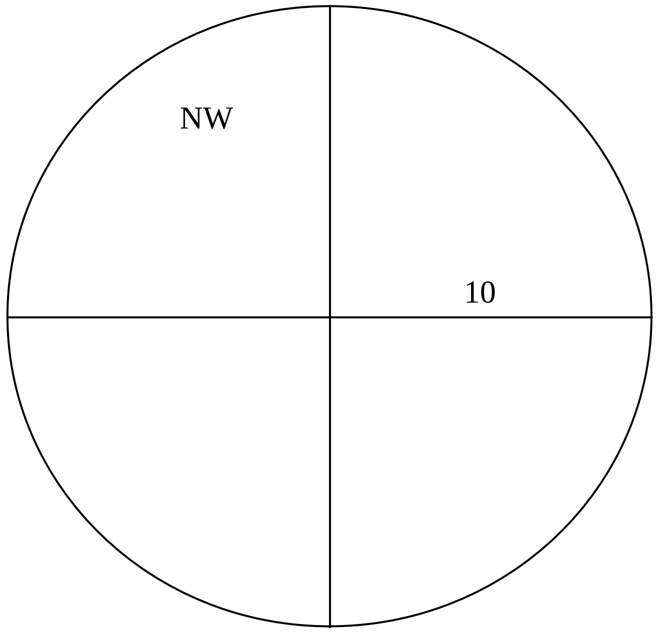
Plots will be divided into quadrants using 2 tapes laid out on cardinal directions. One 36” rebar will be located at the center of the plot and tagged with the plot identifier. Trees will be located by quadrant (i.e. NE, SE, SW, NW), by size class and live or dead. Analysis of density by size class and resulting mortality by size class will be done at Year 2. Rebar will be removed after Year 2.

Rejection criteria: If a random point falls adjacent to a rock outcrop the point will be moved ten meters in a direction perpendicular to the face of the rock outcrop. If the location is still not suitable, the point will be rejected. Other areas that would justify rejection of random points include drainages dominated by deciduous trees and shrubs, man-made features such as roads, and areas that have recently been thinned or other human-caused disturbance.

Equipment:

____ GPS unit
____ map of random points
____ 2 30-m tapes
____ DBH tape
____ compass
____ data sheets
____ pencils

____ 1 rebar
____ UTM coordinates
____ 4 chaining pins
____ Hammer
____ clinometer
____ clipboard



Park __________

Plot I.D.______________________ Install Date _____________

Burn Unit ____________________ Location UTMN _______________

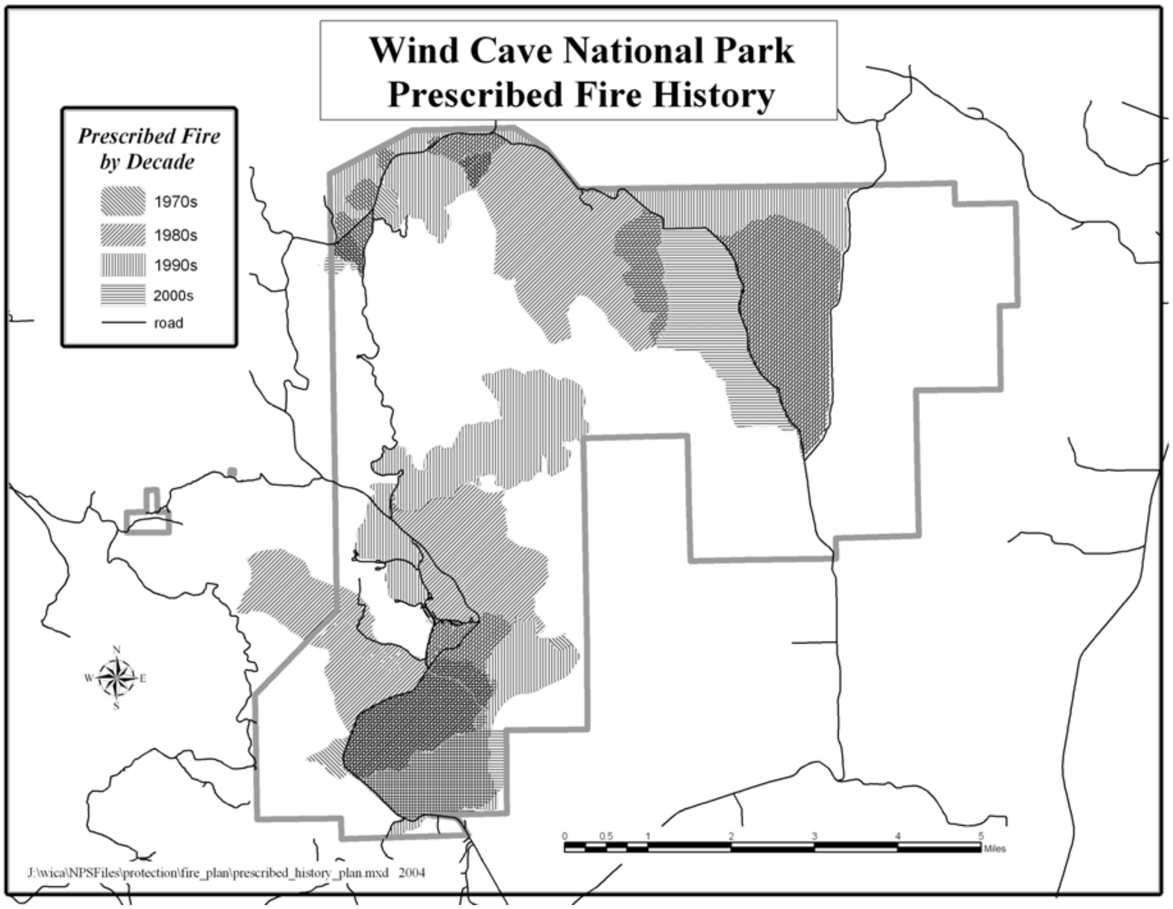
UTME ________________

Recorders____________________________ Datum ________________

2003 Pre				2004 Year 1				2005 Year 2			
Qtr	**Size Class S, P, O**	**Live or Dead**	**Tally**	**Qtr**	**Size Class S, P, O**	**Live or Dead**	**Tally**	**Qtr**	**Size Class S, P, O**	**Live or Dead**	**Tally**

APPENDIX K.

Fuel Treatment History Map (Prescibed Burns)



APPENDIX L.

SAMPLE BURN PLAN

WIND CAVE NATIONAL PARK

Prescribed Burn Plan

Signed 12/18/2003

Project Name: **NORTHWEST**

Prepared by: ________________________________ Date: ________

Dan Morford, Prescribed Fire Specialist

Reviewed by: ________________________________ Date: ________

Doug Alexander, Fire Management Officer

Reviewed by: ________________________________ Date: ________

Dan Foster, Chief of Resource Management

Reviewed by: ________________________________ Date: ________

Rick Mossman, Chief Ranger (Fire Cord.)

Reviewed by: _\s\ Bobby Bloodworth_______________ Date: _11/19/2003_

Technical Reviewer

Reviewed by: ________________________________ Date: ________

NPS Regional Reviewer

This approved prescribed fire plan constitutes a delegation of authority to burn. No one has the authority to burn without an approved plan or in a manner not in compliance with the approved plan. Actions taken in compliance with the approved prescribed fire plan will be fully supported. Personnel will be held accountable for actions taken that are not in compliance with elements of the approved prescribed fire plan regarding execution in a safe and cost-effective manner.

Approved by: ________________________________ Date: ________

Linda Stoll (WICA) Superintendent

Review Comments for Northwest Prescribed Fire

Please note any comments you may have pertaining to this prescribed burn plan.

Fire Management Officer ______________________________

Chief (s) of Resource Management ______________________________

Technical Reviewer ______________________________

Superintendent ______________________________

Other ______________________________

TABLE OF CONTENTS

B. Executive Summary

The Northwest project area is located in the northwest corner of the park along highway 87 and county road 391. The area consists of four units of open meadow surrounded by ponderosa pine. The seedlings from the pine are encroaching into the meadows causing a loss of viable grass vegetation. There is one unit consisting of 50% tree canopy that will be burned last. The project is designed to be accomplished during the winter or spring as conditions permit. This project will be completed with park red-carded personnel, so little to no funding will be requested.

Direction to utilize prescribed fire to achieve goals and objectives further stated in this burn plan come from the park's Resource Management and Fire Management Plans. The 2001 Review and Update of the 1995 Federal Wildland Policy mandates Federal and land management agencies within fire dependent communities to reintroduce and maintain fire as part of the ecosystem and conduct all prescribed fire projects consistent with land and resource management plans, public health considerations, and approved prescribed fire plans. The policy of using fire as a tool will help decrease risks to life, property and resources and help perpetuate the natural resource values for which these parks were established.

C. Description

Location	A. Latitude	W 43° 37’ 37” Longitude N 103° 29’ 47”
	B. Legal	T. 5S. R. 5E. Sections 11, 14
Size	349 Acres	
Elevation	4600’	
Slope	0 – 20, mostly flat	
Aspect	South	

Vegetation

The burn unit consists of warm season native grasses and cool season native and exotic species. The pine seedlings range from 6” to 5 feet tall and are filling in the meadows from the seed trees along the meadow edge. The current fuel model is a fuel model 1, short grass.

VegetationType	Fuel Model	% of Unit	# of acres based on %	Estimated tons per acre
Mixed-grass prairie	1	95		.74
Ponderosa Pine forest	2	5		3.5

Vicinity maps – See Attachment #1

Project maps – See Attachment #2

D. <u>Goals and Objectives</u>

Goal:

Reduce ponderosa pine seedlings that are encroaching on prairie.

Objectives:

Achieve >85% mortality (within 2 years postburn) in ponderosa pine seedlings.

E. Risk Management

The project has been reviewed for risk management. See Attachment #3

F. Project Complexity

The project is rated as a Type 2 burn. See Attachment #4

G. Organization

The following resources are required to implement the project. All non-park resources will be ordered and committed to the project through Northern Great Plains Interagency Dispatch Center. Specific resources will be identified in an incident action plan prepared for each operational period during the implementation of the burn. See Attachment #5 for organizational chart. Trainee assignments will be used in target positions, if needed.

Personnel: Burn day

1 Burn Boss (RXB2)

1 Prescribed Fire Monitors (RXFM)

1 Holding Specialist

1 Ignition Specialists

1 Resource Advisor

Holding Resources

Day of Burn:

4 T-6 Engines

3 ATV w/pump & tank

Ignition Resources

3 Ignitors

6 person handcrew

H. <u>Cost</u>

Projected Costs

	Planning			Preparation			Execution			Evaluation		
	Reg	Prem	Cost	Reg	Prem	Cost	Reg	Prem	Cost	Reg	Prem	Cost
Personnel									1000			
Equipment												
Aircraft												
Misc. and per diem												
Totals									1000			

Projected Total Cost Including Base Time: $ 1000.00

Projected Amount of Additional Funds Needed from FIREPRO: $ 0

This includes overtime, per diem, supplies, some preparation.

Projected Cost per Acre: /ac Including Base Time --- /ac Without Base Time

Actual Costs

	Planning			Preparation			Execution			Evaluation		
	Reg	Prem	Cost	Reg	Prem	Cost	Reg	Prem	Cost	Reg	Prem	Cost
Personnel												
Equipment												
Aircraft												
Misc.												
Totals												

Actual Total Cost: $________

Actual Cost per Acre: $________

I. Scheduling

Proposed Ignition Date: Jan. 1 through April 30, 2004

Projected Burn Duration: 1 Burning period for ignition 2 to 4 days for patrol

Actual Ignition Date:

Date Declared Out:

J. Pre-burn Considerations

PREPARATION NEEDS ON SITE:

1. One week before burn:

- Post segment-break signs. Prepare burn mix.
- Check for any recent blow-downs along timbered section of perimeter
- Take fuel moisture samples from the site and calculate % fuel moisture for multiple size categories of dead and down fuels, as well as live fuels.
- The Burn Boss will get pre-ignition approval from Superintendent and Park Director or designees (Attachment #7).
- Road culverts will have all fuel removed from them.

2. **One Day Before Burn:**
   - Program hand held radios for frequencies identified in the Communication Plan (Attachment #6).
   - Set-up all-terrain vehicles outfitted with water tank and pump, and transport to burn site.

3. **Day of Burn**
   - The Burn Boss will prepare the Go/No-Go checklist before ignition of the test burn (see Attachment #8).
   - Set up RX fire signs along highway 87 and Custer County 391.

OFF SITE:

Send notices to Park neighbors and adjacent state and local management agencies announcing the proposed burn by January 1,2004.

Two weeks before burn:

- Complete necessary pre-work as listed above.

Day of the burn

- Notify neighboring landowners that asked to be called.

K. Prescription

FUEL MODEL & VEGETATION	Fuel Model - 1 Grasses	Fuel Model – 2 Open Ponderosa Pine (outside unit)
Relative Humidity	**20-50**	**20-50**
Mid-flame wind	**1-10 (any)**	**1-10 (any)**
1-Hr. fuel mois.	**6-10**	**6-10**
10-Hr. fuel mois.	**--**	**6-10**
100-Hr. fuel mois.	**--**	**10-13**
Live fuel mois.	**--**	**40**
Rate of spread (c/hr)	**4-270**	**1-149**
Heat/unit area (BTU/sq.ft.)	**59-91**	**494**
Fireline Intensity (BTU/ft/sec)	**5-449**	**8-1352**
Flame Length (ft)	**.9-7.5**	**1.2-12.4**

L. Ignition & Holding Actions

A test burn will be ignited at or near the *main point of origin* for the burn (located on down wind side of burn). Fuels and topography will be representative of most of the project. The Burn Bosses will decide at that point to initiate the main burn or not.

Firing and ignition

Holding Actions

The burn unit is surrounded by roadways and mow line. The roads vary in size and structure. Highway 87 is a two-laned, paved road. Custer County 391(Pringle cut-off) is a gravel road that is slightly less than two-laned.

Holding tactics will consist of hose lays and ATV w/foam and water. Managers will identify to locations of hose lays and where ATV foam units will travel. The hoselay will be used in high visibility areas and charged the day of the burn. It will be drained before crews leave the project area the day of the burn.

Holding for the burn will consist of engine crews, hand crew and ATV,s working along the identified perimeter to assure that the fire does not spot. There are numerous road culverts which will be cleaned (of fuel) prior to the project. Personnel are identified on holding worksheet, attachment #9.

Critical holding areas:

The critical holding areas on this project are the mow lines along the boundary fence.

Patrol and Mop up:

The fire will be mopped up at least 50' in from the lines as soon as possible. This will be done before the initial resources are released from the incident. On the day following the burn, one T-6 engine will be assigned to the burn to patrol the area looking for hot spots

M. <u>Wildland Fire Transition Plan</u>

1. If spot fires or slop-overs occur, the Holding Specialist will supervise initial attack.
2. If spot fires and/or slop-overs are converted to a wildland fire, the Burn Boss will make the declaration and assume the role of Incident Commander Type 3. If the Burn Boss is not a qualified ICT3 prior to ignition of the prescribed burn, one will be available on-scene, or ordered and confirmed to be available on scene within 1 hour.
3. The ICT3 will then assume role of Incident Commander. The Burn Boss will continue to shut down the prescribed fire. The I.C. will immediately notify **Northern Great Plains Interagency Dispatch Center (605) 893-8017** of the change in status to a wildfire and will order the appropriate resources for a "control" suppression strategy. The Burn Boss will also notify the Wind Cave National Park Superintendent.

N. Protection of Sensitive Features

Archeological

There are no known archeology sites within the proposed burn area. Control lines will consist of existing roads and mow lines. No soil disturbance is anticipated during the project's preparation or execution. All engine traffic will be restricted to the road.

Threatened and Endangered

The burn will have no effect on T&E species. No threatened or endangered species are known to be utilizing the proposed burn unit area.

Ethnographic

There are no known ethnographic resources within the burn block. Any additional resources located during burn preparations or operations will be noted and documented by resource advisors. If possible, without compromising firefighter safety, the burn boss may decide to use ignition or holding tactics to exclude these areas from the fire. If ethnographic resources are identified in the post- burn area, and an archeological inventory is conducted, a report of the inventory will be passed on to appropriate American Indian tribes.

Historical

There are no known historical structures in the burn unit.

O. Public and Firefighter Safety

1. "Prescribed Burn-Do Not Report" and/or "Smoke Ahead" signs will be posted along major roads and highways near the burn site (Custer County 391 Rd and Hwy 87).
2. Assigned burn personnel and/or Park Rangers along park roads will conduct traffic control, if smoke emissions are impacting driving visibility.
3. A safety briefing will be given at the pre-burn briefing and at the start of each operational period. See attachment # 11. An Incident Action Plan describing burn operations, objectives, personnel/division assignments, and radio frequency information will be distributed to all personnel. A project map and spot weather forecast will be distributed, as well. All personnel will be advised of Lookouts, Communications, Escape Routes, and Safety Zones. Any potential safety hazards will be pointed out.
4. All burn personnel will wear standard fire fighting leather boots, Nomex clothing, leather gloves, and a hard hat. They will carry a fire shelter and a fire tool during all burn operations.
5. All standard wildland fire fighter safety rules will be strictly enforced (ref: Red Book v2003).
6. Ensure safety of FEMOs with IC and maintain effective communication with ignition and holding teams.
7. The public will be kept at a safe distance from the fireline. Authorized personnel will accompany all visitors and press.

P. Smoke Management

1. Highway 87 will be kept open.
2. Critical receptor points are:
   Hot Springs SD - 11 miles south

3. Smoke emissions and behavior will be continually monitored and documented on a smoke observation form. Any significant change in smoke emissions and/or column behavior will be reported to the Burn Bosses.
4. Smoke dispersal index must be “good” or “better” as predicted by the NWS. This will result in the smoke being carried up and away from the burn unit and will minimize inversions. No night firing will occur and dry fuel conditions with a low relative humidity will be preferred to produce the lowest possible emissions. If predicted smoke dispersal is less than "good" the project will not be initiated.

Q. Coordination & Public Notification

A. On the day of the burn, the Burn Boss will contact the following:

• Sheriff:	Custer County	673-8176
	Fall River County	745-4155
• S.D. State Division of Wildland Fire:		393-8017
• S.D. Air Quality -John Epp		394-2229
• Northern Great Plains Interagency Dispatch Center		393-8017
• US Forest Service		673-9200
• Randall Benson – Meteorologist		394-1989

B. The Park's information officer will prepare a press release at least one week prior to the expected time of ignition for all newspapers, radio, and television stations.

C. Approximately 2 weeks before the burn, informational flyers will be distributed to nearby property owners to inform them of the planned burn. The flyer will suggest keeping windows closed and not having clothing on clotheslines. It will also include Parks telephone numbers to provide residents with a source of information. Residents with health or respiratory problems will be asked to call the WICA Visitor Center for more information.

R. Monitoring & Evaluation

Pre-burn

- Weather will be monitored at least 2 weeks prior to and throughout the burn utilizing elk mountain weather station.
- Dead and live fuel samples will be collected at least 1 week prior to the proposed ignition date.
- The day before the burn, a Spot Weather Forecast will be obtained.

Burn day

- A spot weather forecast will be requested on the day of the burn from the National Weather Service. During the burn, on site the lead prescribed fire monitor and other assigned monitors will conduct monitoring. These people will be responsible for the collection and documentation of weather, smoke, and fire behavior observations. They will maintain communication with the Burn Boss, Ignition, and Holding Specialists to ensure safe operations when working in the interior of the burn.

Post burn

- After the burn, an After Action Review (AAR) will be conducted by the NGPA Fire Management Officer. All associated personnel with the burn will be encouraged to attend. The review will be conducted within 10 days of the project.
- The Resource Management staff of Wind Cave will photo document the burn at intervals of day after, 3 mo., and 6 months the ATV traffic areas and hose lay only areas. This will be used to aid the Park in determining the extent of off road traffic for projects.
- There are fire effects plots utilizing NPS monitoring protocol located within the project boundary.

S. Rehabilitation

- The fire staff will evaluate all temporary fire lines once the Burn Boss has declared the prescribed burn out. If it is determined that rehabilitation work is necessary, it will be completed within six months of burn completion. If any firelines are made barren of natural vegetation, these will have leaves, needles, grass, or other native natural organic material replaced to encourage growth of vegetation.

T. Reports

- The Lead FEMO will prepare and submit an individual report that includes hourly weather, fire behavior and smoke observation data.

- The Burn Boss will prepare an Individual Fire Report, DI-1202, within five days of declaring the fire out.

- The Burn Boss and RXFM will maintain an ICS-214 (Unit Log) throughout each operation.

- The Burn Boss will schedule an AAR. A summary of the AAR will be submitted to the Superintendent, FMO, Park fire coordinator and Resource Management Specialists, along with a copy of the Fire Monitor report.

- The Prescribed Fire Specialist will prepare a project accomplishment report in the National Fuel Project Reporting System (NFPORS).

- The Parks will maintain a project files that includes the burn unit plan, spot weather forecasts, and all required compliance documents.

I.

II. U. ATTACHMENTS

1 Vicinity Map

2 Project Map

3 Prescribed Fire Risk Analysis

4 Prescribed Fire Complexity

5 Prescribed Fire Organization Plan

6 Communications Plan

7 Agency Administrator Go/No-Go Approval

8 Burn Boss Go/No-Go Checklist

9 Holding Forces Worksheet

10 BEHAVE Projections

11 Briefing Outline

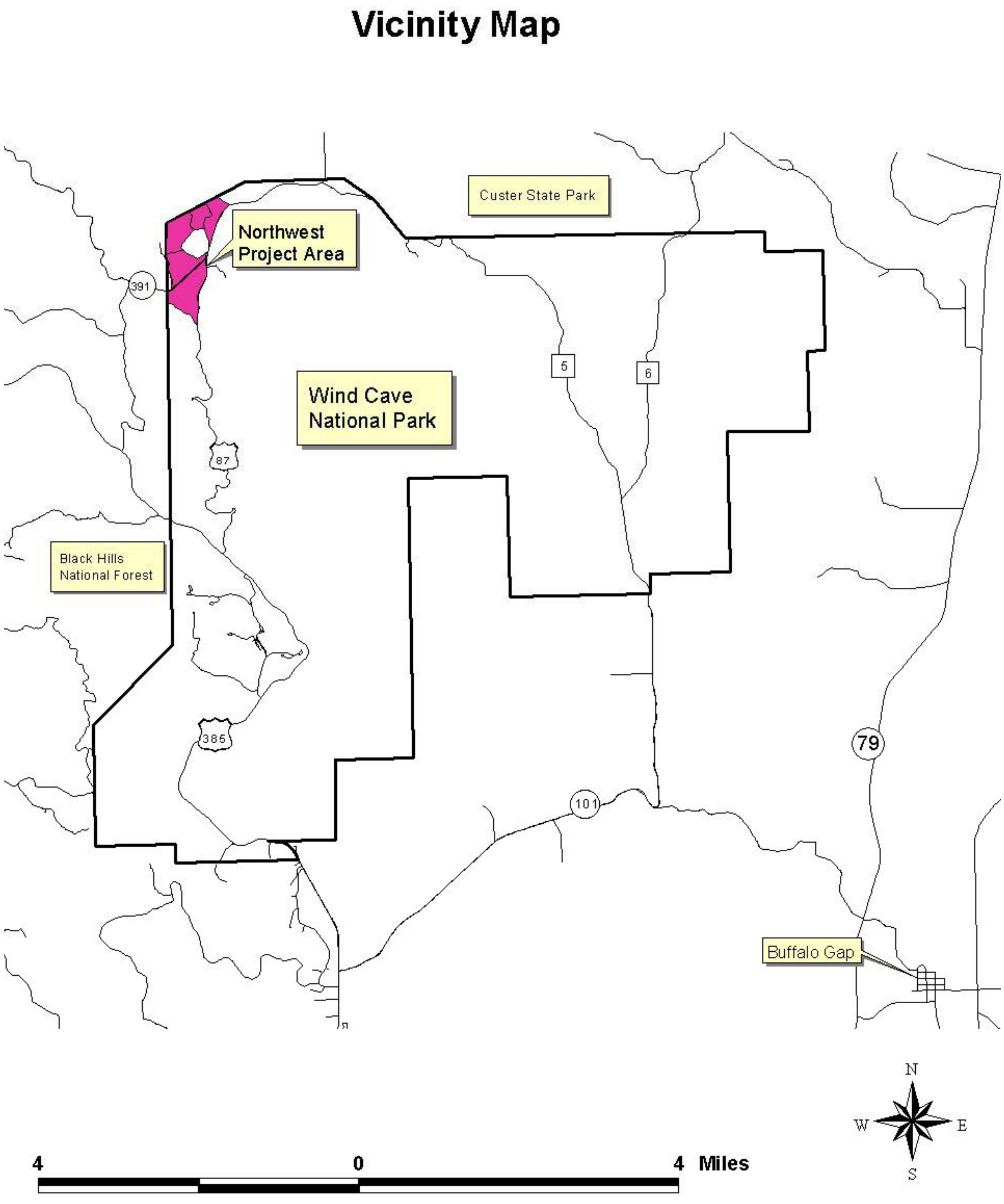
12 Medical Plan

13 Job Hazard Analysis

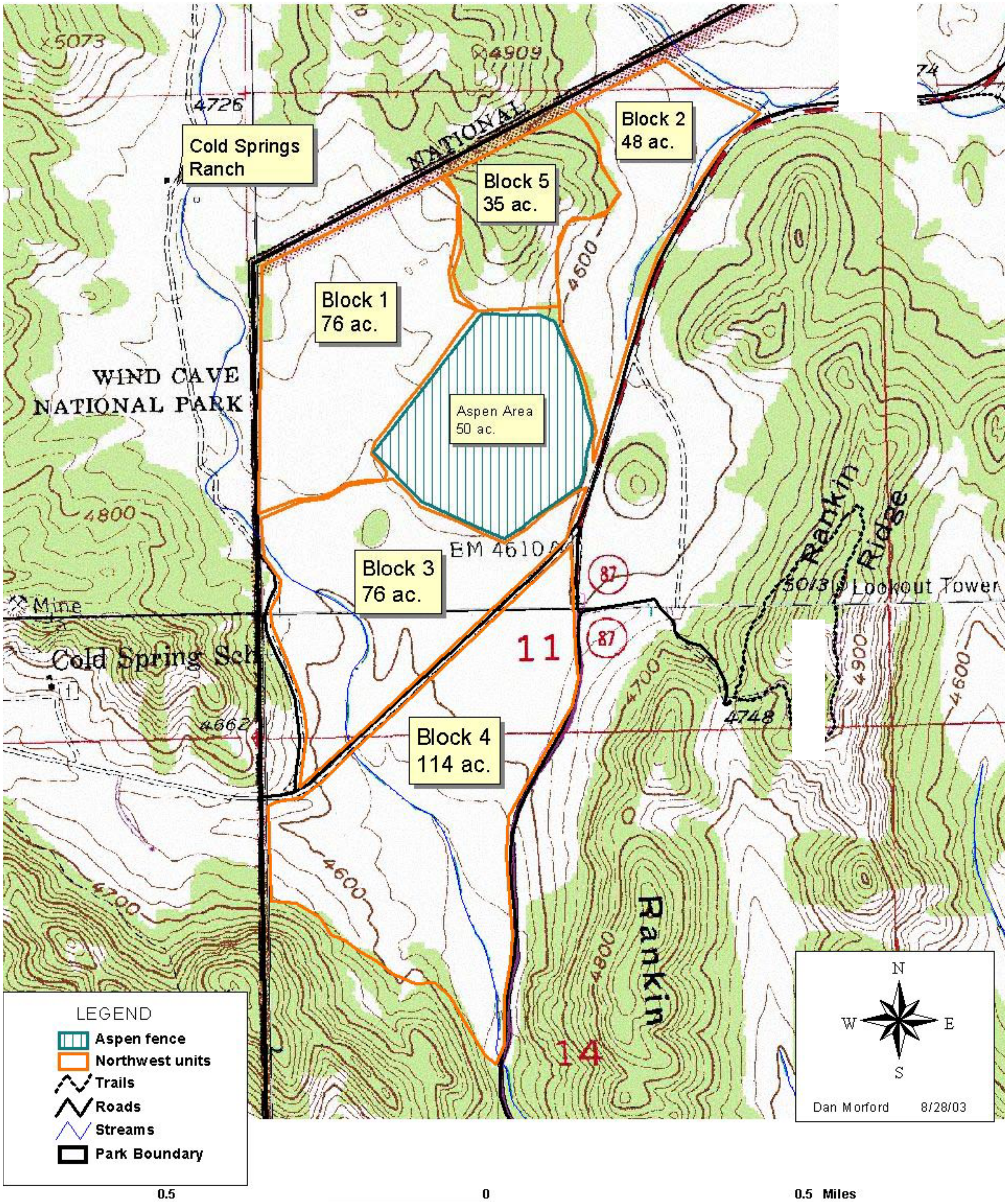
14 Photos

Appendix L - 17

Attachment #1



Attachment #2



Attachment #3

PRESCRIBED FIRE RISK ANALYSIS WORKSHEET

Hazard Element	Hazard Probability			Potential Consequences			*Risk (Exhibit 4)
	L	M	H	L	M	H	
1. Environmental Data							
a. Seasonal severity		X		X			M
b. Fire Behavior	X			X			L
c. Fuels	X			X			L
d. Weather		X		X			M
e. Topography	X			X			L
2. Agency Values							
a. Ecological and Environmental Considerations	X			X			L
b. Social and Cultural Values	X			X			L
c. Project Duration and Logistics	X			X			L
d. Smoke and Air Quality Management	X			X			L
3. Public Values							
a. Land use values		X			X		M
b. Dwellings		X			X		M
c. Non-dwellings		X			X		M
4. Human Factors							
a. Firefighter	X			X			L
b. Public		X		X			M
c. Fire Management	X			X			L

	Hazard Probability			Potential Consequences		
	L	**M**	**H**	**L**	**M**	**H**
1. Environmental Data						
a. Seasonal severity	ERC's are less than the 40th percentile	ERC's are between the 40th and 75th percentile	ERC's are above the 75th percentile	Little chance for significant slop-overs.	Some potential for slop-overs that should be contained with resources on hand	Slop-overs and spot fires would be more frequent and contained with more difficulty
b. Fire Behavior	Flame lengths confined to surface fuels, spread rates low	Flame lengths extending into shrub and tree regeneration; and/or, spread rates moderate. Or, primary fuel is grass.	Flame lengths highly variable, frequently involving individual tree crowns, and/or spread rates moderate to fast.	Low probability of difficulty in holding fire or for adverse fire effects.	Some potential for fire behavior to approach upper prescription limits and cause undesirable effects.	High potential for fire behavior to create holding problems, exceed prescription ranges, and cause undesirable effects.
c. Fuels	Surface fuels are grass, or light with open tree canopies, small midstory component present.	Surface fuels moderate with variable forest stand density and moderate midstory component.	High surface fuel loading with dense midstory component and dense stands of abundant regeneration.	Fuels present no specific implementation problems.	Fuels will have a marked effect on implementation activities and holding force requirements.	Fuels will dramatically affect management organization and qualifications for implementation.
d. Weather	Weather stable, winds light and predictable.	Weather slightly variable, winds present but light, occasional gusts.	Weather highly variable, winds near prescriptive limits, gusts prevalent.	Little impact on implementation.	Weather variation may require mitigation actions involving additional resources.	Weather may serve as a major influence on organization personnel qualifications, and specific implementations.

e. Topography	Low variability in slope and aspect.	Some variability in slope and aspect, will affect fuel moisture and fire behavior	High variability in slope and aspect, have major implications on fire behavior and must be considered in prescription development and implementation.	Little influence on burn implementation.	Consideration of topography during planning process is necessary.	Topography will necessitate mitigation actions to be developed and firing patterns and ignition methods to be modified to reduce impacts.
2. Agency Values						
a. Ecological and Environmental Considerations	Fire poses little threat to cause adverse effects or long-term disturbances to natural resource values. No T and E species or critical habitat	Fire poses moderate threat of adverse effects on natural resources and may cause short-to-mid term alteration or inconveniences such as air quality. Small amounts of T and E species present.	Fire poses high potential for adverse effects to natural resource values or to cause long-term degradations in air quality. Some T and E species present and /or critical habitat.	Low probability for adverse impacts and little need for mitigation actions.	Mitigation actions may need to be developed to ensure desirable outcomes. Some short-term effects may have to be accepted.	Prescribed Fire Plan must address mitigation actions to prevent undesirable outcomes.
b. Social and Cultural Values	No known social or cultural values in or adjacent to the project area.	Features of social or cultural value have been identified in and adjacent to the project area. Mitigation measures can be accomplished	High social or cultural values have been identified in or adjacent to the project area. Mitigation actions are difficult to accomplish.	Severe fire behavior or fire outside the unit would not damage the identified values.	Severe fire behavior for fire outside the unit poses potential for moderate damage to special values. Concerned parties are aware and supportive of the project.	Excessive fire severity or fire outside the unit will have adverse effects (substantial damage to or potential destruction of the special sites). Acceptance by concerned parties is low.

c. Project Duration and Logistics	Logistical needs easily accommodated.	Logistical needs pose some difficulty.	Logistical needs and/or multiple operational periods create much difficulty in accomplishing.	No consequences because of duration or logistics.	Duration may impact firefighters and public and logistical needs must be specifically addressed.	Long duration fire necessitates greater information dissemination, mitigation to remove impacts to firefighters and the public, and logistical needs must be met or project postponed.
d. Smoke and Air Quality Management	Few smoke sensitive areas near project area. No potential scheduling conflicts with cooperators.	Multiple smoke sensitive areas, mitigation actions minimize impacts, low potential for scheduling conflicts.	Multiple smoke sensitive areas near burn area, mitigation actions unable to remove all impacts, duration increases.	No adverse smoke consequences.	Mitigation actions must address smoke impacts, and coordination is required to confirm scheduling.	Mitigation actions must be developed, regulatory agencies must occur, scheduling conflicts may restrict
3. Public Values						
a. Land use values	No commercial or agriculture activities near planned burn area that would be adversely affected.	Commercial or agricultural activities near burn unit have some managed wildlands (recreation, timber, range values).	Planned burn in close proximity to urban, commercial, and/or agriculture areas that may be adversely affected.	No impacts from land use values.	Prescribed Fire Plan must consider actions to prevent fire movement onto commercial and / or agriculture lands.	Mitigation actions must reflect additional resource needs to protect urban, commercial, and / or agriculture areas. If mitigation cannot be accomplished, burn must be postponed.

b. Dwellings	No permanent or part- time residence present in area.	Some part-time residence or outbuildings near burn area.	Planned burn is located in wildland-urban interface zone, permanent residence in close proximity.	No impacts from fire to dwellings	Plan must address actions to ensure adequate protection of residences.	Notifications of all concerned homeowners residents, and visitors, coordination with local fire protection organizations is needed, and mitigation actions must adequately address potential fire escapes.
c. Non-dwellings	No non-dwellings present.	Some outbuildings and non-residences near burn area.	A significant number of non-residences may be affected.	No adverse impacts.	Plan must address actions to ensure adequate protection of non-dwellings.	Notifications of all owners of structures, coordination with local fire protection organizations is needed, and mitigation actions must adequately address potential fire escapes.
4. Human Factors						
a. Firefighter	Little firefighter exposure.	Some firefighter exposure due to fire duration and smoke	Potential for high firefighter exposure to smoke and also general hazards from the fire and/or terrain.	No specific problems, implement standard safety measures.	Mitigation measures to eliminate smoke exposure	Mitigation measures must address smoke exposures, use of mechanized equipment to eliminate exposure to fire.

b. Public	No public exposure	Some public exposure, mitigation actions can remove/minimize problems.	Public may be exposed to high smoke concentrations for moderately long periods, especially during night time hours.	No adverse consequences anticipated.	Mitigation actions necessary to provide for maximum public safety.	Mitigation actions must be developed, coordinated with other emergency organizations and fully understood prior to ignition.
c. Fire Management	No problems with commitment and acceptance by park and staff members.	No problems with commitment but some unwillingness to support and prioritize the prescribed fire over other activities.	Park staff not committed to using prescribed fire as a tool and not willing to support and prioritize prescribed fire over other activities.	No adverse consequences.	Park staff must be briefed on need and importance of prescribed fire.	Park management team must be informed of prescribed fire objectives, support needs, and priority.

Attachment # 4

	(ii) Complexity Element	Complexity Value L	M	H
Primary Factors	**1. Life and Safety**	X		
	2. Threats to Boundaries		X	
	3. Management Organization		X	
	4. Political Concerns		X	
	SUBTOTAL OF PRIMARY FACTORS	1	3	0
Secondary Factors	**5. Objectives**		X	
	6. Fuels and Fire Behavior	X		
	7. Air Quality Values	X		
	8. Improvements		X	
	9. Logistics	X		
	10. Natural, Cultural and Social Values	X		
	11. Tactical Operations	X		
	12. Interagency Coordination	X		
	SUBTOTAL OF SECONDARY FACTORS	6	2	0
TOTAL COUNT OF COMPLEXITY VALUES		7	5	0

<u>QUALIFICATIONS DETERMINATION TABLE</u>:

	Prescribed Fire Burn Boss Type 2 (RXB2)	Prescribed Fire Burn Boss Type 1 (RXB1)
Primary Factors rated “H”	Less than 2	2 or more
	AND	OR
Total Count rated “H”	Less than 4	4 or more
		OR
	<u>Minimum</u> required on all prescribed fires.	When deemed appropriate by the agency administrator or unit Fire Management Officer.

Prescribed Fire Burn Boss Level Indicated (check one):	RXB1		RXB 2	X

PREPARED BY: _Dan Morford_____________ DATE: ____09-23-03________

(b) APPROVAL BY: ___________________________ DATE: ___________________

Agency Administrator

REVIEWED BY: ___________________________ DATE: ___________________

III.

IV. (Burn Boss immediately prior to burning)

V.

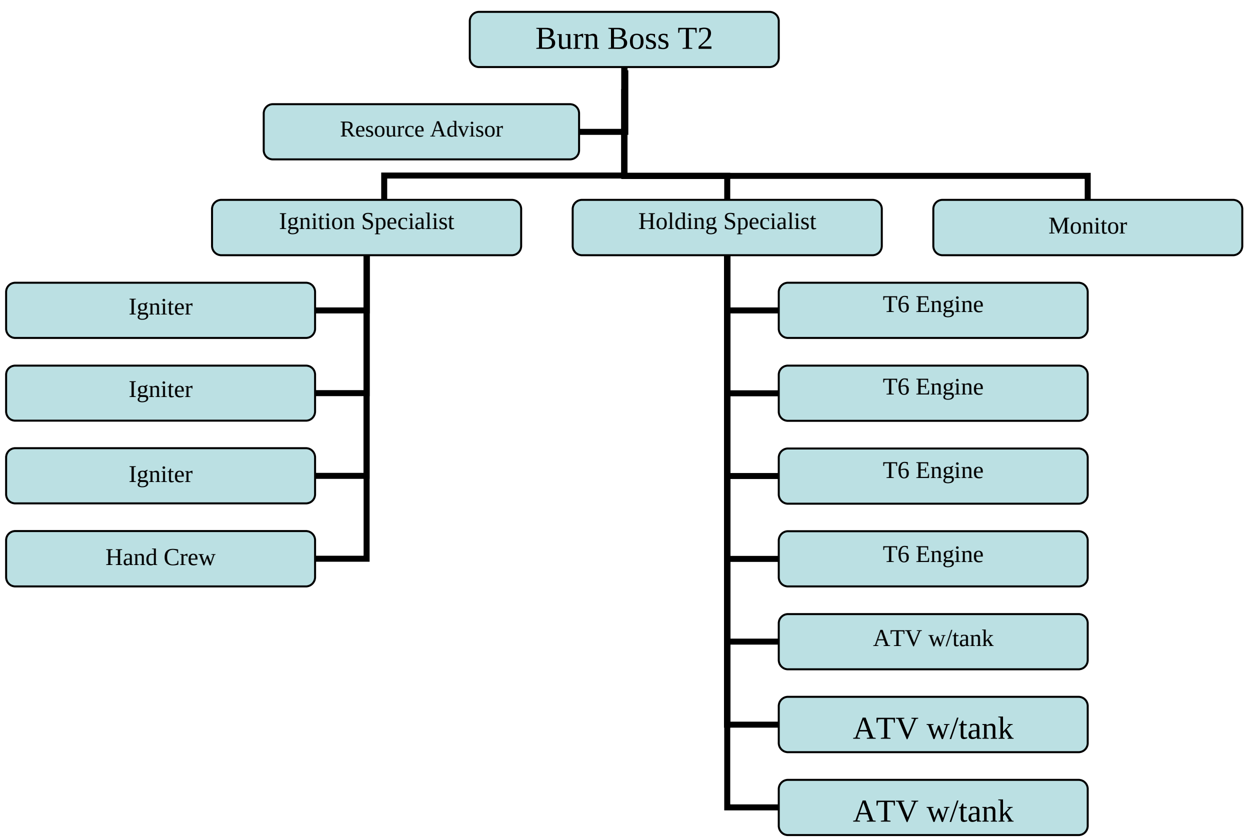
PRESCRIBED FIRE RISK MITIGATION TABLE

Hazard Element	Risk	Mitigations / Controls Briefly explain what actions will be taken relative to each hazard element that will reduce the risk.	Residual Risk	Reference: In Prescribed Fire Plan
1. Environmental Data				
a. Seasonal Severity	M	If ERCs are greater than the 40th percentile, "low end" of the prescription parameters will be utilized for the go/nogo decision	L	Prescription
b. Fire Behavior	M	Ignition patterns will be altered in order to insure predominate "backing fire" through most of project area	L	Ignition and Holding actions
c. Fuels	L			
d. Weather	M	Weather conditions will be favorable for successful completion, with not ALL weather variables on the "upper end" of the RX	L	Prescription
e. Topography	L		L	
2. Agency Values				
a. Ecological and environmental considerations	L			
b. Social and Cultural values	L			
c. Project duration and logistics	L			
d. Smoke and Air Quality Management	L			
Hazard Element	**Risk**	**Mitigations / Controls**	**Residual**	**Reference:**

		Briefly explain what actions will be taken relative to each hazard element that will reduce the risk.	Risk	In Prescribed Fire Plan
3. Public Values				
a. Land use values	M	Resources will be placed on the applicable rangelands in order to attack any potential escapes	L	Ignition and Holding
b. Dwellings	M	Appropriate action will be taken to protect dwellings	L	Holding, Preparations
c. Non-dwellings	M	Appropriate action will be taken to protect out buildings	L	Holding, Preparations
4. Human Factors				
a. Firefighter	M	Enough resources will be present so that crews may be rotated out of smoky areas in order to reduce long term exposure to smoke.	L	Holding
b. Public	M	Smoke will be monitored, press release will advise public of activities in the park.	L	Lighting, Notifications
c. Fire Management	M	Notification of park personnel will be made at least 2 weeks prior to ignition	L	Notifiacations

Attachment #5

Prescribed Fire Organization



Attachment #6

INCIDENT RADIO COMMUNICATIONS PLAN **ICS - 205** **dz**	**1. INCIDENT NAME:** Northwest Prescribed Fire	**2. PREPARED** **DATE:** 7-03 **TIME** : 1300	**3. OPERATIONAL PERIOD** **DATE:** **TIME : 0900-1900**

SYSTEM/CACHE	CHANNEL	FUNCTION	FREQUENCY	ASSIGNMENT	REMARKS
NIFC/KING		Wind Cave repeat	170.050 RX 171.625 TX 103.5 CG (both)	Command Repeat	
NIFC/KING	14		168.350 RX 168.350 TX	Holding, Ignition	
NIFC/KING	13		169.200 RX 169.200 TX	Air to Ground	

Use plain text. Call signs are last names or position names. Keep messages short and avoid cluttering the frequency with unnecessary traffic.

5. PREPARED BY (COMMUNICATIONS UNIT) Dan Morford

Attachment #7

AGENCY ADMINISTRATOR

a) GO/NO-GO PRE-IGNITION APPROVAL

Prescribed Fire Name: Northwest Date:

Key Elements

Is the prescribed fire plan up to date?

Is risk management in place?

Have all compliance requirements been completed?

Cultural, threatened and endangered species, smoke management

Are all elements of the prescribed fire plan being met?

Preparation work, weather, organization, prescription

Have all internal and external notifications been made?

Recommended by ___________________________________ Date: ______________

FMO/Burn Boss

Approved by _________________________________ Date: ______________

Park Superintendent

Approval Expires: ______________

Date

Attachment #8

Go/No-Go Checklist

Prescribed Fire Name: Northwest RX Date:

	YES	NO
- Has Agency Administrator GO/NO-GO Pre-Ignition Approval been approved?		
Narrative/Comments:		
- Are current and forecasted weather conditions favorable for execution of the prescribed fire? (hints: spot weather, dialogue with fire weather forecaster, climatological analysis complete)		
Narrative/Comments:		
- Have all key personnel listed on the Incident Action Plan (IAP) been briefed with an opportunity to give feedback? (hints: safety, objectives, assignments)		
Narrative/Comments:		
- Has all pre-burn preparedness work been completed? (hints: fuels and weather observations, signs, closures, smoke management, unit preparation)		
Narrative/Comments:		
- Are all equipment and supplies required in the prescribed fire plan in place and functional? (hints: pumps, radios, ignition devices, hose lays, vehicles, aviation, etc.)		
Narrative/Comments:		
- Are all holding resources described in the IAP committed and can be on-scene within specified time frames?		
Narrative/Comments:		
- Are all personnel certified for their assigned positions? (hints: Check Red Cards)		
Narrative/Comments:		
- There are no extenuating circumstances that preclude successful completion of this project? (hints: regional & national preparedness, unusual circumstances, unusual drought, outstanding issues, other fires, recent fire escapes, etc.)		
Narrative/Comments:		
IF ALL BOXES HAVE BEEN CHECKED "YES" YOU MAY PROCEED WITH THE TEST FIRE.		

TEST FIRE DOCUMENTATION AND RESULTS:		
- Observed Fire Behavior within Prescription?		
Narrative/Comments:		
- Test fire was successful?		
Narrative/Comments:		
- Are all prescription parameters in the prescribed fire plan favorable for implementing the project? (hints: each plan element, pre-burn, smoke management, cooperator coordination)		
Narrative/Comments:		
IF LAST 3 BOXES ARE ALL "YES", YOU MAY PROCEED WITH PRESCRIBED FIRE.		

Signatures

RX BURN BOSS (S):	IGNITION SPECIALIST:
HOLDING OPERATIONS:	DATE:

Project Name: Northwest (Burn Day)

Fuel Models Inside Project Area:. 1

Fuel Models Outside Project Area: 2

Attachment #9

1 Hr Fuel Moisture	6	6	%
Wind Speed	10	10	MPH
Slope	1	1%	%
Rate of Spread	270	149	ch/hr
Fire line Intensity	449	1352	BTU/ft/sec
Flame Length	7.5	12.4	Feet
POI		N/A	%
Spotting Distance		.5	Miles
Scorch Height		31	Feet
Projection Time	.1	.1	Hours
Forward Spread	27.0	14.9	Chains
Backward Spread	.7	.3	Chains
Method Of Attack	Rear	Head	Head/Rear
Max Escape Target	50	50	Acres
Max Containment	02	.4	Hours
Total Line Building	542	388	Ch/hr

388

1

388

80

3

24

63

-325

ADEQUATE HOLDING RESOURCES WORKSHEET
FOR PRESCRIBED FIRE

Characterist	Output	Modeling Predictions	Modeling Predictions	Unit of
CRITICAL FIRE				
KE FIRE OUTPU				
FIRE SIZE				
FIR CONTAINME				

1. Choose worst case total line building rate above that is ch/

2. Estimate potential number spot fires or slop-overs

3. TOTAL LINE BUILDING RATE NEEDED (multiply line 1 times line 2) **ch/**

4. Production Rates: (refer to fire line

Ease of POOR FAIR GOOD EXCELLENT
Hand Crew ch/
Engine Production (Crew of) ch/
ch/

On Site Organization	Total # Planne	Total # Available for Spot Fire or		Line Building		Total Spot Fire or Slop-Over
Overhead	4	1	X	0	ch/h	
Firing Crew	3	1	X	3	ch/h	3
Holding	6	6	X	3	ch/	18
Helicopter	0			11	ch/	
Engine (Crew of	3	2	X	15	ch/h	30
Dozer (Size)	0		X		ch/	
ATV w/ tank &	3	2	X	6	ch/h	12

5. TOTAL SLOP OVER OR SPOT FIRE LINE BUILDING ch/

6. DETERMINATION OF ADEQUATE HOLDING RESOURCES (Line 5 ch/

If number on line 6 is positive then adequate holding forces will be available. If number is negative, more holding

EXPLANATION SHEET

Although the number is negative for the determination of adequate holding resources, there are circumstances that increase the ability to control spot fires and slop-overs.

The burn has been designed to reduce the threat of escape along the perimeter. The blocks have a road on at least one side of them. The remaining sides will be mowed at least 6 feet wide allowing for hose lay and/or ATV for water support. If needed an engine could drive the mow lines since the terrain is relatively flat.

Further need to vary from the holding resources sheet comes from fuel availability. Recent site survey indicates the area has been grazed by the bison most of the summer. This has reduced the available fuels for ignition.

The plan states that a backing fire will be used to meet objectives. This will allow personnel to light into the wind and use foam lines and flappers for control.

In light of the previous statements, it is felt that the holding worksheet has been adequately prepared and that the resources on hand will be sufficient to handle problems.

Attachment #10

BEHAVE Projections – burn units

VI.

Fuel Model 1, Hottest end of the Rx, Head Fire

Direct Inputs		
Dominant fuel model	1	
Percent cover		100
Other fuel model		
1 hour fuel moisture	6.0	%
10 hour fuel moisture		%
100 hour fuel moisture		%
Herbaceous fuel moisture		%
Woody fuel moisture		%
Mid flame wind speed	10.0	mph
Terrain slope		1.0 %
Direction of wind vector		degrees
Calc maximum spread rate		Yes
Dir.for spread calculation		degrees
Direct Outputs		
Rate of spread	270	ch/hr
Heat per unit area	91	Btu/ft²
Fireline intensity		449 Btu/ft/s
Flame length		7.5 feet
Reaction intensity	826	Btu/ft²/m
Effective windspeed	8.4	mph

Fuel Model 1, Coolest end of the Rx, Backing Fire

Direct Inputs		
Dominant fuel model	1	
Percent cover 100		
Other fuel model		
1 hour fuel moisture	10.0	%
10 hour fuel moisture		%
100 hour fuel moisture		%
Herbaceous fuel moisture		%
Woody fuel moisture		%
Mid flame wind speed	1.0 mph	
Terrain slope 1.0 %		
Direction of wind vector degrees		
Calc maximum spread rate No		
Dir.for spread calculation	180 degrees	
Direct Outputs		
Rate of spread	1.0 ch/hr	
Heat per unit area	59 Btu/ft²	
Fireline intensity Btu/ft/s		1
Flame length 0.5 feet		
Reaction intensity Btu/ft²/m	538	
Effective windspeed	0.0 mph	

Attachment #10 cont.

BEHAVE Projections – outside burn units

VII.

Fuel Model 2, Hottest end of the Rx, Head Fire

Direct Inputs		
Dominant fuel model	2	
Percent cover		100
Other fuel model		
1 hour fuel moisture	6.0	%
10 hour fuel moisture	7.0	%
100 hour fuel moisture	10.0	%
Herbaceous fuel moisture	40	%
Woody fuel moisture		%
Mid flame wind speed	10.0	mph
Terrain slope		1.0 %
Direction of wind vector		degrees
Calc maximum spread rate		Yes
Dir.for spread calculation		degrees
Direct Outputs		
Rate of spread	149	ch/hr
Heat per unit area	494	Btu/ft²
Fireline intensity		13529 Btu/ft/s
Flame length		12.4 feet
Reaction intensity	3583	Btu/ft²/m
Effective windspeed	10	mph

Fuel Model 2, Coolest end of the Rx, Backing Fire

Direct Inputs		
Dominant fuel model	2	
Percent cover	100	
Other fuel model		
1 hour fuel moisture	10.0	%
10 hour fuel moisture	13.0	%
100 hour fuel moisture	17.0	%
Herbaceous fuel moisture	40	%
Woody fuel moisture		%
Mid flame wind speed	1.0	mph
Terrain slope	1.0	%
Direction of wind vector		degrees
Calc maximum spread rate	No	
Dir.for spread calculation	180	degrees
Direct Outputs		
Rate of spread	1.0	ch/hr
Heat per unit area	446	Btu/ft²
Fireline intensity		8 Btu/ft/s
Flame length	1.2	feet
Reaction intensity	3235	Btu/ft²/m
Effective windspeed	0	mph

Attachment #11

PRESCRIBED BURN BRIEFING OUTLINE

I. ISSUE HANDOUTS

A. Map of Burn

B. Organization Chart

II. DESCRIBE AREA OF BURN

A. Vegetation Type

B. Acreage

C. Slope

D. Roads/Access

E. High Values at Risk

F. Water Sources - natural, water tender, and hydrants

G. Natural/Manmade Barriers

H. Objectives

I. Cultural, exclosures, etc

III. SPOT WEATHER FORECAST

A. Wind Direction and Speed

B. Relative Humidity

C. Temperatures

D. Predicted Changes

IV. ORGANIZATION

A. Organization Chart - Location on Map

B. Equipment - water tenders, refueling, hose lays, water sources

C. Any other resources

D. Contingency Plan

V. IGNITION

A. Test Burn

B. Type, Location, and Sequence of Firing

C. Igniters must know the location of all personnel nearby

VI. RADIO ASSIGNMENTS AND ISSUE

VII. SAFETY

A. Winds

B. Safety Zones

C. Hazards (terrain, slopes, animals, plants, vehicles, drip torch fuel, foam concentrate)

D. Personal Protective Equipment

E. Refueling - fuel handling, gloves, spilling

F. Carbon Monoxide

G. Public Safety (closing roads and trails if necessary; sweeping them of visitors)

H. The 10 Orders and 18 Situations

VII. MONITORING ACTIVITIES DURING THE BURN

Attachment # 12

MEDICAL PLAN **ICS-206**	**1. INCIDENT NAME** Northwest RX	**2. DATE PREPARED** 0703	**3. TIME PREPARED** 1200	**4. OPERATIONAL PERIOD** 0900-1900

5. INCIDENT MEDICAL AID STATIONS

MEDICAL AID STATIONS	LOCATION	PARAMEDICS	
		YES	NO
EMTs to be identified at project briefing.			

6. TRANSPORTATION

A. AMBULANCE SERVICES

NAME	ADDRESS	PHONE	PARAMEDICS	
			YES	NO
Hot Springs	Hot Springs, S.D.	**911**	EMT-I	X
Custer	Custer, SD	673-4467	EMT-I	
Life Flight	Rapid City Regional Hospital	1-800-232-2452	X	

B. INCIDENT AMBULANCES

NAME	LOCATION	PARAMEDICS	
		YES	NO
(none)			

7. HOSPITALS

		TRAVEL TIME		HELIPAD	BURN CENTER

NAME	ADDRESS			PHONE				
		AIR	GRND		YES	NO	YES	NO
Rapid City Regional	Rapid City, SD		75 min	341-8822	X		X	
Custer Community	Custer, SD		30 min	673-2229		X		X
Fall River County Hospital	Hot Springs, SD		20 Min	745-3159	X			X

8. MEDICAL EMERGENCY PROCEDURES

Burn Boss will be made aware of any medical emergencies during prescribed fire operations. Burn Boss will send available EMT's (pre-identified) to the scene to stabilize and treat patient. Burn Boss (at the counsel of the EMT) will then arrange for applicable EMS system. Burn Boss will clear all radio traffic for medical traffic. Life Flight frequencies are

Mutual Aid I - 154.265, Mutual Aid II – 154.295

9. PREPARED BY (MEDICAL UNIT LEADER)

MORFORD

10. REVIEWED BY (SAFETY OFFICER)

(i) JOB HAZARD ANALYSIS

United States Department of Interior NATIONAL PARK SERVICE	1.WORK PROJECT/ACTIVITY PRESCRIBED BURNS	2.LOCATION NGPA FIRE	3.UNIT Parks
JOB HAZARD ANALYSIS (JHA)	4.NAME OF ANALYST DAN MORFORD	5.JOB TITLE PRESCRIBED FIRE SPEC.	6.DATE PREPARED 9/21/2001

7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS ENGINEERING CONTROLS – SUBSTITUTION - ADMINITSTRATIVE CONTROLS - PPE
Prescribed fire	Qualifications	ALL personnel MUST meet National Fire Qualification System, physical fitness, experience, and training requirements.
	Tools	Use proper tool for the job. Maintain tools in good condition. Maintain spacing while working and walking. Avoid swing tools toward body. Use tool guards when not in use or travel mode.
	Foot travel	Wear appropriate boots, 8” leather tops with vibram soles. Use caution when walking on wet rocks, logs, and sticks. Plan and select safe routes, watch for changes in ground surface, slick spots, or unusual hazards.
	Being stuck by overhead hazards	Plan ahead. Avoid high hazard areas. Wear protective gear (hard hats).
	Animals/insect bites	Be aware of your surroundings and select a safe travel route. Avoid potentially dangerous animals, insects, and snakes. Do NOT pursue or play with or other wise harass animals. Persons known to have allergic reactions should carry appropriate prescription drugs at all times. Identify those persons with reactions to bites ahead of activity.
		Individuals should become familiar with area in a

	Becoming lost	briefing prior to activity. Individuals should carry map and compass and be skilled in their use.
	Traffic hazards	Be alert; anticipate the actions of other drivers. Do not assume other drivers see you or will yield right-of-way. Do not operate vehicles if not properly maintained. Anticipate other traffic on narrow roads. Personnel must wear seat belts at all times when vehicle is in motion. Person operating vehicle must be licensed for that type of vehicle.

(iii) JOB HAZARD ANALYSIS

United States Department of Interior NATIONAL PARK SERVICE	1.WORK PROJECT/ACTIVITY PRESCRIBED BURNS	2.LOCATION NGPA FIRE	3.UNIT Parks
JOB HAZARD ANALYSIS (JHA)	4.NAME OF ANALYST DAN MORFORD	5.JOB TITLE PRESCRIBED FIRE SPEC.	6.DATE PREPARED 9/21/2001

7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS ENGINEERING CONTROLS – SUBSTITUTION - ADMINITSTRATIVE CONTROLS - PPE
	Traffic hazards (cont.)	Use spotter when backing. Drive an appropriate speed for weather and road conditions. Anticipate animals/pedestrians entering highway. Passengers should assist in watching for wildlife. Never exceed speed limits. Follow at a safe distance. Never exceed passenger capacity of the vehicle.
	Fatigue	Provide plenty of fresh water and meals as needed. No personnel assigned to one shift may be assigned to the Next shift.
	Heat exhaustion	Have fresh water available. Pace yourself on hot days. Ensure you are getting enough salt in your food.
	Poison ivy/oak	Be able to identify plants. Communicate location of plants to other personnel. DO NOT breathe smoke from burning plants. If exposed, remove and wash clothing as soon as possible.
	Injuries	Wear PPE. All injuries will be reported to burn boss. First aid kits will be available. Minor injuries will be addressed on site, all others will follow medical plan.

Ignition	General public Entrapment	No untrained personnel will be allowed on the burn. Proper lighting techniques will be employed to avoid entrapment. Qualified lookouts will be posted as needed. Maintain communication and know where all igniters are at all times. A briefing will be conducted prior to ignition.

(v) JOB HAZARD ANALYSIS

United States Department of Interior NATIONAL PARK SERVICE	1.WORK PROJECT/ACTIVITY PRESCRIBED BURNS	2.LOCATION NGPA FIRE	3.UNIT Parks
JOB HAZARD ANALYSIS (JHA)	4.NAME OF ANALYST DAN MORFORD	5.JOB TITLE PRESCRIBED FIRE SPEC.	6.DATE PREPARED 9/21/2001

7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS ENGINEERING CONTROLS – SUBSTITUTION - ADMINITSTRATIVE CONTROLS - PPE
Drip Torch Use and Fueling	Mixing fuel	Mix fuel only in well ventilated area and away from sources of ignition. NO SMOKING. Avoid creating mix ratios in excess of 1 part gas to 3 parts diesel.
	Fueling	Any person who spills fuel on clothing will be removed from the burn until contaminated clothing is replaced. Fuel containers will be appropriately marked. No smoking will be allowed within 100 ft. of fuel. Avoid contact with eyes and skin.
	Fuel spills	Use funnel and spout when filling torches from gerry cans. No fueling in riparian areas to prevent habitat damage.
	Burns	Wear Personal Protective Equipment (PPE)
	Back injury	When lifting heavy boxes (torches), use proper lifting techniques and protect lower back. Enlist help as needed.
	Poisoning	Material Safety Data Sheets (MSDS) for diesel, gas will be located in vehicle carrying fuel to burn unit. Wear proper PPE. Identify hazards such as stumps holes, snags, bee nests, etc. Proper use of hand tools at all times.

Mop Up	Burns, cuts, flying debris (eyes)	Wear PPE.
Holding	Smoke	Rotate personnel out of smoke every one-hour for fresh air.
ATV Operation	Operation accidents	Only trained personnel will use ATV’s. Use sturdy loading ramps for loading and unloading. Maintain control of ATV by shifting weight of the operator appropriately to negotiate proper turning. Do not haul passengers. Do not over load machine. Do not forge deep or swift water.

(vi) JOB HAZARD ANALYSIS

United States Department of Interior NATIONAL PARK SERVICE	1.WORK PROJECT/ACTIVITY PRESCRIBED BURNS	2.LOCATION NGPA FIRE	3.UNIT Parks
JOB HAZARD ANALYSIS (JHA)	4.NAME OF ANALYST DAN MORFORD	5.JOB TITLE PRESCRIBED FIRE SPEC.	6.DATE PREPARED
7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS ENGINEERING CONTROLS – SUBSTITUTION - ADMINITSTRATIVE CONTROLS - PPE	

ATV Operation	Personal injury	Carry a first aid kit. Have a portable radio with you. Stay alert and avoid long hours of operation. Wear helmet with chinstrap, eye protection, and gloves.

10. SUPERVISOR'S SIGNATURE	11. TITLE	12. DATE

Park/Unit 4-Character Alpha Code: ________

FMH-3A **ALTERNATE SMOKE MONITORING DATA SHEET** Page ___ of ___

Plot ID: ____________________ Date: ___/___/___

Burn Status (Indicate number of times treated, e.g., 01 Burn, 02 Burn, etc.): ______-Burn

Burn Unit/Fire Name–Number: ________________________ Recorder(s): ________________

Date	Time	Observer Location and Elevation	Elevation of Smoke Column Above Ground	Smoke Column Direction	Approx. Elevation Smoke Inversion Layer Above Ground	Fireline Visibility	Roadway Visibility	Which Illustration (See Back) Best Describes the Smoke Column (Circle One)
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3
								1 - 2 - 3

Date Entered: ___/___/___ FMH-3A

APPENDIX M.

NON-FIRE FUEL TREATMENT PLAN

A. Introduction

Wind Cave National Park is located 11 miles north of Hot Springs, South Dakota, in the Southern Black Hills. It is bounded on the west by the Black Hills National Forest, north by Custer State Park, and on the east, south, and southwest by private lands containing rural homes and farms. Because of current fuels conditions on the Federal land, park and private resources are threatened by wildland fires.

Before the advent of European settlement, the park was dominated by mixed-grass prairie and open park-like stands of ponderosa pine, which were maintained by frequent, low intensity fire. This fire regime maintained the open park-like conditions by killing small trees developing in the understory and encroaching into grasslands. The low intensity fires were not lethal to the larger, thick barked trees within the overstory. The exclusion of fire within the park for more than a century, has allowed the small understory trees to develop into overstocked thickets, closure of forest openings, and encroachment of forest into the mixed-grass prairie.

This alteration from natural patterns has moved most of the forested areas of the park from fire condition class 1 to fire condition class 2 and many areas to a fire condition class 3. Fire regime condition classes are a qualitative measure describing the degree of departure from historical fire regimes. Fire regimes in condition class 2 have been moderately altered from their historical range by (in this case) decreased fire frequency. Fire regimes in condition class 3 have been significantly altered from their historical range. Condition class 2 areas have a moderate risk of losing key ecosystem components, while a high risk of losing key ecosystem components exists on condition class 3 areas. To restore the historical fire regime, these lands require restoration through prescribed fire, manual, mechanical or chemical treatments, and, in some instances, the subsequent reintroduction of native plants (US Forest Service 2000).

The desired future condition for the park is to restore mixed-grass prairie and forest stands to the historical fire regime found in the pre-European settlement stands. This would place the park within the historical fire regime, and hence, in fire condition class 1.

In order to restore the park's stands to fire condition class 1, there is a need to reduce the stocking density of forest regeneration and ladder fuels found in forest thickets. Treating these areas to reduce the hazardous fuels would, in the event of a fire start, reduce the intensity of the wildfire, and greatly aid in its management or suppression. It would reduce the likelihood of the fire developing into a high intensity, high severity event.

B. Non-fire treatment assessment

The Black Hills are located between the centers of two prehistoric culture areas: the Middle Missouri River Valley to the east and the High and Northern Plains to the west. Early people were attracted to the Hills because they offered shelter in the winter and were slightly cooler in the summer than the surrounding country. Archeological records indicate pre-historic activity in the areas as early as 6,500 years before present. From the earliest records, it is evident that indigenous peoples utilized the area for hunting and occasional gathering activities.

Numerous American Indian tribes have frequented the Black Hills. With the acquisition of the Louisiana Purchase, the United States attained ownership of the Black Hills in that territory. Almost immediately the federal government began to negotiate treaties with tribes within the purchase. In 1805 negotiations, the Sioux Nation was promised the right to "pass, repass, hunt or make other uses of the said districts, as they have formerly done, without any other exception, but those specified in article first" (Institute for the

Development of Indian Law 1973). Again in the early 1830s, a treaty guaranteed the Sioux the right to live in the Black Hills without interference.

Even with several negotiated treaties, the government sanctioned several exploratory operations in the Black Hills. In 1852 Dr. John Evans explored the area and then in 1855 an expedition commanded by General W. F. Harney entered the Black Hills (Palais 1941). In Harney's party was Dr. F. V. Hayden who wrote that "[i]n these mountain formations, which border the great plains on the west, are to be found beautiful flowing streams, and small rich valleys covered with fine grass for hay, and susceptible *of* cultivation by means *of* irrigation. Fine timber for fuel and lumber, limestone and good stone for building purposes are here abundant" (Warren 1875). These reports indicated the desirable nature of the area for settlement and resources for extraction.

In 1874, General George A. Custer led a military expedition into the Black Hills, during which gold was discovered, leading to the Black Hills gold rush of 1875. Although the U.S. Army was directed to prevent settlers from entering the Black Hills, thousands of settlers had entered the Black Hills by the mid-1870s, developing roads, ranches, homesteads, and towns. With the onrush of settlement, supply and passenger routes were established to Custer and Deadwood from Cheyenne, Wyoming and Sidney, Nebraska, with evidence of these in the park.

Even while the Army was working to remove settlers, an 1875 expedition was commanded by Lieutenant Richard I. Dodge, with geologist Walter P. Jenney in the party (Dodge 1876). This expedition was directed to determine the "mineral wealth, climate and rainfall and natural resources of the region" (Robinson 1904). In his report of the expedition, Jenny stated that "grazing in the Black Hills is most excellent. Nine-tenths of the whole area is covered by a thick growth of the finest wild grasses. It constitutes the great future wealth of this region, and its value can hardly be over-estimated. . . I was surprised at the quality of the grazing we found. . . [during the expedition] the grass [was] commencing to grow again as soon as it was eaten off by the stock" (Jenney and Newton 1880).

This description of the excellent grazing potential was a portent of type of use the area was soon to receive. By March 1876, a reported 11,000 miners were in Custer City, all needing to be fed (Robinson 1904). Beef prices were high through both mining and government purchases for reservation annuities and herds of cattle were brought into the area (Palais 1942). It is estimated that between 1878 and 1883, the number of cattle in the Black Hills rose from 100,000 to 500,000 on an “open range” basis (Palais 1942). Although many of the ranches were located in Fall River County, just south of the park area, it is difficult to tell how much the lands within the park were affected, due to the nature of open range operations.

Waste and inefficiency became common and Palais asserted that, “Not an acre of grazing land was left unoccupied, and ranges that for regular use should have carried a cow in every forty acres were loaded until they were carrying one to every ten acres. This continuous grazing, without allowing the soil any chance for recuperation, resulted in the dangerous depletion of the range. Ranges were so closely cropped that cattle losses even during a normal winter would have been quite severe.” The number of cattle began to decline as the range lost its ability rebound. Beaver began to disappear. With beaver gone, their dams "soon began to let go." When the dams failed the streams began to dry up. In addition, an "extremely arid season [which] caused intense dryness, and prairie fires burnt the grass not already dried out or killed" (Palais 1942).

Two successive bad winters in 1885-1886 and again in 1886-1887 combined with declining beef prices resulted in losses ranging from 20% to as high as 90% (Palais 1942). These conditions, along with the upswing in homesteading, brought an end to the open range period in the Black Hills area. With this, fenced pastures with small herds took precedence (Palais 1942).

Government Land Office surveys of the Black Hills began in 1877 and by 1899 the last of the lands now encompassed within the park were completely surveyed. By 1899, over 50 miles of wagon roads had been developed within the park area linking homesteads to the towns of Custer, Hot Springs, and Buffalo

Gap.

Land records for the area within the park indicate that 83 land patents were filed and a possibility that an additional 13 were not filed, bringing the total sites to 96. These date from the early 1890s, but the majority were filed after 1912 when land size doubled from 160 to 320 acres. Land records also include information as to number of improvements and the amount of land cultivated (Western History Research 1992).

Information from these records indicate that 284 structures were constructed within the park, including houses (59), barns (39), corrals (33), sheds (21), chicken houses (21), wells (19), granaries (12), and other structures (Western History Research 1992).

Homesteads normally required cultivation of at least 1/8th of the lands claimed, however many settlers in the park area filed applications for reduction of cultivation claiming that the land was not fit for cultivation. Of the lands with cultivation (52 of 83), size of cultivation ranged from 4 to 60 acres, with an average of 18.9 acres cultivated (Western History Research 1992). Areas that were put under cultivation were plowed and seeded to grain, hay, and garden crops. In addition, timber was heavily cut in some areas for fence posts, mine timbers, building lumber, and firewood.

The enabling legislation of 1903 established the National Park System's first cave park on 10,522 acres. Over the years additional land was acquired through homestead claim cancellations, land purchases, and exchanges, which increased to area to the present 28,295 acres.

To increase the visibility and significance of the young park, the Wind Cave Wildlife Preserve was established on the surface under the administration of the Biological Survey and the Department of Agriculture in 1912. With the arrival of the first bison in 1913, the surface attractions of the park were considerably enhanced, though the budgetary problems continued. For nearly the next 20 years, with minimal funding, the superintendents were engaged in maintenance, protection and public service. The superintendent was the only permanent employee until 1919 when one park ranger position was added.

In July of 1934, participants in the Civilian Conservation Corps (CCC) arrived at Wind Cave. Many improvements geared toward tourism were completed through the manpower of the CCC, including digging the elevator shaft and construction of the cave elevator, construction of fences, trails, reservoirs, stairs and railings in the cave, cave lighting, and construction of numerous buildings. The CCC also did considerable landscaping in the headquarters area and planted over 5,000 trees in the area (Bohi 1962).

From the establishment of Wind Cave as a National Park, managers have attempted to maintain what were thought to be natural conditions of the vegetation within the park, with the exception of the development zone. However, this should not be construed as an exoneration of some management practices. Practices such as planting of trees within the development zone and fire management have resulted in some significant changes to the ecology of the area and require vigilant effort to restore the processes of nature.

The most striking management action within the park has involved fire suppression. Early explorers noted the role wildfire in the Black Hills. Dodge (1876) wrote, "Throughout the Hills the number of trees which bear the marks of the thunderbolt is very remarkable, and the strongest proof of the violence and frequent recurrence of these storms… The woods are frequently set on fire and vast damage done. There are many broad belts of country covered with tall straight trunks of what was only a short time before a splendid forest of trees."

Jenney and Newton (1880) wrote that the Black Hills had been subjected to extensive forest fires. They also noted that "generally the pine springs up again as soon as it is burnt off, though sometimes it is succeeded for a time by thickets of small aspen[s]."

Suppression of wildfires in the Black Hills began shortly after settlement. The establishment of the Black Hills Forest Preserve in 1897 and National Park Service sites in the early 1900s led to large scale fire suppression activities by federal land management agencies (Progulske 1974).

The importance of this activity is underlined by studies which provide fire interval and intensity. Fisher et. al. (1987) reported that the average fire return between 1632 and 1900 was between 14 and 27 years at Devil's Tower National Monument on the western edge of the Black Hills. Brown and Sieg (1996) reported a mean fire interval at Jewel Cave of 16 years for the period of 1388 to 1900. Brown and Sieg (1999) also reported that fires in Wind Cave National Park were regular events in both the forests and grasslands between forest stands from the 1500s up to the late 1800s, with fire intervals from 10 to 12 years. These studies show that intervals between fires in the Black Hills were relatively short (between 10 and 27 years).

Alterations of fire patterns have contributed to significant changes in vegetation community structure, particularly expansion of forested areas into previous grasslands and increase in tree density of forested areas.

Fire suppression in the lands now encompassed by Wind Cave National Park has continued until the present. From the establishment of the park through 2002, 196 lightening fires and 118 other wildfires were suppressed within the park (Wind Cave National Park Fire Management Records).

Prescribed burning was initiated in the park in 1973, when the park created a firebreak along roads in the eastern portion of the park (Bone and Klukas 1988). Burns since then have included small plot burns, research burns, and large-scale unit burning involving thousands of acres. To date, 64 prescribed burns have occurred in the park totaling 24,205 acres, with some areas having been burned more than once (Wind Cave National Park Fire Management Records).

Coniferous forest lands are the second most prevalent vegetation community comprising approximately 28.8% of park vegetation, with ponderosa pine comprising almost the entirety of this type. Pre-settlement ponderosa pine forests consisted of discrete groups of trees within a grassland matrix, in a non-random pattern (Woosley 1911; Cooper 1960; White 1985). White also showed that pre-settlement stands of ponderosa occupied areas ranged from 0.05-0.72 acres, with the average stand age ranging from 141-382 years. White's study also support the idea that groups of ponderosa pine were uneven-aged in composition.

However, coniferous forested areas within the park are continuous stands with increasing canopy closure and fuel buildup and those areas that creep into meadow and grasslands. This has resulted in a forest that has few mosaics with a dominant size class of pole-sized trees (14.5-25 inch dbh), indicative of an even age stand. The absence of fire has also allowed dense thickets of seedlings and saplings to develop. In addition, few old growth trees and/or snags remain. As a result, the majority of forested areas of the park and adjacent lands are relatively young. In 1994, the Forest Service estimated that 73% of the Black Hills National Forest was less than 120 years old (US Forest Service 1994). In addition, they contain heavy down/dead material and have heavy regeneration along the periphery, resulting in constant creep of forested areas in grasslands.

One of the most obvious difficulties faced within the park is the decline of herbaceous vegetation while forests size and density increase and fire fuels accumulate. Within the park, grasslands are shrinking in size due to conifer encroachment.

Similar conifer invasions have been observed in other parts of the nation. Patterns of forest invasion into former grasslands are repeatedly marked by the combined effects of years of fire exclusion, removal of overstory pine by logging, heavy livestock grazing, and climate change. These factors have combined to create closed-canopy stands with dense understories and high concentrations of ladder fuels (Allen 1998; Brandegee 1891; Brown et. al. 2000; Brown and Sieg 1999; Covington and Moore 1992; Covington et. al. 1997; Fule, Covington and Moore 1997; Savage 1991; Swetnam and Baisan 1996; Touchan et. al. 1996)

Vegetation patterns are determined by many factors, with climate, topography, and soils as major contributors. However, the influence of fire may be of equal importance as it is key in determining the structure and defining the function of ecological systems. Herbaceous vegetation is benefited by fire in that perennial grasses will survive and quickly recover. Trees and shrubs, on the other hand, are often killed by fire.

In areas of the park that have not been burned by prescribed fire, forest expansion has pushed into areas that were formerly grassland, including both areas that were spaces between forest stands and creep into open grassland. In addition, the density of trees within individual stands has greatly increased. It is also important to note that where density of trees increases within individual stands, the density of understory vegetation decreases along with the attendant biological diversity.

Using aerial photographs within WICA from 1938 and 2002, two locations were examined to get a better understanding of change that has taken place in park forested lands. A one mile square area was overlaid on each photograph and the forested and non-forested lands were digitized to determine the acreage of each type. Once the areas were digitized, an estimate of change was then calculated over time. In the Bison Flats area, forested areas in the 1938 photos occupied roughly 252.1 of the 638.2 acres calculated, or 39.5% of the area. The same area in 2002 showed that 192.4 of the 638.2 acres were now forested, or 30.1% of the area. This equated to a 47.4% increase in the acreage of forest in that area. Near the Pigtail Bridge, forested areas in the 1938 photos occupied roughly 252.1 of the 638.1 acres calculated, or 39.5% of the area. The same area in 2002 had 481.5 of the 638.1 acres were now forested, or 75.5% of the area. This equated to a 90.9% increase in the acreage of forest in that area. These were simple estimates, but show that park forest lands area increasing.

In conjunction with the expansion of forests, the increase in the density of trees in forests can have an impact on water tables and stream flow within the park. In a study in the Coconino National Forest, researchers found that as basal area of ponderosa pine decreased (from 120 to 0 ft^2/acre), the stream flow increased by as much as 35% (US Forest Service 1979). A concern to park management is that perennial streams within the park do not decrease in flow rate as a result of forest spread.

Since 1968, National Park Service policy has been to allow natural processes to occur. Fire management planning and programs have been operational in the park since the early 1970s, following the National Park Service change in its policy from controlling natural processes to allowing and even supplementing natural processes when possible. This means, for fire management, that the National Park Service went from suppressing all fires to letting some fires burn if they would contribute to accomplishing resource management objectives without threatening developed or populated areas or cultural sites. Because of the park size, wildfires are not allowed to burn and prescribed fire is utilized on a continual basis. This and other refinements in the fire management program have been made since the early 1970s and will continue to be made as knowledge of fire ecology and fire behavior increases.

An additional impact to the lands now encompassed by the park is grazing, by both wildlife and livestock. As previously mentioned, grazing activities in the Black Hills were begun in the mid-1870s. It is difficult to ascertain the amount of livestock grazing that took place on lands now within the park, but grazing has been identified as a probable contributor to forest expansion into former grasslands (Archer 1994). Bison were known from the area, but the uninhibited forage patterns of bison were such that an area would be grazed intensively and then bison would move to another area, possibly not returning to the first area for several years. Early livestock grazing practices placed continual pressure on grasslands with no time for recovery. As this pressure continued the density of grasses decreased and provided a competitive edge for seedling trees.

Wind Cave National Park was established with the act of January 9, 1903 (32 Stat. 765-766, 16 USC 141-146), to protect Wind Cave. By the time Wind Cave was established in 1903, both bison (*Bison bison*) and elk (*Cervus elaphus*), the major natural grazers, had been extirpated from the Black Hills area.

The act of August 10, 1912, provided for the establishment of Wind Cave National Game Preserve on the land included within the boundaries of Wind Cave National Park under the jurisdiction of what was then the Bureau of Biological Survey of the U.S. Department of Agriculture. This action established "a permanent national range for a herd of buffalo to be presented to the U.S. by the American Bison Society, and for such other native American game animals as may be placed therein." The act called for the erection of a substantial fence for the care and maintenance of the animals. A 7-8-foot fence surrounds the park to prevent emigration of bison onto neighboring properties. There is also the 3 -4 mile stretch of 4-5-foot fence in the SW corner of the park.

In 1913, fourteen bison donated by the Bronx Zoo were reintroduced to the park. Six additional animals were obtained from Yellowstone National Park in 1914. The bison population is managed at about 350-500 animals.

Between 1911 and 1916 approximately 80 elk were reintroduced into the park from Jackson Hole, Wyoming and Yellowstone National Park (Bauman 1997). The elk population in a spring count of 2004 was placed at approximately 700 animals.

Pronghorn antelope (*Antilocapra americana*) were reintroduced into the park in 1914 and 1916 from Alberta, Canada. Twelve buck pronghorn from Yellowstone National Park were brought to the park in 1951. The population was up to 350 animals in 1963. Estimates from research in 2004 place the population within the park to be approximately 40 animals.

Research begun in 2003 on white-tailed (*Odocoileus virginianus*) and mule (*Odocoileus hemionus*) deer within the park places their estimated population within the park at approximately 150 deer within the park.

The black-tailed prairie dog (*Cynomys ludovicianus*) has been a significant player in the prairie ecosystem and has a close relationship with bison and pronghorn grazing preferences. Populations of the black-tailed prairie dog in South Dakota and the park appear to be stable, with park acreage at about 1,700 acres utilized by prairie dog colonies.

An additional impact to lands within the park is the development of human infrastructure for settlement and national park management. Over 50 miles of wagon roads were established within the park area (Western History Research 1994) at one time. At present, the park has approximately 34 miles of roads and 31 miles of trails. Roads and trails create barriers to system functions such as a natural fire moving across an area. A road will stop a fire that previously may have continued to burn in a natural manner. The areas that remain unburned will not act ecologically as those burned, thus creating a different ecology.

Implementation and completion of fuel treatment within Wind Cave National Park will bring an increased level of visitor, resident and firefighter safety by inserting strategically placed treatments within the park that will allow wildfires to be more safely and effectively managed. These treatments will additionally support the goal of ecosystem restoration through the application of prescribed fire use for resource benefit. By sequencing mechanical treatments the immediate risk to life and property is reduced and the careful re-introduction of a more natural fire regime using other management tools becomes feasible. This will create a condition that will ultimately benefit both the surrounding community and the Park as a whole. Specific goals for this project include:

- Promote firefighter and public safety.
- Restore and sustain the natural ecosystem (includes reduction/maintenance of hazardous fuels to natural levels, using fire to maintain/improve forage for wildlife).
- Promote fire prevention and the suppression of unintended ignitions.
- Promote cooperation and collaboration with park neighbors (i.e., government agencies, private entities, etc.).
- Protect natural, cultural resources, and infrastructure of the park.

C. Management alternatives for meeting stated objectives and issues

1. Fuel Treatment Alternatives

There are a variety of treatments alternatives for fuel reduction, all of which are encompassed by the following treatment types:

- Manual - The use of hand-operated power tools and hand tools to cut, clear or prune herbaceous and woody species. Plants are cut above ground level to remove undesired vegetation or root systems are dug out to prevent subsequent sprouting and regrowth. Hand tools such as the handsaw, axe, shovel, rake, machete, and hand clippers are used in manual treatments. Power tools such as chainsaws and power brush saws may also be used. Manual treatments may be considered stand-alone treatments or be followed by burning of debris piles or prescribed burning of the treatment site. In some cases of manual removal of woody species, stumps are "painted" with herbicide to prevent sprouting.
- Mechanical - Mechanical treatment is the removal of undesired or excess live and dead fuels through the use of wheeled tractors and crawler-type tractors or specially designed vehicles with attached implements, e.g. saw heads, excavators, and disks and blades. Mechanical treatment activities may have adverse impacts on soils and surface litter, accelerating surface erosion and runoff. Mechanically treated material may be left on site or physically removed from the site. Mechanical treatments may be considered stand-alone treatments or be followed by burning of debris piles or prescribed burning of the treatment site. Any equipment brought in from a distance should be inspected, and as necessary, washed and cleaned of any seeds (found in wheels, etc.).
- Chemical - Chemical treatment is the application of chemical agents to alter existing fuels. Chemical agents are applied to kill or restrict the growth of existing vegetation. This type of treatment is predominantly used to reduce the distribution of non-native and invasive species. Chemical treatments may proceed or be followed by another treatment type such as prescribed burning or mechanical treatment and/or planting of desired vegetation species depending on the response of the system.
- Biological - Biological treatment is the use of living organisms to selectively suppress, inhibit, or remove herbaceous and woody vegetation. This must include planning for vacating/fasting and eventual removal, as well as threats to threatened and endangered species. That is, animals should not be a source of non-native inocula (seeds, spores, etc.) via which they might carry on/in hooves, coats and intestines. Plant eating organisms include insects as well as grazing animals such as goats and sheep.
- Combination - Combination would consist of utilizing aspects of each of the previous treatment types to reduce fuels. This may include some or all of the types. For example, small pockets of regeneration could be treated by vehicles with torches where snow has melted within the area, but where snow in the adjacent areas would methods

In addition, there are a variety of methods for disposal of debris produced as a result of fuel treatment. These include, but may not be limited to:

- Chipping and spreading: This alternative would chip the slash and spread the chipped material on the ground in the area where the treatments were completed. Although this alternative would reduce the standing fuel, accumulation of chipped material would still constitute fuel in a different form. Unburned, this chipped material would inhibit understory species from reestablishing and may alter soil composition.
- Piling the slash and burn: This alternative would hand-pile slash, and burn it once the fuels have cured and at times when conditions permit.

- Burning the slash with an underburn: This alternative would leave the cut material on the ground and utilize fire to consume the material.
- Commercial logging: This alternative would remove trees through the issuance of a contract to achieve thinning goals.
- Utilization for Woody Biomass: This alternative would remove all slash material and offer to local business for woody biomass utilization.

2. Treatments Considered

a. Manual – The use of hand-operated power tools and hand tools to cut, clear, girdle, or prune herbaceous and woody species meets the goals for the project. Hand tools (chainsaw, brush saw, weed whip, handsaw, axe, shovel, rake, machete, and hand clippers) are acceptable to be used in manual treatments.

b. Mechanical – Some mechanical treatment methods meet the goals for the project, such as mowing to reduce regeneration and create fire lines and the use of feller-bunchers along roads.

c. Mowing – hand/bush-hogs can be used to reduce regeneration and preparing lines

d. Feller-buncher – may be used in situations in certain areas such as roads, trails, etc.

3. Treatments Considered but Rejected

a. Mechanical – Mechanical treatment activities such as horse skid, terra-torch, dozer and slash buster operations were considered but dismissed as they have adverse impacts on vegetation, soils and surface litter, accelerating surface erosion and runoff. Helicopter logging was also considered but dismissed as there are few contractors in the area to do this type of work.

b. Chemical – Chemical treatment was dismissed due to the extensive area requiring treatment and the potential consequences to the environment.

c. Biological – Biological treatment was dismissed due to the extensive area requiring treatment and the potential consequences to the environment.

4. Preferred Treatments

The preferred treatments would implement a combination of treatments to reduce forest closure and hazardous fuels within Wind Cave National Park through a program of manual and mechanical thinning with the creation of brush piles to be burned when conditions permit. Operations are proposed to commence with the completion of the fire management plan.

The project will be achieved using a combination of park hand crews and, potentially, contracted resources from the local area, when funding is available. The debris generated from the project will be piled for burning at a later date. Project debris generated by contractors will be removed as part of contract agreement, with debris that cannot be removed piled for burning at a later date. The details of hiring contract labor will be handled by the MORU Contract Specialist and oversight will be provided by WICA staff.

The proposed action entails reduction of canopy in forested areas to approximate the following conditions:

- South facing aspects: Forests would be thinned to a canopy closure of less than 5 percent.
- North facing aspects: Forests would be thinned to a canopy closure between 40 and 80 percent.
- East and West facing aspects: Forests would be thinned to a canopy closure between 20 and 50 percent.
- On north, east, and west facing aspects, the goal is to achieve conifer stands that are widely spaced with varied age/size class distributions (including seedling, sapling, pole, mature, old

growth, and snags). Individual stands should have a ponderosa savannah appearance of open ponderosa and grassland mosaics, being typically small (between 0.25-40.0-acres) in size. For the most part, trees within stands would have wide and random spacing, including forest regeneration with seedling areas that are thin and widely spaced. However, some pockets of thick, dense conifer will be retained. Small pockets of regeneration would occur along meadow/prairie edges, but these would be the exception, as conifer regeneration within grasslands would be discouraged. Aspen and other hardwoods will not be cut.

- Thinning and pruning would occur within all forested burn areas of the park, but would target those areas planned for prescribed burning on a priority basis.
- Only upland thickets would be treated; no riparian areas would be cut.
- Cutting would be primarily by hand (i.e., brushsaw, chainsaw, weedwhip, lopper or hand pruners), but mowers and feller-bunchers may have certain applications. Brush saws would not be utilized as a wand to remove swaths of seedlings, but on individual trees.
- All cut material greater than 2 inches dbh would be cut into segments of less than 18 inches to reduce habitat for beetle infestation.
- When feasible, material will be utilized as firewood, fencing material, chipped mulch or other forest based product. When not feasible, the cut material will be gathered and piled for burning when conditions permit. Pile dimensions will be kept to a minimum and will be placed in areas that allow safe burning at a later date. Materials would be hand-carried to the burn piles. After burning, piles will require mixing of the soil in the top few inches and a liberal application of an approved seed mix to minimize the invasion of weeds. (NOTE: piles less than about six feet in diameter and four feet high, after drying down, are often not large enough to keep out enough snow or generate enough heat to burn well in the winter)
- No trees over 20 inches dbh would be cut and no yellow-barked ponderosa will be cut.
- Snags larger than 6 inches dbh would be left standing, unless removal is required to maintain treatment objectives.
- All stumps will be flush cut as close to ground level as possible. The tops of stumps will be scored and covered with proximal debris to facilitate rapid deterioration.
- Residual trees would be pruned of branches – both dead and green – to a minimum height of 5 feet above the ground.
- Only existing roads would be used; no new roads would be constructed.

The Wind Cave Fuels Reduction Project has the following probable benefits:

- Potential to create partnerships with adjoining local stakeholders while allowing the park to fulfill its land management objectives.
- Placing fuels treatments within the park reduces the threat of catastrophic wildfire to both the public and firefighters who may engage in fire suppression activities.
- By accomplishing fuels treatments the park gains significant potential to continue the use of prescribed fire in the restoration of natural fire regimes in what were previously fire adapted ecosystems.
- It is believed that this project will represent a critically important step forward towards a return to overall ecosystem sustainability and community support for future programs.
- Reduction of forest closure will return the area to more natural ecological conditions, which will in turn:
    - Will benefit wildlife by creating a wider variety of habitat.

- Will increase forest edge habitat.
- Will reduce the amount of water consumed by forest.

The Wind Cave Fuels Reduction Project has potential to create impacts on park resources intended to be managed in as near natural condition as possible. These impacts include cutting activity, noise, and brush pile accumulation. These impacts are expected to be short-termed.

Annual Goals

Acres accomplished on this project range in difficulty due to the spatial variation of the fuels across the landscape. While some areas are dominated by dense, small diameter trees with heavy dead and down fuel concentrations, other areas have only sparse fine fuels that require little to no treatment. The treatment prescription will be applied uniformly across all target areas and some areas will be completed more rapidly than others, but areas planned for prescribed burning will be treated on a priority basis.

Seasonal Use Restrictions

The following described measures (project design specifications) would be incorporated into the proposed action to mitigate anticipated environmental impacts from implementation of the proposed action.

a. Wildlife

1) Bald Eagle. No potential perch or roost trees would be affected as no work would occur in riparian zones. If bald eagle activity does occur within one mile of the project areas during implementation, then work hours would be restricted to between 9 am and 3 pm, or recommended time period for reducing the potential effects from noise.
2) Black-tailed prairie dog. No potential habitat would be adversely affected as this project is intended to reduce encroachment of trees into the mixed-grass prairie, thereby benefiting prairie dog habitat.
3) Neotropical Migratory Birds. To reduce potential effects to neotropical migratory birds, no fuels reduction work would occur within a 100-foot riparian buffer. Prior to work in proposed fuel reduction areas, surveys will be conducted to determine use by neotropical migratory birds and appropriate seasons of work within those areas will be established. The time periods to reduce disturbance will be the breeding / nesting / fledging period.

b. Vegetation

1) There are no endangered and threatened plant species potentially occurring in the project area. Four South Dakota Natural Heritage Program listed plant species occur within the park, and several additional state-listed plants occur in areas adjacent to the park.
2) Noxious Weeds. In order to minimize the potential for the spread of noxious weeds:
   - No mechanized equipment (excepting chain saws, and weed whips), would leave existing roads.
   - Cut material would be hand carried to the piles to minimize duff disturbance and exposed soil.
   - After burning, brush piles will have the top few inches of soil mixed by rake, drag, or disc, and liberally seeded with an approved seed mix.

c. Insects

1) Mountain pine beetle. The mountain pine beetle (*Dendroctonus ponderosae*), is a native insect affecting pines, particularly ponderosa. In general, these beetles prefer dense stands of large-diameter, mature and overmature forests. Areas of such habitat is at greater risk of epidemic, than forested areas that include a mixture of age classes (either between stands or within stands) and tree species. Risk increases the closer the forest resembles an even-aged, pine monoculture of large trees with a closed canopy over a large area. An important strategy in mountain pine beetle management is the recognition and prevention of susceptible stand conditions that may lead to epidemics (US Forest Service 2003).

2) *Ips sp. Ips* are bark beetles that can attack and kill sapling, pole-sized pines and the tops of larger pines. However, they prefer fresh downed wood or logging slash (diameter > 5 cm or 2 in.) or damaged and severely weakened trees. Research indicates that *Ips* adults prefer horizontal logs.

   a) The following constitute conditions which may promote *Ips:*

      1. Drought conditions, particularly in the spring, can lead to tree mortality by *Ips*.
      2. Managed stands following thinning or prescribed burning where an abundance of green slash has been created, especially in areas where these actions have been repeated on an annual basis.
      3. Natural disturbances such as windthrow and snow and ice damage.
      4. High-density, sapling- and pole-sized stands.

   b) Measures to prevent or minimize *Ips:*

      1. Thin tree density, especially in very dense young stands and decadent old ones.
      2. Monitor green slash and standing trees for evidence of *Ips* attack, particularly during the April to July period and especially in those areas where management activities, such as thinning or prescribed burning have occurred. Should abundant evidence of *Ips* activity be located, consultation with a pest management specialist should be undertaken.
      3. Creation of green slash between January and June should not be done, as slash created during this time period is excellent habitat for *Ips*. If slash production must be done during this time, material greater than 2 inches in diameter should be destroyed as soon as possible by burning, chipping, crushing, debarking, burying, spreading to dry in the sun, or piling under a clear plastic tarp in a sunny location.
      4. Avoid continuous annual management activities in adjacent areas by separating management activities by two miles or more.
      5. In areas that have trees of high value, removal of injured and diseased trees, with prompt disposal of slash is important (US Forest Service 2003).

D. Long-term Monitoring

1. Monitoring Plan - Monitoring of this work will be handled through the Fire Monitoring Plan.
2. Standards against which success in achieving the park's objectives can be measured

   a. Achieve the desired canopy closure for all forested aspects throughout the park.
   b. Placement of prescribed fire in all prescribed fire management areas of the park on normal fire return intervals in a safe and efficient manner.

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APPENDIX N.
Interagency Contacts and Coordination

Fire Management Agencies:	**Telephone Number:**
Great Plains Intergency Dispatch, Rapid City, SD	605-393-8017
USDA Forest Service, Custer, SD	605-673-9300
USDA Forest Service, Hot Springs, SD	605-745-4107
Custer State Park, Custer, SD	605-255-4515
Custer County Fire Dept.	605-673-8176
Hot Springs Fire Dept.	605-745-3333
Pringle Fire Dept.	605-673-8176
Emergency Medical Services:	
Custer County Ambulance	605-673-3334
Fall River County Ambulance	605-745-4444
Custer County Hospital, Custer, SD	605-673-2229
Rapid City Regional Hospital. Rapid City, SD	605-719-1000
Ellsworth Airforce Base, Box Elder, SD	605-385-1000
Law Enforcement:	
Custer County Sheriff Office	605-673-8146
Fall River County Sheriff	605-745-4444
South Dakota Highway Patrol	605-394-2286
State Radio Dispatch	605-394-2221
Emergency Management Agencies:	
State Division of Emergency Management	605-394-5161
State Radio Dispatch	605-394-2221
Custer County Emergency Services Coordinator	605-673-8128
South Dakota Army National Guard	605-737-6200
National Weather Service:	
Fire Weather Forecaster, Rapid City, SD	605-341-7531
NWS, Rapid City, SD Office	605-341-7531
NWS, Cheyenne WY Office	307-772-2468

Media:

Associated Press, South Dakota	605-332-3111
KNBN -TV, Rapid City, SD	605-355-0024
KOTA TV, Rapid City, SD	605-342-2000
KEVN TV, Rapid City, SD	605-394-7777
KELO TV, Rapid City, SD	605-341-1500
KZMX Radio, Hot Springs, SD	605-745-3637
Hot Springs Star (newspaper)	605-745-4170
Rapid City Journal (newspaper)	605-394-8300
Custer Chronicle (newspaper)	605-673-2217

National Park Service:

Wind Cave National Park HQ	605-745-4600
Superintendent Home	605-745-7986
Chief Park Ranger Home	605-745-4463
Chief of Resource Management Home	605-673-3124
Midwest Regional Office	402-221-3475
Fire Management Officer Home	605-890-0783
Asst. Fire Management Officer Home	605-745-7372
Prescribed Fire Specialist Home	605-745-3337

APPENDIX P.

Definitions and Abbreviations

Wildland Fire Management Terminology

(Adopted By National Wildfire Coordinating Group 01/2005)

Appropriate Management Response - Any specific action suitable to meet Fire Management Unit (FMU) objectives. Typically, the AMR ranges across a spectrum of tactical options (from monitoring to intensive management actions). The AMR is developed by using Fire Management Unit strategies and objectives identified in the Fire Management Plan.

Fire Management Plan - A plan which identifies and integrates all wildland fire management and related activities within the context of approved land/resource management plans. It defines a program to manage wildland fires (wildfire, prescribed fire, and wildland fire use). The plan is supplemented by operational plans, including but limited to preparedness plans, preplanned dispatch plans, and prevention plans. Fire Management Plan's assure that wildland fire management goals and components are coordinated.

Initial Attack - A planned response to a wildfire given the wildfire's potential fire behavior. The objective of initial attack is to stop the spread of the fire and put it out at least cost. An aggressive suppression action consistent with fiefighter and public safety and values to be protected.

Preparedness - Activities that lead to a safe, efficient, and cost effective fire management program in support of land and resource management objectives through appropriate planning and coordination. Mental readiness to recognize changes in fire danger and act promptly when action is appropriate. The range of deliberate, critical tasks, and activities necessary to build, sustain, and improve the capability to protect against, respond to, and recover from domestic incidents.

Prescribed Fire - Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements must be met prior to ignition.

Prescription - Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions.

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

Wildland Fire – Any non-structure fire that occurs in the wildland. Three distinct types of wildland fire have been defined and include wildfire, wildland fire use, and prescribed fire.

Wildland Fire Situation Analysis (WFSA) - A decision-making process that evaluates alternative management strategies against selected safety, environmental, social, economic, political, and resource management objectives as selection criteria.

<u>OBSOLETE TERMS</u>

Many traditional terms have either been omitted or made obsolete by the Policy. The terms listed here have uses or connotations that are contrary to the new policy.

Confine/Contain/Control - These terms, when used in the context of suppression strategies, are confusing since they also have tactical meanings. Containment and control are assumed to maintain their definition for fire reporting purposes.

Escaped Fire Situation Analysis - This term is replaced by Wildland Fire Situation Analysis,

Management Ignited Prescribed Fire - This term is replaced by the term “prescribed fire”.

Prescribed Natural Fire - This term is replaced by the term “wildland fire use”.

Presuppression - The term "presuppression" has been replaced by the term "preparedness" to match policy and appropriation language.

APPENDIX Q.

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APPENDIX R.

NEPA and NHPA Compliance

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

ENVIRONMENTAL ASSESSMENT

for the

FIRE MANAGEMENT PLAN
WIND CAVE NATIONAL PARK

Custer County, South Dakota

Summary: Wind Cave National Park is characterized by a mixed-grass prairie and ponderosa pine forest fire regime. These areas contain large tracts of continuous fine fuels, but also considerable closed stands of long-needled pine. Fire is a fundamental ecological process that influences plant and animal diversity and distribution as well as abiotic processes such as erosion, nutrient cycling, and soil genesis.

Both natural and human-caused ignitions have historically influenced the landscape at Wind Cave National Park. The National Park Service has used prescribed fire as a management tool since the early 1970's at Wind Cave. The park's existing Fire Management Plan has been in place since 1999 and emphasizes fire suppression and the use of prescribed fire for fuel reduction. The National Park Service's Fire Management Policy (Director's Order #18: Wildland Fire Management) was revised in 2003, with specific guidance (Reference Manual #18: Wildland Fire Management) implemented in 1999.

A new Fire Management Plan has been drafted that reflects new management policies and addresses an integrated fire management program. This Environmental Assessment (EA) describes two alternatives and the environmental consequences of each.

Alternative A: No Action. The park would implement a new Fire Management Plan that continues the existing practice of prescribed fire for fuel reduction throughout the park, as well as to achieve resource management goals. Fire suppression would continue as in the past, as no natural ignitions would be allowed to burn under any circumstances.

Alternative B: Integrated Management. The park would continue the existing practice of fire suppression as well as using prescribed fire to achieve resource management goals and the reduction of fire fuels. In addition, the park would utilize fuel treatments of forested areas to aid in fire hazard reduction and manage the forests at desired resource conditions. This is the preferred alternative and its implementation is more fully described in the Fire Management Plan.

Alternatives considered but rejected include the use of mechanical treatment alone for fuel reduction, the use of wildland fire (allowing natural fires to burn) and the exclusion of prescribed fire within the park.

This environmental assessment is an appendix to Wind Cave National Park's Fire Management Plan, which provides specific guidance and procedures for accomplishing park fire management objectives.

This environmental assessment can be found on-line at http://parkplanning.nps.gov/wica. Comments can be submitted via that website or they can be mailed to Superintendent; Wind Cave National Park; 26611 U.S. Highway 385; Hot Springs, SD 57747-9430. Printed copies of the EA are available for review at the Custer, Hot Springs, and Rapid City libraries and at the park visitor center

Names and addresses of people who comment become part of the public record. If you wish your name and or address withheld, state this prominently at the beginning of your comment. All submissions from organizations, businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses will be available for public inspection in their entirety.

The public comment period on this document will remain open for 45 days. Comments should be received by October 22, 2005.

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List of Tables

1. INTRODUCTION

PURPOSE

Wind Cave National Park was established in 1903 to protect Wind Cave. Since the original designation, the purpose of the park has been expanded from cave preservation alone to protection of both surface and subsurface resources. The primary features of the park are the cave, recognized worldwide as a significant site, and the surface ecosystem which supports plains and hills grasslands and forests, as well as a wide variety of wildlife, including bison, elk, and prairie dogs.

The National Park Service (NPS) is considering implementation of a fire management plan at Wind Cave National Park, South Dakota. The purposes of the plan are 1) to promote firefighter and public safety; 2) to restore and sustain natural ecosystems and reduce hazarous fuels; 3) promote fire prevention and the suppression of wildfires; 4) promote cooperation and collaboration with park neighbors; and 5) to minimize impacts of wildfire on park natural and cultural resources, park infrastructure, and adjacent lands, to the extent possible. An Environmental Assessment (EA) analyzes the proposed action and alternatives, and their impacts on the environment. This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and regulations of the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations (CFR) 1508.0).

NEED

National Park Service Director's Order 18 states: "National Park Service wildland fire management activities are essential to the protection of human life, personal property and irreplaceable natural and cultural resources, and to the accomplishment of the NPS mission. High safety risks and expenses associated with fire management activities require exceptional skill and attention to detail when planning and implementing fire management activities." (NPS 2003a)

The existing park Fire Management Plan has been in place since 1999 and emphasizes fire suppression and the use of prescribed fire for fuel reduction throughout the park. In 1999, the National Park Service published Reference Manual #18: Wildland Fire Management, which provided guidance on fire management planning, and in 2003, National Park Service fire management policy (Director's Order #18: Wildland Fire Management) was revised.

With the establishment of new reference manuals and policy, the park's Fire Management Plan needs revision to be remain consistent NPS and national guidelines.

2. BACKGROUND

PARK PURPOSE AND SIGNIFICANCE

Wind Cave National Park was established in January 1903 (32 Stat. 765-766, 16 USC 141-146) as a 10,532-acre area to protect Wind Cave and the underground resources of this unique site. It was the seventh national park and the first one created to protect a cave. The original legislation applied only to the cave and surface developments needed to manage and care for the cave (NPS 1994a).

The purpose of Wind Cave National Park has evolved from cave preservation to protection of both subsurface and surface ecosystems. In 1912, establishment of the Wind Cave National Game Preserve provided a permanent range for bison and "such other native American game animals as may be placed therein." Bison, elk and pronghorn had been extirpated from the area prior to establishment of Wind Cave National Park. Herds of bison and elk were re-established, as the need to preserve and protect big game species was realized. In 1935, Section 601 of Public Law 148 (49 Stat. 383, USC 141b) transferred management of the game preserve from the Department of Agriculture to Wind Cave National Park. In 1946, Public Law 708 (60 Stat. 970, 16 USC 141a) expanded the park to over 28,000 acres to maintain a viable population of a variety of big game, especially pronghorn. Public Law 95-625 (92 Stat. 3475) added approximately 228 acres to the southern end of the park. The park currently encompasses 28,295 acres.

Based on park legislation and legislative history, the purpose of Wind Cave National Park (as identified in the park GMP) is to:

- Protect Wind Cave.
- Provide habitat for bison and other native game animals.
- Preserve and protect surface and subsurface resources.
- Preserve the flora, fauna, and natural processes of the mixed-grass prairie ecosystem.
- Provide services and facilities necessary and appropriate for public enjoyment and appreciation of the park's resources.

Wind Cave National Park is significant because:

- The special features of Wind Cave are acknowledged by speleologists around the world as being rare and significant, with it's length, complexity, and vertical levels making it one of the most complicated maze caves in the world.
- Wind Cave contains mixed-grass prairie, ponderosa pine, and riparian ecosystems, and forms a transition zone between eastern and western biomes, supporting a large variety of plants and animals, including those successfully restored after extirpation.
- The park provides access to geologic resources including the Madison aquifer and contains rare Quaternary deposits of regional significance.
- The cultural resources of the park go back at least 10,000 years and contain prehistoric and historic resources.
- Wind Cave is an important part of the region's tourism.
- Wind Cave is a designated Class I air quality area under the Clean Air Act.

OBJECTIVES OF FIRE MANAGEMENT AND PLANNING

In order to preserve many of the values for which this area was set aside, an active fire management program is needed to maintain a pre-European settlement (pre-Columbian) fire-dependent ecosystem. The Fire Management Plan (FMP) is a working document that details how the park will control and/or use fire to maintain park resources for future generations. The FMP is an implementation plan subordinate to, and derived from, the park General Management Plan (GMP) (NPS 1994a) and the Resource Management Plan (RMP) (NPS 1994b).

Consistent with NPS policy and the park's resource management objectives, the fire management plan will achieve the following fire management goals.

a. Promote firefighter and public safety.
   1) Provide for the safety of park visitors, neighbors, and employees during all phases of fire management operations.

b. Restore and sustain natural ecosystems and reduce hazardous fuels.
   1) This includes reduction/maintenance of hazardous fuels to natural levels, using fire to maintain/improve forage for wildlife.
   2) Minimize the effect of unwanted (human-caused) fires through reduction of hazard fuels by prescribed fire and/or mechanical treatment.
   3) Where applicable, restore fuel loads and plant community structure and composition to ranges of natural variability comparable to pre-European settlement using prescribed fire.
   4) Monitor and evaluate the effectiveness of the prescribed fire program.

c. Promote fire prevention and the suppression of wildfires.
   1) Suppress all wildfires in a safe and efficient manner.
   2) Provide opportunities for public understanding of fire management.

d. Promote cooperation and collaboration with park neighbors (i.e., government agencies, private entities, etc.).
   1) Provide opportunities for public understanding of fire management.

e. Minimize impacts of wildfire on park natural and cultural resources, park infrastructure, and adjacent lands, to the extent possible.
f. Use Minimum Impact Suppression Tactics needed for the values at risk.
g. Rehabilitate disturbed areas to protect resources from adverse impacts attributable to fire suppression activities.
h. Promote understanding of fire suppression effects on sensitive park resources among park staff and firefighters.
i. Ensure that a resource advisor is present on all major suppression actions.

More specific objectives related to individual vegetation types may be found in the Fire Monitoring Plan (Appendix F of the Fire Management Plan). Also, each prescribed fire plan for individual prescribed fires will include specific resource goals and objectives which will be refinements of, and compatible with, these program objectives.

INTERNAL SCOPING

On July 7, 2004, an internal scoping meeting was held at Wind Cave National Park. During this meeting alternatives were discussed to develop the alternatives to address this issue.

IMPACT TOPICS INCLUDED IN THIS EA

Impact topics were used to focus the evaluation of the potential consequences of the alternatives. Impact topics were identified based on legislative requirements, topics specified in Director's Order #12 and Handbook (NPS 2001b), and park-specific resource information. The impact topics for the Fire Management Plan at Wind Cave National Park are presented in Table 2. The following impact topics are included in this Environmental Assessment:

Air Quality: Wind Cave National Park is a Class I airshed as designated by the federal 1963 Clean Air Act (42 U.S.C. 7401 *et seq*.). This designation stipulates that federal land managers have an affirmative responsibility to protect a park's air quality from adverse air pollution impacts. Air quality would be affected to various degrees by fire events inside the park. In addition, smoke generated inside the park could affect sensitive receptors outside of the park. Visibility would be affected by the presence of particulates associated with smoke. However, the short duration of most grassland fire events would make contributions to acid deposition or ozone unlikely. Direct, indirect, and cumulative impacts to visibility are therefore analyzed in this EA.

Cultural Resources: The National Historic Preservation Act, as amended in 2000 (16 U.S.C. 470 *et seq*.), and the NPS Cultural Resource Management Guidelines (NPS 1999b) and NPS Management Policies (2000) require consideration of impacts on cultural resources listed on or eligible for listing on the National Register of Historic Places. The park contains National Register-eligible historic structures, cultural landscapes, and a variety of ethnographic resources. Eligible cultural resources may be affected by fire events. Consultation with the State Historic Preservation Officer has been documented on all undertakings initiated by the park.

<u>Archaeological Resources:</u> Fire has always been a part of the prairie environment. However, all fires are not the same due to factors such as fuel type, load, moisture, size and arrangements, and environmental variables such as temperature, wind speed and direction. Fire in fuels such as grassland, have a tendency to burn fast and have a minimal effect on archeological resources. Organic material may be consumed, but inorganic material will experience minimal impacts. Fire in woody fuels, such as ponderosa, may burn for minutes to hours, depending on the frequency of fire in the area. High frequency fire will consume woody fuels over time and speed up the rate of fire moving through the area. Because fire intervals at Wind Cave are short, it is unlikely that planned low-intensity burns such as those found in prescribed fires will harm cultural resources that have been exposed to the large number of fires that have swept through the Park.

Additional impacts to consider are those resulting from fire activities such as vehicular and foot traffic.

<u>Cultural Landscapes:</u> A Cultural Landscape Report of the Historic District of the park and cave was completed in May, 2005. This report recommends that a revised and expanded historic district be considered for the current NPS-administered lands including cultural resources and natural features and systems within the original 1903 boundary for Wind Cave National Park. This district should include the cave areas that are known to have been accessed and altered for the purposes of tourism during the historic period of significance (1890 – 1941). The Cultural Landscape Report also recommended the creation of a historic district running the length of SD Highway 87 beginning at the current northern boundary of the park and extending to the intersection with U.S. Highway 385. The boundary of the district should include the environs of the road. The terrain features and plant communities that define the spatial character of the road should define the edges of the district. The district should include important designed scenic views from along the roadway and views of road features such as bridges.

<u>Ethnographic Resources:</u> An Ethnographic Overview was completed in September 2003. Many plant species discussed as important to tribes with affiliation to the park, such as skunkbush, chokecherry, yucca, and cacti, have root structures that have adapted to survive fire. Additional species identified, such as ponderosa pine, depend upon fire as an integral part of their life cycle. The substructures of these plants are not consumed by fire but instead thrive through exposure to fire. Additionally, the native wildlife populations may also be positively impacted by fire as it creates opportunities for new plant shoots to appear for grazers and browsers. The following historic and prehistoric uses for fire

by the Plains Indians have been documented: to drive game, to improve forage, to concentrate wildlife in unburned areas, and for use as a weapon. Accidental fires or campfires were also likely sources (Williams 2001). However, of more significant impact was fire suppression. This practice, which began with Indo-Europeans land management practices, particularly agriculture, has had a much larger impact on the long-term viability of grassland and forest ecosystems. Consultation with tribes affiliated with Wind Cave National Park has been initiated and is ongoing with regards to fire.

<u>Museum Collections:</u> Specimens and artifacts in the park museum collections will be not impacted by the fire management plan. These items have been collected for research purposes and provide relationships to the significant natural and cultural history of Wind Cave National Park. These resources will not be impacted and are therefore dismissed as an impact topic.

Public Health and Safety: Fire on the landscape poses obvious threats to public health and safety. Smoke can cause severe respiratory difficulty, particularly in children and the elderly. Visibility on roadways can be severely reduced, leading to vehicular collisions. Uncontrolled fire can threaten lives and property. Effects of fire on public health and safety will be addressed in this EA.

Sustainability and Long-term Management: Sustainability is the result achieved by doing things in ways that do not compromise the environment or its capacity to provide for present and future generations. Long-term management is a program that will work with few alterations in the future.

Threatened and Endangered Species: The Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*.) prohibits federal agencies from taking actions that jeopardize the continued existence of listed species or to adversely modify critical habitat. Under Section 7 of the Act, agencies must consult with the US Fish and Wildlife Service before undertaking any action with such potential. NPS *Management Policies* (2000) require assessment of impacts to certain state-listed rare, candidate, declining and sensitive species.

Vegetation Resources: The frequency, duration, and seasonality of fire have direct impacts on the composition and distribution of plant species. The suppression of fire has an indirect impact on the composition and distribution of plant species. Specific impacts to grassland, shrubland, forests and woody draw communities will be addressed. Direct and indirect vegetation impacts are therefore analyzed in this EA.

Wildlife Resources: The distribution and frequency of fire have direct impacts on populations of small mammals, ungulates, birds, reptiles and amphibians, and invertebrates. Fire may have a marked effect on predator-prey relationships between these populations by reducing the amount and availability of cover, thus increasing animal predation on small mammals. It can also destroy nests and kill young animals. Direct and indirect wildlife impacts are therefore analyzed in this EA.

Fire can also change wildlife habitat and forage quality. Fire's effects on habitat vary with fire characteristics. Soils lose fewer nutrients in low-severity fire than in severe fire. Severe fire volatilizes nutrients and occasionally decreases wettability of the soil surface. Forage is improved when low-severity fire increases herb diversity and stimulates plant growth, particularly among native legumes. Improved nutritional levels in forage species can occur following fire.

ISSUES AND IMPACT TOPICS CONSIDERED BUT NOT FURTHER ADDRESSED IN THIS EA

Adjoining Lands: The park is surrounded by a mixture of federal, state and private lands. The land to the north of the park is Custer State Park and on the west is US Forest Service, Black Hills National Forest, most of which is leased to local ranchers for grazing. The lands on the south and east consist of private rangeland, cropland and residences. Small communities, Hot Springs, Pringle, and Custer, are also located near the park and could be affected by the fire program. Direct impacts to be considered are those from smoke and vegetative impacts from fires that start in the park and escape to surrounding lands. Smoke is addressed under Air Quality impact in this EA. Under any fire management scenario, risk to adjoining lands is similar. Wind Cave will work to prevent any ignition within the park from burning across the boundary, except where we are conducting a cooperative prescribed fire with the US Forest Service or Custer State Park. Therefore, impacts to adjoining lands will not be addressed in this EA.

Ecologically critical areas: Wind Cave National Park does not contain any designated ecologically critical areas, wild and scenic rivers, or other unique natural resources, as described in the Wild and Scenic Rivers Act, 36 CFR 62 criteria for national natural landmarks, or *NPS Management Policies 2001* (NPS 2000). Therefore, this impact topic is not included for further analysis in this EA.

Environmental Justice: Executive Orders 12250, 12898 and 12948 require agencies to consider the impact of their actions on disadvantaged human populations. The areas surrounding the Park are considered economically depressed. The suppression of wildland fire and the use of prescribed fire would be generally consistent with the fire management programs in place in Custer and Fall River counties and on adjacent lands managed by the US Forest Service and Custer State Park. When appropriate, park fire suppression capabilities would be utilized for communities in and near the park with occasional need for local fire crews to participate in the park's fire management activities. Therefore, this impact topic is not included for further analysis in this EA.

Geologic Resources, including cave and karst: National Park Service policies require protection of geologic resources and processes. Burned areas may experience increased rates of erosion for short periods of time following burns. However, this increase would be negligible given the short duration of the increase and the rapid response of ground cover vegetation that characterize the park landscape. In addition, studies show that fire occurred on regular intervals within the park and would have resulted in materials being carried into cave and karst resources. Both alternatives support the establishment of fire return to the park and thus the potential for materials to be carried into cave and karst resources. With this, there would be no appreciable differences between the alternatives. Therefore, this impact topic is not included for further analysis in this EA.

Housing: The implementation of any of the alternatives would have no effect on housing within the park or local area, therefore housing is dismissed as an impact topic from this EA.

Indian trust resources: Indian trust assets are owned by American Indians but held in trust by the United States. Requirements are included in the Secretary of the Interior's Secretarial Order No. 3206, "American Indian Tribal Rites, Federal – Tribal Trust Responsibilities, and the Endangered Species Act," and Secretarial Order No. 3175, "Departmental Responsibilities for Indian Trust Resources." No Indian trust assets occur within Wind Cave National Park.

Land Use: Land uses within the park would remain the same following implementation of any of the alternatives. Therefore, land use is dismissed as an impact topic in this EA.

Natural, depletable, or energy resource requirements and conservation potential: As directed by *NPS Management Policies 2001* (NPS 2000), the park service strives to minimize the short- and long-term environmental impacts of development and other activities through resource conservation, recycling, waste minimization, and the use of energy-efficient and ecologically responsible materials and techniques. Both of the alternatives require energy for fire suppression and prescribed fire activities, however quantification of the energy required by the options is not feasible in this assessment. Specific impacts to the cultural and natural environment are addressed by impact topic.

Natural Soundscape: The *NPS Management Policies 2001* (NPS 2000) state that the NPS will strive to preserve the natural quiet and natural sounds associated with the physical and biological resources of parks. Neither of the alternatives addressed in this analysis would introduce long-term, inappropriate noise levels to the park. No actions are proposed that would introduce long-term noise sources to developed or remote/undeveloped portions of the park, and the proposed action would not alter the baseline, ambient noise level at Wind Cave National Park. Therefore, noise is dismissed as an impact topic in this EA.

Prime and Unique Farmlands: Prime farmland, as defined by the Council on Environmental Quality 1980 memorandum, has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Unique agricultural land is land other than prime farmland that is used for production of specific high-value food and fiber crops. These designations are established by the Natural Resource Conservation Service following soil and resource analyses. No lands within Wind Cave National Park have been defined as prime or unique agricultural lands.

Socioeconomics: NEPA requires an analysis of impacts to the human environment, which includes economic, social, and demographic elements in the affected area. The area surrounding the park is primarily ranch land with a few small communities. Fire events may bring a short-term need for additional personnel in the park, usually provided by adjoining agencies such as the US Forest Service, Custer State Park, and local volunteer fire departments, but would not affect the communities' overall population, income, or employment base. Therefore, this impact topic is not included for further analysis in this EA.

Visitor Use: NPS *Management Policies* (2000) require parks to provide for visitor use. Fire events may require visitor use closures for visitor protection. However, the displacement of visitors would be temporary and localized due to the discontinuity of fuels and the burn unit distribution. Generally, similar visitor experiences would be available in other areas of the park. The park's Interpretive Program would be utilized when needed to inform visitors about the positive and negative aspects of fire events. Interpretive programs to explain the role of fire in the landscape are generally well received, and many visitors are curious about fire. Thus, fire operations may provide a desirable visitor experience. Therefore, this impact topic is not included for further analysis in this EA.

Park Operations: Fire events may redirect park personnel with fire qualifications from their usual responsibilities. However, the advanced scheduling of prescribed burns and the use of a weekly call-out list for response to unwanted wildland fires would allow managers to anticipate needs and develop a strategy to continue essential park operations. Therefore, this impact topic is not included for further analysis in this EA.

Water Resources, including wetlands: National Park Service policies require protection of water resources consistent with the Clean Water Act (33 U.S.C. 1251 *et seq*.). Burned areas may be subjected to erosion that would result in a temporary increase in sediment loading of surface waters. However, this increase is negligible given the rates of erosion and sediment loading that characterize the Park landscape. Sparsely vegetated and highly erodable areas constitute 108 hectares (266 acres), or 1 percent of park acreage, and annual acreage burned under any realistic fire management program would be no more than 1,011 hectares (2,500 acres), or 9 percent of the total park acreage. Plus there is generally a short time period between a fire event and vegetative regrowth, which stabilizes the soil and limits the period of post-burn erodability. Therefore, erosion increase from fire is likely to be negligible, and this impact topic is not included for further analysis in this EA.

Wilderness: The Wilderness Act of 1964 (16 U.S.C. 1132) and *RM-41, Wilderness Preservation and Management* require consideration of impacts on Wilderness resources. Wind Cave National Park has no designated wilderness area or areas suitable for wilderness designation. Therefore, impacts to wilderness areas will not be addressed in this EA.

IMPAIRMENT OF PARK RESOURCES OR VALUES

National Park Service policy, (NPS 2000) requires analysis of potential effects to determine whether or not actions would impair park resources.

The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values.

However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources. Additionally, a determination involving the environmental consequences of the proposed action, resources and values must be considered. Although Congress has given the National Park Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute impairment. An impact would be more likely to constitute an impairment to the extent that it affects a resource or value whose conservation is:

a. Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
b. Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park;
c. Identified as a goal in the park’s general management plan or other relevant NPS planning documents.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park. This environmental assessment will analyze the potential effects of all alternatives presented to determine if the alternative would result in an impairment of park resources. An impairment finding is included in the conclusion section for each impact topic.

COMPLIANCE AND AUTHORITY FOR ACTION

National Park Service management policy directs each park to prepare a wildland fire management plan appropriate for that park's purpose and resources. Fire management at Wind Cave National Park is based upon this policy and the guidance found in RM-18: Wildland Fire Management (2003a) and Reference Manual 18: Wildland and Prescribed Fire Management Policy (1999a). These guidelines identify fire as the most aggressive natural resources management tool employed by the National Park Service. NPS policy also directs that all fires burning in natural vegetation be classified as either wildland fires or prescribed fires. Prescribed fires and wildland fire use may be authorized by an approved fire management plan and can be of significant importance in achievement of the park's resource management objectives. More detailed information regarding fire policy can be found in *Section II: Policy Compliance* of the Fire Management Plan. The draft Fire Management Plan for Wind Cave National Park has been prepared in compliance with these policies.

The National Environmental Policy Act of 1969 (NEPA), as amended, requires all federal agencies to prepare in-depth studies of the impacts of, and alternatives to, proposed major federal actions; use information contained in such studies in deciding whether to proceed with the action; and involve the interested and affected public before any decision affecting the environment is made. Specific policy and procedures by which the NPS will comply with NEPA are set forth in RM-12: Conservation planning, Environmental Impact Analysis, and Decisionmaking. This Environmental Assessment for the Fire Management Plan for Wind Cave National Park has been prepared in compliance with these policies.

3. ALTERNATIVES

Alternatives are different ways of meeting the stated purpose of this project, which is to implement a long-range fire management program to restore fire as a fundamental ecological process while protecting structures and adjacent lands from fire. To this end, two alternatives are fully analyzed and several alternatives are considered but rejected because they do not fulfill the purpose of this project or they are inconsistent with NPS policy.

To better enable the reader to follow the discussion presented, the following terms are defined in *RM-18* and are provided here for easy reference:

- *Control:* This strategy reflects aggressive suppression efforts and would be the strategy of choice whenever the imminent threat to life or property exists or when fire behavior is potentially extreme.
- *Containment:* The spread of the fire under prevailing and forecasted weather conditions to the fullest extent possible to minimize resource damage, and to restrict an unwanted wildland fire to a defined area. This strategy would be utilized when no significant values are at risk and fire behavior predictions preclude direct attack to ensure firefighter safety. Consultation with adjacent landowners may be initiated before this tactic is selected.
- *Confinement:* Confinement entails minimal suppression action intended to limit fire spread to a certain acceptable geographic area. This strategy may be utilized depending on size, irregular boundaries, and the values of resources at risk adjacent to the park.
- *Fire Management Unit (FMU)*: Any land management area definable by objectives, topographic features, access, values-to-be-protected, political boundaries, fuel types, or major fire regimes, etc., that sets it apart from management characteristics of an adjacent unit. FMUs are delineated in Fire Management Plans. These units may have dominant management objectives and pre-selected strategies assigned to accomplish these objectives. Within each FMU, prescribed fire units may be also be delineated.
- *Wildland Fire Use*: The management of naturally ignited wildland fires to accomplish specific pre-stated resource management objectives in pre-defined geographic areas outlined in Fire Management Plans.
- *Mechanical Treatment*: The use of hand-operated power tools and hand tools or wheeled tractors and crawler-type tractors to cut, clear or prune herbaceous and woody species. Plants are cut above ground level to remove undesired vegetation or root systems are dug out to prevent subsequent sprouting and regrowth. Mechanical treatments may be considered stand-alone treatments or be followed by burning of debris piles or prescribed burning of the treatment site. In some cases of removal of woody species, stumps are "painted" with herbicide to prevent sprouting.
- *Prescribed Burn or Fire*: Any fire intentionally ignited by a management agency to meet specific objectives. A prescribed fire plan must be prepared and approved in advance. NEPA requirements must be met, prior to ignition. Prescribed fire units simply delineate the geographical extent of each planned prescribed fire treatment.
- *Wildland Fire Suppression*: An appropriate management response to wildland fire that results in curtailment of fire spread and eliminates all identified threats from the particular fire. All

wildland fire suppression activities provide for firefighter and public safety as the highest consideration, but minimize loss of resource values, economic expenditures, and/or the use of critical firefighting resources.

ALTERNATIVES ANALYZED IN THIS EA

Alternative A - No Action

Under this alternative, the park's fire management program would continue a program of prescribed fire used for fuel reduction throughout the park, as well as to achieve resource management goals. Fire suppression would continue as in the past, as no natural ignitions would be allowed to burn under any circumstances.

Under this alternative, all wildfires in Wind Cave National Park will be suppressed and all suppression efforts are directed toward safeguarding life and property while protecting park resources from harm. All fires are evaluated to determine the appropriate suppression strategy. Twentyone prescribed fire units (PFU) are delineated for the park. Due to the complexity of both the topography and the surface ownership that exists at Wind Cave National Park, prescribed fire units are tied to natural (drainages, ridges, vegetative boundaries) or manmade features (park boundary, roads, trails).

Appropriate fire management strategies are identified for each unit, considering vegetation, terrain, fire behavior/effects, cultural resources, access, developed areas, political boundaries and protection of life and property.

Each PFU would be managed with a combination of prescribed fire and wildland fire suppression.

Mechanical treatments would be used in preparation for prescribed fire treatment. Treatments may include, but are not limited to: minimal limbing of trees to reduce ladder fuels and the potential for crown fire, thinning of small pockets, and mowing grass to create fuel breaks.

Prescribed fire would be used as a tool for resource management, monitoring, and research to simulate a natural ecological process. In addition, prescribed fire would be used to reduce fuel load and thereby reduce the potential for wildland fire damage of park resources and adjacent lands. The prescribed fire accomplishments within the park would be less than 2,500 acres per year averaged over fifteen years, so that each unit would be burned at least once every fifteen fifteen years to replicate the historic fire frequency of 5-20 years. Each of the prescribed fire units has been placed in a burning cycle based on past burns, as well as on park needs and objectives. Boundaries for the prescribed fire units are based on physical barriers to minimize the need for fire line construction.

There is no prescribed fire unit that allows for wildland fire use. Wildland fires are suppressed in such a manner as to reduce threat to human life and facilities while ensuring adequate protection of natural and cultural resources.

Forest prescribed fire units: Includes the South Cold Brook, Hidden Valley, Keyhole, Limestone Canyon, Pigtail, and Rankin Ridge units. Total Unit size is approximately 10,233 acres. Unit objectives:

1) When possible suppress fire under a control strategy.
2) Utilize prescribed fire to reduce heavy fuel loadings, reduction of canopy closure, reduce stand density, reduce forest encroachment into grassland, and provide for grassland restoration.

3) *Grassland prescribed fire units:* Includes the remaining units of the park, totaling approximately 18,062 acres. Unit objectives:

4) When possible suppress fires under a control strategy.
5) Utilize prescribed fire to reduce fuel loadings, reintroduce fire for reduction of forest creep and provide for grassland restoration.
6) Protect woody draws.
7) Enhance grassland resources as a forage base utilized by wildlife populations.

Management-ignited prescribed fire would be used as a management tool for resource management, hazard fuel reduction, monitoring, and research. The intention of the park has been to reintroduce fire into prescribed fire units in an effort to replicate the historical fire frequency (5-20 years). Less than 2,500 acres would be burned annually.

Summary of *Alternative A:*

- 19 prescribed fire units: totaling 28,295 acres
- Six PFU's are predominantly forest lands and thirteen PFU's predominantly grasslands and employ prescribed fire, and suppression to reduce fuel and restore/preserve native forest and prairie
- No use of wildland fire is allowed
- Less than 2,500 acres per year burned via prescribed fire

Alternative B – Integrated Management (Preferred Alternative)

Under this alternative, the draft Fire Management Plan would be adopted. The park's fire management program would continue a program of prescribed fire used for fuel reduction throughout the park, as well as to achieve resource management goals. Fire suppression would continue as in the past, as no natural ignitions would be allowed to burn under any circumstances.

Under this alternative, all wildfires in Wind Cave National Park will be suppressed and all suppression efforts are directed toward safeguarding life and property while protecting park resources from harm. All fires are evaluated to determine the appropriate suppression strategy. Twentyone prescribed fire units are delineated for the park. Due to the complexity of both the topography and the surface ownership that exists at Wind Cave National Park, prescribed fire units are tied to natural (drainages, ridges, vegetative boundaries) or manmade features (park boundary, roads, trails).

Appropriate fire management strategies will be identified for each PFU, considering vegetation, terrain, fire behavior/effects, cultural resources, access, developed areas, political boundaries and protection of life and property.

Each PFU would be managed with a combination of mechanical treatment, prescribed fire, and wildland fire suppression.

Mechanical treatments would be used in preparation for and in conjunction with prescribed fire treatment. Treatments may include, but are not limited to: limbing of trees to reduce ladder fuels and the potential for crown fire, reduction of regeneration to reduce fire intensity and restore open ponderosa/mixed-grass ecosystem, tree felling to add to fuel loads on ground to carry fire or break up canopy for reduction of canopy closure, mowing grass to create fuel breaks, hose lays or the potential use of ATV with tanks, and construction of fire breaks. Mechanical treatments are not intended to be utilized forever, but their use would bring conditions to a point that could be largely maintained by prescribed fire and then their use would diminish.

The proposed action entails reduction of canopy in forested areas to achieve the following conditions:

- The goal is to achieve conifer stands that are widely spaced with varied age/size class distributions (including seedling, sapling, pole, mature, old growth, and snags). Individual stands should have a ponderosa savannah appearance of open ponderosa and grassland mosaics, being typically small (between 0.20-40.0-acres) in size. For the most part, trees within stands would have wide and random spacing, including forest regeneration with seedling areas that are thin and widely spaced. However, some pockets of thick, dense conifer will be retained. Small pockets of regeneration would occur along meadow/prairie edges, but these would be the exception, as conifer regeneration within grasslands would be discouraged. Aspen and other hardwoods will not be cut.
- Thinning and pruning would occur within all forested burn areas of the park, but would target those areas planned for prescribed fire on a priority basis.
- Only upland thickets would be treated; no riparian areas would be cut.
- Cutting would be primarily by hand (i.e., brushsaw, chainsaw, weedwhip, lopper or hand pruners), but mowers and feller-bunchers may have certain applications. Brush saws would not be utilized as a wand to remove swaths of seedlings, but on individual trees.
- All cut material greater than 2 inches dbh would be cut into segments of less than 18 inches to reduce habitat for beetle infestation.
- When feasible, material will be utilized as firewood, fencing material, chipped mulch or other forest based product. When not feasible, the cut material will be gathered and piled for burning when conditions permit. Pile dimensions will be kept to a minimum and will be placed in areas that allow safe burning at a later date. Materials would be hand-carried to the burn piles.
- No trees over 20 inches dbh will be cut and no yellow-barked ponderosa will be cut.
- Snags larger than 6 inches dbh would be left standing, unless removal is required to maintain treatment objectives.
- All stumps will be flush cut as close to ground level as possible. The tops of stumps will be scored and covered with proximal debris to facilitate rapid deterioration.
- Residual trees would be pruned of branches – both dead and green – to a minimum height of 5 feet above the ground.
- Only existing roads would be used; no new roads would be constructed.
- Fuels with high intensity and long burn durations along burn perimeters will be cut into manageable sections. To minimize ground disturbance, hand crews will first pick up the material before scattering it within the burn unit to reduce fire intensity. No material will be placed near known cultural sites.

Prescribed fire and mechanical treatments would be used together as a tool simulate a natural ecological process. In addition, these treatment methods would be used to reduce fuel load and thereby reduce the potential for wildland fire damage of park resources and adjacent lands. Fuel treatments may be used to prepare areas for safer prescribed fire use by removing ladder fuels, strengthening natural fire and man-made fire breaks, and aiding in the reduction of forest canopy closure to return park forests to more natural conditions. The prescribed fire and mechanical treatment use within the park would be up to nearly 4,000 acres per year averaged over fifteen twenty years, with each unit receiveing fuel reduction and/or burning at least once every fifteen years to replicate the historic fire frequency of 5-20 years. Each of the PFU's has been placed in a burning cycle based on past burns, as well as on park needs and objectives. Boundaries for the PFU's are based on physical barriers to minimize the need for fire line construction.

There is no prescribed fire unit that allows for wildland fire use. Wildland fires are suppressed in such a manner as to reduce threat to human life and facilities while ensuring adequate protection of natural and cultural resources.

Forest prescribed fire units: Includes the South Cold Brook, Hidden Valley, Keyhole, Limestone Canyon, Pigtail, and Rankin Ridge units. Total Unit size is approximately 10,233 acres. Unit objectives:

a. When possible suppress fire under a control strategy.

b. Utilize prescribed fire to reduce heavy fuel loadings, reduction of canopy closure, reduce stand density, reduce forest encroachment into grassland, and provide for grassland restoration.

Grassland prescribed fire units: Includes the remaining units of the park, totaling approximately 18,062 acres. Unit objectives:

a. When possible suppress fires under a control strategy.

b. Utilize mechanical treatments and prescribed fire use to reduce fuel loadings, reintroduce fire for reduction of forest creep and provide for grassland restoration.

c. Protect woody draws.

d. Enhance grassland resources as a forage base utilized by wildlife populations

Management-ignited prescribed fire and fuel treatment use would be used in combination as management tools for resource management, hazard fuel reduction, monitoring, and research. The intention of the park has been to reintroduce fire into prescribed fire units in an effort to replicate the historical fire frequency (5-20 years). Up to 4,000 acres would be burned and/or physically treated annually.

Summary of *Alternative B:*

- 19 prescribed fire units: totaling 28,295 acres
- Six FMU's are predominantly forest lands and thirteen PFU's predominantly grasslands and employ mechanical treatment, prescribed fire, and suppression to reduce fuel and restore/preserve native forest and prairie
- Up to 4,000 acres per year burned via prescribed fire and/or mechanically treated annually

ALTERNATIVES CONSIDERED BUT NOT FURTHER ADDRESSED IN THE EA

Wildland Fire Use: Under this alternative, natural ignitions would be allowed to burn, with no management action taken. This alternative was considered initially to determine its extent of impacts and resource benefits. Although this alternative would restore fire to a natural state, this would create a significant risk to lives, property and park resources. Because of staff limitations, small land management size, long response times, valuable cultural resources, and values at risk on neighboring lands, allowing uncontrolled wildland fires would not meet resource objectives and could potentially violate a number of state and federal resource laws; therefore, it was not analyzed further.

No Prescribed Fire: The NPS mission is to protect and preserve the native ecosystems it manages for the enjoyment of future generations. Guided by this mandate, the national fire management program focuses on restoring and maintaining fire as a natural process while protecting human life and property. Furthermore, RM-18 directs parks to scientifically manage wildland fire using best available technology as an essential ecological process to restore, preserve, or maintain ecosystems and use resource information gained through inventory and monitoring to evaluate and improve the program. To help in achieving these long-term goals, the NPS has a comprehensive fire management program including hazardous fuels reduction, prescribed fire, wildland fire for resource benefit, and wildland fire suppression (NPS Appropriations Implementation, 2001a). Native species in Wind

Cave National Park evolved with fire, and many are dependent upon fire for their continued survival. Natural fire events are fewer due to land management practices and suppression activities associated with human utilization of landscapes surrounding the park, making prescribed fire necessary to replicate historic fire frequency. Because the absence of prescribed fire would result in degradation of the native ecosystem at Wind Cave National Park, this alternative was not further analyzed or incorporated into other alternatives.

Mechanical Treatment Alone: Under this alternative, hazard fuel buildups would be removed or manipulated strictly by mechanical means to the extent practicable. Removal of fuel by mechanical means alone would leave the majority of the land within the park with no viable method to remove fuel loads. Approximately 63% of the land cover at Wind Cave is composed of grassland, with the remainder as forest, woodland, or shrublands. The only mechanical treatment available in the grasslands is mowing, however, the rugged terrain and rapid growth of grasses during the summer months preclude mowing as a viable fuel reduction treatment. Furthermore, widespread or frequent mowing would cause unacceptable visual impacts to the park's prairie resources (long lasting tracks from the mower) and tends to encourage encroachment by exotic plant species. Approximately 29% of the land cover within the park is forested. This treatment most often employs chainsaws to remove woody fuels (i.e. trees) to reduce fuel loads. Cut materials would require removal, causing additional unacceptable visual impacts to the park's forest areas (long lasting stumps and tracks from vehicles) and again encourages encroachment by exotic plant species.

Although this alternative would protect people from fire and minimize impacts of wildfire on park and adjacent lands and resources, it fails to restore fire as a fundamental ecological process within the park. In addition, this alternative would have extremely high costs and would result in substantial damage to the resources from heavy equipment use. Therefore this alternative was not analyzed further.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which is guided by the CEQ. The CEQ provides direction that "[t]he environmentally preferable alternative is the alternative that will promote the national environmental policy" as expressed in NEPA's Section 101b:

a. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
b. Ensure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings;
c. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
d. 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;
e. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
f. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Alternative B provides greater flexibility in the management of smoke and prevention of air quality degradation. Because Alternative B would allow prescribed fire, including burning of brush piles, in a wider variety of seasons, prevention of smoke in local communities would be easier to achieve.

Under Alternative B, park managers would have better capability to protect cultural resources through use of fuel treatments and prescribed fires that would burn in more predictable patterns. Prescribed fire alone, as outlined in Alternative A, would increase the risk of damage or loss to cultural resources, as fires with little or no pre-treatment have a wider variance in predictable behavior and thus greater potential to harm cultural resources.

As examined, both alternatives present no substantive differences in impact on threatened or endangered species.

Alternative B provides greater ability to place fire on the ground in the season and area needed to achieve desired results in the vegetative communities, especially with regards to reduction of exotic species and restoration of natural ecosystem processes.

Alternative B also provides greater ability to manage and enhance wildlife habitat within the park through utilization of fuel treatment and fire at the proper time and place.

The Environmentally Preferred Alternative is Alternative B, which is also the agency Preferred Alternative. This alternative has the greatest long-term positive environmental impacts with the least negative impacts. Specifically, the Preferred Alternative has significant long-term positive impacts by restoring a natural process that would support native plant growth and survival, while at the same time providing for safety and security of park and adjacent land resources. By supporting native plant species and communities, the Preferred Alternative would also have long-term benefits for the native mixed-grass prairie and forest ecosystem as a whole.

Table 1. Summary Matrix of Alternatives.

Elements	Alternative A: No Action	Alternative B: Integrated Management
Acres of Forested Management Unit	10,233	10,233
Acres of Grassland Management Unit	18,062	18,062
Average number of acres treated by prescribed fire annually	2,500	2,500
Average number of acres treated by fuel treatments annually	0	1,500

Table 2. Summary Matrix of Impacts of Alternatives.

Impact Topic	Alternative A: No Action	Alternative B: Integrated Management
Air Quality	Short-term, minor negative	Short-term, minor negligible
Cultural Resources	Long-term, moderate negative	Long-term, minor negative
Public Health and Safety	Short-term, minor negative	Short-term, minor negative
Sustainability and Long-term Management	Long-term, moderate negative	Long-term, moderate positive
Threatened/Endangered Species	Short-term, minor negative	Short-term, minor negative
Vegetation Resources	Long-term, minor positive	Long-term, moderate positive
Wildlife Resources	Long-term, minor positive	Long-term, moderate positive

4. AFFECTED ENVIRONMENT

AIR QUALITY

Historically, the Park and surrounding area have enjoyed excellent air quality, with only occasional, short-term air pollution from transient wildland fire smoke and blowing dust. National Park Service fire management activities that result in the discharge of pollutants (smoke, carbon monoxide, paticulates, and other pollutants from fires) are subject to, and must comply with, all applicable federal, state, interstate, and local air pollution control requirements as specified by Section 118 of the Clean Air Act, as amended (42 USC 7418). Wind Cave National Park is designated as a Class I area under the Clean Air Act, prohibiting significant deterioration of air quality.

It is likely that pre-Columbian visibility was lower than current levels due to frequent fires in summer months. The park has 7 years of passive ozone monitoring data and is currently adding to 4 years of Interagency Monitoring of Protected Visual Environments (IMPROVE) data (1999-present). The ozone levels measured within the park are well below those found to damage sensitive plants. Similarly, wet deposition data does not indicate high levels of acidic deposition, at the present. More recent data may indicate an increase in the presence of atmospheric nitrates. Nitrate and sulfate emissions from regional-scale sources such as industrial and electric utility facilities in eastern Wyoming and western South Dakota are of primary concern to the Wind Cave airshed, and these emissions are on the rise.

CULTURAL RESOURCES

Archaeological Resources

The Black Hills and Wind Cave National Park are located between the centers of two prehistoric culture areas: the Middle Missouri River Valley to the east and the High and Northern Plains to the west. Early people were attracted to the Hills because they offered shelter in the winter and were slightly cooler in the summer than the surrounding country. There was also good hunting and sources of good quality stone for tools. As a result, the Black Hills have a rich archaeological past.

Archaeologists have defined the culture of the area on the basis of the character of material remains from prehistoric sites and have outlined a sequence of changes in those remains. Documentation of these changes in association with materials that can be dated using absolute dating techniques (e.g., radiocarbon) has allowed archaeologists to assign a general time frame to variations in the material culture. Using these and other techniques, a broad sequence of culture history has been defined for the region and divided into four periods and/or cultural affiliations: Paleo-Indian (11,500 to 8,000 BP), Plains Archaic Tradition (8,000 to 1,500 BP), Late Prehistoric Period (1,500 BP to 1700s), and Protohistoric/Historic Period (1675 to1920s).

Currently less than 20% of the land area within Wind Cave National Park has been surveyed for archeological resources. Seventy-six sites were identified as of June 2005. Site types are various and include lithic and artifact scatters, tepee rings, quarries, historic farmsteads and wooden remnants.

All archeological sites within the park are protected by federal legislation (Antiquities Act of 1906, 1979 Archeological Resources Protection Act, Executive Order 11593), Section 110 of the National Historic Protection Act and their management is guided by NPS-28: Cultural Resource Management Guideline (NPS 1999b). Further survey and evaluation of the park's archeological resources may also yield archeological remains that warrant future nominations to the National Register. To date, the majority of sites within the park have not been fully evaluated for nomination to the National Register.

Fire has always been a part of the prairie environment. Peter Brown and Carolyn Sieg collaborated on a study in 1999, in the Northern Great Plains prairie ecotone, southeastern Black Hills, South Dakota. Their study looked at fire-scarred ponderosa pine trees to document the timing and frequency of historical fire at Wind Cave National Park. The study used previous studies showing that America Indians used fire for a variety of reason in the area. Cross sections were cross-dated to date trees and the frequency of fire was documented.

Frequent, episodic surface fires were recorded on trees beginning from dates in the 1500s or 1600s until the late 1800s or early 1900s when suppression efforts began. Fire scars were studied in three areas of the park: just north of the park, near the proposed Northwest Burn; in the middle of the park near the Pigtail Bridge, just south of the proposed Rankin Ridge Burn; and along Gobbler Ridge, near the Cold Brook South Burn. Fire dates recorded on trees from the three study areas included 1564, 1580, 1591, 1617, 1652, 1706, 1724, 1739, 1756, 1768, 1785, 1805, 1822, 1845, 1853, 1863, 1870, 1875, 1881, 1910, and 1912. This study included 415 fire scars. A graph showing the distribution of these fires is found on Attachment D.

Fire intervals found at Wind Cave are among the shortest documented for northern ponderosa pine forest. Fire frequencies at Wind Cave are comparable to those found in southwestern ponderosa pines stands. Fire is twice as frequent in the ponderosa pine found at Wind Cave as it is in the forest's interior, such as at Jewel Cave National Monument. It is unlikely the planned low-intensity burns will harm cultural resources that have been exposed to the large number of fires that have swept through Wind Cave National Park. Even with this, research conducted by Buenger (2004) determined that the short, superficial duration of prescribed fire presents only a minimal risk to archaeological sites. The primary impacts will result from off-road vehicle travel to support fire activities.

Cultural Landscapes

A Cultural Landscape Inventory for the park was finished in May 2005. Along with the existing Administrative and Utility Area Historic District, the report identified two potentially eligible National Register districts. Identified as potential cultural landscapes are:

- The original boundary of Wind Cave National Park.
- Highway 87 corridor within the Park.

The existing Administrative and Utility Area Historic District relates to the Civilian Conservation Corps (CCC). Workers began to arrive at Wind Cave in 1934, and a camp was established in the area now occupied by the park's seasonal housing. The CCC constructed many of the improvements in the park. The CCC established the visual character of the park's developed zone with landscaping, stone retaining walls, and the construction of the many of the buildings still in use today.

Historic Structures

There are twenty structures and two bridges that are listed on the National Register of Historic Places within the park. The buildings are of northern Spanish architecture and were built primarily by local contractors during the CCC era. Building 4 was built in 1906 as the Superintendent's residence and remodeled in 1938 to reflect the northern Spanish appearance. The Administrative and Utility Area Historical District consists of: the Administrative Building; Elevator Building; present Superintendent's Residence; Employee's Quarters-Dormitory; Building 7, Residence-Ranger Cabin dating to 1929; Building 6, Residence dating to 1934; Building 5, Residence dating to 1920; Building 8, Residence dating to 1931; Main Fire Cache/Garage; Old Fire Cache and Vehicle Storage Building; Power House/Recreation Hall; Oil and Gas House; Shop and Garage Building; and Warehouse/Garage Building. Included in the District are the parking area adjacent to the Administrative building with its walks and walls, as well as the service road and shoulders connecting the two developed areas. The present non-historic housing area, constructed in the 1960s and the 1980s, is not included in the historic district.

The bridges are the Beaver Creek ("High") Bridge built in 1929 and the Pigtail Bridge built in the 1920s. The Beaver Creek Bridge is the largest and most complex reinforced concrete bridge in the State. The Pigtail Bridge is the only remaining structure of this design in the State.

The Historic District and the bridges are on the National Register of Historic Places.

Ethnographic Resources

A number of American Indian tribes have aboriginal, historical, and cultural ties to the land within the Black Hills, which includes Wind Cave. Government agencies representing tribes with ties to the Park include: Crow Creek Sioux Tribal Council, Ponca Tribe of Oklahoma, Apache Tribe of Oklahoma, Rosebud Sioux Tribal Council, Cheyenne River Sioux Tribe, Three Affiliated Tribes Business Council, Arapaho Business Committee, Lower Brule Sioux Tribal Council, Fort Peck Tribal Executive Board, Standing Rock Sioux Tribal Council, Ponca Tribe of Nebraska, Northern Cheyenne Tribal Council, Cheyenne-Arapaho Tribes of Oklahoma, Santee Sioux Tribal Council, Oglala Sioux Tribal Council, Standing Rock Sioux Tribe, Cheyenne River Sioux Tribe, Fort Belknap Community Council, Yankton Sioux Tribal Bus. & Claims Comm., and Sisseton-Wahpeton Sioux Tribal Council. The Black Hills occupy a very special place in the history, creation stories, and religious beliefs of these groups.

American Indians use various areas within the park as spiritual sites. Activity at these sites usually consists of small offerings (often small packets of tobacco) tied to a tree or bush. These ceremonial locations are documented and consultation takes place with appropriate tribes prior to fire activities in those areas.

The park may have potential ethnographic landscapes as yet unevaluated. An Ethnographic Overview was completed in 2003. Many plant species discussed as important to tribes with affiliation to the park, such as skunkbush, chokecherry, yucca, and cacti, have root structures that have adapted to survive fire. Additional species identified, such as ponderosa pine, depend upon fire as an integral part of their life cycle. The substructures of these plants are not consumed by fire but instead thrive through exposure to fire. Additionally, the native wildlife populations may also be positively impacted by fire as it creates opportunities for new plant shoots to appear for grazers and browsers.

PUBLIC HEALTH AND SAFETY

The area around Wind Cave National Park is lightly populated, which reduces potential for public health and safety concerns arising from the park's fire program. The town of Hot Springs (approximately 4,100 people) and Pringle (approximately 110 people) are 10 miles south and six miles west of the park, respectively. The rest of the nearby population consists of scattered developments and ranches. One travel corridor crosses through the park area in a general north south route. Interstate 385 enters the southwest portion of the park and exits the central portion of the western border of the park. State Highway 87 intersects Highway 385 near the western border of the park and proceeds along the western edge of the park north to Custer State Park, where it exits Wind Cave. Two other travel routes, NPS 5 and NPS 6 (both in a general north-south pattern), traverse the east side of the Park.

THREATENED AND ENDANGERED SPECIES

NPS policy states that national parks must give state-listed species the same consideration as federal-listed species. Within the state of South Dakota there are a total of 35 threatened, endangered, and candidate species of invertebrates, fishes, reptiles, amphibians, birds, mammals, and plants. From this list there are a total of three avian, three mammalian, and one insect species known potentially to be resident or migrant species within the local area of Wind Cave National Park. Bird species that are migrant and seasonally resident in the area are the federally threatened/state endangered bald eagle (*Haliaeetus leucocephalus)*, the state endangered peregrine falcon (*Falco peregrinus*) and the state threatened osprey (*Pandion haliaetus*). The park includes large colonies of the black-tailed prairie dog (*Cynomys ludovicianus*), a species considered warranted for but precluded from listing by the US Fish and Wildlife Service at this time. These colonies provide a prey base and critical habitat for the federal and state endangered black-footed ferret (*Mustela nigripes*) and potentially the state threatened swift fox (*Vulpes velox*), although there are no verified sighting from within the park. Prairie dog communities occur throughout the park and would be subjected to prescribed fire and possibly to wildland fires. The park lies within the historic range of the American burying beetle (*Nicrophorus americanus*), although none have been documented within the park. There are occasional sightings within the park of the state threatened mountain lion (*Felis concolor*). No federal or state listed plant species are found within the park. Five plant species on the South Dakota Natural Heritage list (two species of Easter daisies (*Townsendia exscapa and Townsendia hookeri*), Hopi tea (*Thelesperma megapotamicum*), the hedgehog cactus (*Echinoceres viridiflorus*) and sleepy grass (*Stipa robusta*) occur within the park.

VEGETATION

Wind Cave vegetation is characteristically diverse and consists of three major types with approximately 63% prairie grassland, 29% forest, and 7% shrublands. These major types can be further divided into several plant communities or association types, including, but not limited to upland grasslands, riparian/wet meadows, shrublands, coniferous forests, hardwood forests, rocky outcrops/sparse vegetation, and landscaped areas. In general, as elevation increases, ponderosa pine has a tendency to dominate north- facing slopes. The basis for the difference between pre-settlement vegetation composition and current conditions is found in past livestock grazing practices, elimination and reduction of native wildlife and suppression of fire.

Completed in 1997, the park’s Vegetation Map project classified and digitally mapped 88,760 acres including the entire park and surrounding areas. Vegetation map classes were determined through extensive field reconnaissance, data collection, and analysis in accordance with the National Vegetation Classification System. The vegetation map was created from photographic interpretation of 1997, 1:12,000 scale color infrared aerial photography. The National Vegetation Classification System for the Wind Cave study area includes twenty-four natural and semi-natural associations and six complexes. The natural associations are comprised of seven woodland, eight shrubland, four upland herbaceous/grassland and five sparse vegetation types. The semi-natural association is comprised of one upland herbaceous type (Pucherelli et al. 1999).

There is a diverse grassland mixture across the landscape, occupying approximately 63% of the park. Western wheatgrass (*Pascopyrum smithii*), little bluestem (*Schizachyrium scoparium*), needle-and-thread (*Hesperostipa comata*), and big bluestem (*Andropogon gerardii*) are the predominant grasses occurring in the park. Western wheatgrass is a sod-forming grass that thrives on clayey soils where it ranges from almost pure, monotypic stands on clay to a true mixed-grass prairie on silty/sandy clays or loamy clays. Associated species include various forbs and grasses such as prairie coneflower (*Ratibida columnifera*), white milkwort (*Polygala alba*), and prairie dropseed (*Sporobolus heterolepis*). Almost all of the native grass and forb species of these grassland communities are fire tolerant and many are fire dependent (Wangberg 1984; Bailey 1978; Bragg 1982; Ewing and Engle 1982).

Kentucky bluegrass (*Poa pratensis*) is an introduced species that exists in most of the grassland complexes of the park and as a dominant or co-dominant species in many locations. Two additional non-native annual grasses, Japanese brome (*Bromus japonicus*) and downy brome (*B. tectorum*) are also present to some degree in some grassland associations. Non-native annual grasses may be decreased with fire, but timing is an important factor (Johnson 1987; Anderson 1965). Western wheatgrass also tends to be replaced by blue grama in drier areas or places with increased grazing. This shorter grass often grows in association with needle-and-thread and threadleaf sedge (*Carex filifolia*). On gravelly soils, side draws, and broad swales, little bluestem becomes dominant, often in association with side-oats grama (*Bouteloua curtipendula*), both of which are fire tolerant species (Henderson et al. 1983; Wofford 1989).

Coniferous forest lands are the second most prevalent vegetation community within the park, comprising approximately 28.8% of park vegetation. However, coniferous forested areas within the park are continuous stands with increasing canopy closure and fuel buildup and those areas that creep into meadow and grasslands. This has resulted in a forest that has few mosaics with a dominant size class of trees that are in the range of 14.5-25 inches in diameter at breast height, indicative of an even age stand. The absence of fire has also allowed dense thickets of seedlings and saplings to develop. As a result, the majority of forested areas of the park and adjacent lands are relatively young. In 1994, the Forest Service estimated that 73% of the Black Hills National Forest was less than 120 years old (U.S. Department of Agriculture, Forest Service 1994). In addition, they contain heavy down/dead material and have heavy regeneration along the periphery, resulting in constant creep of forested areas in grasslands.

Hardwood forest lands comprise approximately 0.3% of park vegetation. These areas occur as small stringers along streams and other specialized areas. The major species within these areas include box elder (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), and plains cottonwood (*Populus deltoides*). Small pockets of aspen (*Populus tremuloides*) are also found within the park. Green ash and American elm (*Ulmus americana*) are the most common hardwood trees present, being found along bottoms of draws and in river floodplains. The upper portion of hardwood draws commonly contains various shrub species, particularly American plum (*Prunus americana*) and western snowberry (*Symphoricarpos occidentalis*). Many of the deciduous woodland species sprout vigorously after fire (Severson and Boldt 1977; DeByle et al. 1987; DeByle 1985; Leege 1968; Leege 1979; McKell 1950). Wetter sites with high soil moisture within the park support diminishing stands of plains cottonwood trees. Along with willow (*Salix sp.*), these typically occur within the Park as small clumps along minor streams, around seeps, springs, and around ponds. The tree species found in these floodplain and wetland communities are generally not tolerant of fire (Braante et al. 1996; Van Dersal 1938).

Shrublands occupy 2,142 acres (867 ha) and compose approximately 7.6% of the park’s area. Shrublands occur in conjunction with mixed-grass prairie, ponderosa pine forest, and deciduous woodlands. While shrublands appear to be healthy within the park, some shrub species are represented in the park by a single occurrence of fewer than twenty-five plants. The most common shrub species include mountain mahogany (*Cercocarpus montanus*), creeping juniper (*Juniperus horizontalis*), chokecherry (*Prunus virginiana*), and western snowberry (*Symphoricarpos occidentalis*). Most of the native shrub species are fire tolerant and many are fire dependent, experiencing increased germination rates and/or vigorous sprouting after fire (Bradley et al. 1991; Crane 1982; Gartner and Thompson 1973).

The remaining shrublands represent relatively rare types found only in a few locations in and around the park. Willow shrublands grow in saturated areas or cut-banks of Beaver, Highland, and Cold Spring creeks. Willow are abundant and sprout readily following fire (Machida 1979; Lyon and Stickney 1976).

Sparse vegetation can be found within areas of established prairie dog towns, covering approximately seven percent of the park. Prairie dog towns occupy deeper soils on large flats, such as in Bison Flats.

Prairie dogs through their cycle of burrow establishment, grazing, and burrow abandonment, may alter grassland vegetation types over time. This constant use causes the native vegetation to revert back to an early successional state dominated by annual forbs, some of which are exotic weeds. Fire generally does not carry easily into the sparse vegetation surrounding prairie dog burrows.

Exotic species found in various disturbed sites include Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), Scotch thistle (*Onopordum acanthium*), spotted knapweed (*Centaurea maculosa*), common mullein (*Verbascum thapsus*), and field bindweed (*Convolvulus arvensis*).

Approximately 266 acres of the park are sparsely vegetated. Ponderosa pine, chokecherry, creeping juniper, and some drought-tolerant broom snakeweed (*Gutierrezia sarothrae*) are found on these areas.

In summary, most of the park's native species are fire tolerant and many are fire dependent to some extent. Those species that are not fire tolerant generally occur in areas that are not naturally prone to fire, such as floodplains.

WILDLIFE

There are a variety of wildlife that occupy forests, woodlands, shrublands, and grasslands of Wind Cave National Park, including small mammals, ungulates, birds, reptiles, amphibians and invertebrates. There are at least 48 documented mammalian species within the park including five species of ungulates, more than 200 species of birds, 17 species of reptiles and amphibians, 48 known species of lepidoptera along with numerous other arthropod species. (NPS 2004).

Common small mammal species observed include the least chipmunk (*Eutamius minimus)*, eastern cottontail rabbit (*Sylvilagus floridus*), thirteen lined ground squirrel (*Spermophilus tridecemlineatus*), black-tailed prairie dog (*Cynomys ludovicanus*), deer mouse (*Peromyscus maniculatus*) and muskrat (*Ondontra zibehicus*) and numerous other smaller rodents. Meso-carnivores include the coyote (*Canis latrans*), bobcat (*Felis rufus*), red fox (*Vulpes vulpes*) and American badger (*Taxidea taxus*).

Ungulates within the park include mule deer (*Odocoileus hemionus)*, white-tailed deer (*O. virginianus)*, pronghorn antelope (*Antilocapra americana)*, bison (*Bison bison)*, and elk (*Cervus elaphus*). Bison were restored to the park in 1913 and now number more than 400 head. Bison management requires the park be fenced. Surplus bison are rounded up and transferred to tribal governments and other agencies. Elk were also restored to the park between 1911 and 1916 and now number more than 650 animals during winter, and about 400 in summer.

Amphibians found within Wind Cave National Park include the blotched tiger salamander (*Ambystoma tigrinum*), Woodhouse's toad (*Bufo woodhousei*), and the chorus frog (*Pseudacris triseriata*). Some common reptiles include the red-sided garter snake (*Thamnophis sirtalis*), wandering garter snake (*Thamnophis elegans*), bullsnake (*Pituophis melanoleucus*), and prairie rattlesnake (*Crotalus viridis*).

Common bird species within Wind Cave National Park include the turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), sharp-tailed grouse (*Tympanuchus phasianellus*), killdeer *(Charadrius vociferus*), mourning dove (*Zenaida macroura*), yellow-shafted flicker (*Colaptes auratus*), eastern kingbird (*Tyrannus tyrannus*), Bell's vireo (*Vireo bellii*), warbling vireo (*Vireo gilvus*), American crow (*Corvus brachyrhynchos*) bank swallow (*Riparia riparia*), cliff swallow (*Hirundo pyrrhonota*), barn swallow (*Hirundo rustica*), mountain bluebird (*Sialia currucioides*), American robin (*Turdus migratorius*), field sparrow *(Spizella pusilla*), dickcisssel (*Spiza americana*), and western meadowlark (*Sturnella neglecta*).

Common butterfly species found within Wind Cave National Park include the clouded sulphur (*Colias philodice*), orange sulphur (*Colias* eurytheme), Melissa blue (*Lycaeides melissa*), variegated fritillary (*Euptoieta claudia*), Manitoba fritillary (*Speyeria Aphrodite*), red admiral (*Vanessa atalanta*), painted lady (*Vanessa cardui*), prairie ringlet (*Coenonympha tullia*), and the garita skipperling (*Oarisma garita*). Several species of grasshoppers and crickets (Orthoptera) along with carrion beetles (*Nicrophorus marginatus* and *Nicrophorus tomentosus*) are also common within Wind Cave National Park.

5. ENVIRONMENTAL CONSEQUENCES

The National Environmental Policy Act (NEPA) requires that environmental documents disclose the environmental impacts of the proposed federal action, reasonable alternatives to that action, and any adverse environmental effects that cannot be avoided should the proposed action be implemented. This analysis provides the basis for comparing the effects of the alternatives. In considering the impacts both the intensity and duration of the impacts, mitigation measures and cumulative impacts were assessed.

AIR QUALITY

Impacts to air resources common to both alternatives:

Both alternatives include the use of prescribed fire. The State of South Dakota requires that the park inform the State Department of Air Quality prior to performing prescribed fires. Burning permits are not required. The park would also notify local Federal Aviation Administration offices so pilots may be made aware of possible temporary visibility impairments. Smoke drift affecting neighbors and public roads is also a concern. Smoke dispersal would be a consideration in determining whether or not a prescribed fire is within prescription, as described in the specific prescribed fire plan. For prescribed fires, particulate matter will be the primary pollutant with localized effects. No significant long-term health impacts are expected. The effect of particulate matter and visibility on local communities and commercial establishments can be lessened by the proper use of smoke management and public notification.

Evaluation Criteria

The following definitions apply to impact descriptions for air quality:

Context: Geographic extent or scope of the impact

Duration:

Short-term – Effects lasting for the duration of the treatment action
Long-term – Effects lasting longer than the duration of the treatment action

Intensity:

Negligible – air quality would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on the air quality.
Minor – The effect would be detectable, but would not have an appreciable effect on air quality. If mitigation was needed, it would be relatively simple and would likely be successful.
Moderate – The effects would be readily apparent, and would result in substantial, noticeable effects to air quality on a local scale. Mitigation measures would probably be necessary and would likely be successful.
Major – The effects would be readily apparent and would result in substantial, noticeable effects to air quality on a regional scale. Extensive mitigation measures would be needed, and their success would not be guaranteed.

Impacts of *Alternative A* to air resources: Because this alternative calls for suppression of all wildland fires, the duration of smoke generation and resulting impacts to air resources would be for the duration of prescribed fires. The controlled nature of burns under this alternative makes their effect on air quality less severe than from wildland fires. Impacts of smoke to local communities would be minimized to take advantage of weather conditions to promote smoke dispersal.

Conclusion: Due to the generation of smoke for short durations during prescribed fires and wildland fires before suppression, implementation of this alternative would result in short-term, minor negative impacts to air resources.

The no action alternative would not produce major adverse impacts on air resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of air resources or values as a result of continuation of the no action alternative.

Impacts of *Alternative B* to air resources: Because this alternative calls for suppression of all wildland fires, the duration of smoke generation and resulting impacts to air resources would be for the duration of prescribed fires and the burning of brush piles from fuel treatment. The controlled nature of burns under this alternative makes their effect on air quality less severe than from prescribed fire alone or wildland fires. Smoke from mechanical treatment machinery would be localized to project areas and for the duration of the treatment. Because fuels treatment projects would remove some fuels from prescribed fire areas, smoke from prescribed fires would be more predictable and of less duration than from prescribed fires with no pre-treatment. Smoke from brush pile burning would also be of short duration. Impacts of smoke to local communities would be minimized to take advantage of weather conditions to promote smoke dispersal.

Conclusion: Due to the generation of smoke for short duration during mechanical treatment, prescribed fires, brush pile burning, and wildland fires before suppression, implementation of this alternative would result in short-term, minor negligible impacts to air resources.

The preferred alternative would not produce major adverse impacts on air quality resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of air resources or values as a result of the implementation of the preferred alternative.

CULTURAL RESOURCES

Archaeological resources

Under both alternatives, wildland fire suppression activities within the park have the greatest impact on archaeological resources. While vehicular traffic can have a damaging impact on fragile surface remnants, foot traffic would not likely cause excessive damage. To prevent the potential crushing or scattering of archaeological resources, vehicle traffic is limited to roads, except where fire threatens structures or escapes from the park or where authorized by the Park Superintendent. During a wildfire, areas recommended for hand lining, trenching, and equipment operation should be reviewed, if possible, by the Park Cultural Resource Manager and approved by the Park Superintendent. The construction of fire lines and the occurrence of burns should be followed by archeological inventories to identify resources and assess impacts.

Areas of planned ground disturbance activities on prescribed burns will be surveyed by a qualified archeologist, with the survey meeting the Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation, prior to the beginning of the project. Prior to all prescribed burns, a cover letter and Assessment of Effect form detailing the proposed undertaking will be submitted to the South Dakota State Historic Preservation Officer to comply with 36 CFR part 800 of the National Historic Preservation Act (as amended).

Journal of Range Management. 31(4): 283-289. With these safeguards in place, it is our conclusion that prescribed fires in mixed-grass fuels presents only a minimal risk to surface artifacts and little or no risk to subsurface artifacts. Prescribed fire in forest fuels would present a greater risk in that fuels would burn hotter and for a greater duration of time (Buenger 2002). Artifacts in these areas would have greater potential for damage and/or destruction. Through physical reduction of fuel loads, burn temperatures would be reduced, but burn piles would have increased burn time and temperature on isolated spots.

To facilitate the decision making process during any proposed or occurring fire event, digital cultural resource maps has been developed and incorporated into the park's geographic information system (GIS). The data set includes location, site number, site type, and site evaluation. This information is readily available for prescribed fire planning and to incident commanders for wildland fire management. These digital maps need to be updated to include information that would identify preferred fire management activities in regard to specific sites and site types. Actions that could be identified include site avoidance (buffer area), use of physical or applied barriers, mechanical reduction of fuel loads, collection of certain artifact classes prior to burn, follow-up survey, and collection post-burn. However, the impacts to these resources through fire management activities will not typically consume the resources. Although this information will assist in management of cultural resources, they are not critical to making a well reasoned decision relating to fire management.

The park will seek to develop a programmatic agreement covering prescribed burns with the South Dakota State Historic Preservation Officer.

Cultural Landscapes and Ethnographic Resources

Since this type of historic resource can vary dramatically in purpose and in story, it cannot be predicted what impact fire would have on these potential resources. However, since fire was historically a part of the American Indian heritage on the plains, it is possible that fire could help restore and maintain certain landscapes, including plant species that are of ethnographic importance, in their historic appearance. Additionally, since the resources are not likely to be consumed, the impacts are considered minor.

If any ethnographic resource are located during burn preparations, or operations, they will be noted and documented by field advisors. If possible, without compromising firefighter safety, the Incident Commander may decide to use ignition or holding tactics to exclude these areas from the fire. Consultation will occur with affiliated tribes prior to fire activities in those areas.

Historic Structures

Specific fire management activities will be managed to avoid any structures or features included in the Wind Cave National Park Administrative and Utility Area Historical District. As a matter of course, wildland fires are managed to avoid destruction to government property.

Evaluation Criteria

The following definitions apply to impact descriptions for the cultural resources:

Context: Geographic extent or scope of the impact

Duration:

Short-term – Effects on the natural elements of a cultural landscape may be comparatively short-term (e.g., three to five years until new vegetation grows or historic plantings are restored, etc.)

Long-term – Because most cultural resources are non-renewable, any effects on archaeological, historic, or ethnographic resources, and on most elements of a cultural landscape would be long-term.

Intensity:

Negligible – The impact is at the lowest levels of detection – barely perceptible and not measurable.

Minor – For archeological resources, the impact affects an archeological site(s) with modest data potential and no significant ties to a living community's cultural identity. The impact does not affect the character defining features of a National Register of Historic Places eligible or listed structure, district, or cultural landscape.

Moderate – For archeological resources, the impact affects an archeological site(s) with high data potential and no significant ties to a living community's cultural identity. For a National Register eligible or listed structure, district, or cultural landscape, the impact changes a character defining feature(s) of the resource but does not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized.

Major – For archeological resources, the impact affects an archeological site(s) with exceptional data potential or that has significant ties to a living community's cultural identity. For a National Register eligible or listed structure, district, or cultural landscape, the impact changes a character defining feature(s) of the resource, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the National Register.

Impacts of *Alternative A* to cultural resources: The greatest impact on cultural resources for Alternative A is the active suppression of wildland fires. The construction of fire lines could impact historic and ethnographic resources. Because wildland fire suppression is completed under emergency situations it is difficult to complete the pre-burn surveys and monitoring needed.

Another impact to cultural resources would be the conducting of prescribed fires within the park. Effective documentation and/or recovery of artifacts during pre-burn surveys take considerable cost and effort. Because prescribed fires are planned, areas of known resources could be avoided and/or protected in a manner to protect cultural resources. Access to sacred sites may be impacted and offerings left behind could be consumed. Because access to sites may be impacted and offerings left behind could be consumed, the park must make every effort to insure that users are aware of proposed fire activities.

<u>Conclusion</u>: Based on the potential disturbance of exposed artifacts, cultural landscapes, and ethnographic resources in this alternative, long-term, moderate negative impacts to cultural resources would occur. Based on the potential for consumption of religious offerings, long-term, moderate negative impacts to ethnographic resources would occur.

The no action alternative would not produce major adverse impacts on cultural resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of cultural resources or values as a result of continuation of the no action alternative.

Impacts of *Alternative B* to cultural resources: The greatest impact to cultural resources under Alternative B, as in Alternative A, would be the conducting of prescribed fires within the park. The construction of fire lines could impact historic and ethnographic resources. Because wildland fire suppression is completed under emergency situations it is difficult to complete the pre-burn surveys and monitoring needed.

Impacts from prescribed fires would be the same as in Alternative A. However, having personnel completing fuel treatment projects prior to initiation of prescribed fires provides additional opportunities to identify cultural resources prior to impact.

Conclusion: This alternative has the potential to disturb exposed artifacts, cultural landscapes, and ethnographic resources. However, completion of pre-burn fuel treatment projects increases the potential of identifying and protecting unknown cultural resources, thus reducing the potential for impact. With this, long-term, minor negative impacts to cultural resources would occur.

The preferred alternative would not produce major adverse impacts on cultural resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of cultural or values as a result of the implementation of the preferred alternative.

PUBLIC HEALTH AND SAFETY

Impacts common to both alternatives: Since both alternatives involve the use of prescribed fire within the park, there is equal potential in each alternative for problems associated with smoke and escaped fires burning into towns or ranches. Poorly dispersed smoke from prescribed fires can settle over nearby sites and sustained breathing of smoke can cause severe respiratory ailments, particularly in children and the elderly. It can also cause visibility hazards on nearby roads. Since the number of acres to be burned via prescribed fire is approximately the same in each alternative, the impacts to public health and safety from prescribed fire is also the same.

Evaluation Criteria

The following definitions apply to impact descriptions for public health and safety:

Context: Geographic extent or scope of the impact

Duration:

Short-term – Effects lasting for the duration of the treatment action
Long-term – Effects lasting longer than the duration of the treatment action

Intensity:

Negligible – Public health and safety would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on the public health or safety.
Minor – The effect would be detectable, but would not have an appreciable effect on public health and safety. If mitigation was needed, it would be relatively simple and would likely be successful.
Moderate – The effects would be readily apparent, and would result in substantial, noticeable effects to public health and safety on a local scale. Mitigation measures would probably be necessary and would likely be successful.
Major – The effects would be readily apparent and would result in substantial, noticeable effects to public health and safety on a regional scale. Extensive mitigation measures would be needed, and their success would not be guaranteed.

Impacts from *Alternative A:* Through Alternative A, all wildland fires would be fought aggressively. This would reduce fire threat to public safety and resources, both in and out of the park. There would be minor problems associated with smoke, as planned ignitions can take advantage of weather conditions to disperse smoke.

Conclusion: Due to the generation of smoke for short durations during prescribed fires and wildland fires before suppression, implementation of this alternative would result in short-term, minor negative impacts to public health and safety.

Impacts from *Alternative B:* Through this alternative, all wildland fires would be fought aggressively. This would again reduce fire threat to public safety and resources, both in and out of the park. There would be minimal problems associated with smoke, through the reduction of fuels from mechanical treatment, therefore planned ignitions would take advantage of weather conditions to reduce and disperse smoke to minimum levels.

Conclusion: Due to the generation of smoke for short durations during brush pile burning, prescribed fires and wildland fires before suppression, implementation of this alternative would result in short-term, minor negative impacts to public health and safety.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

Sustainability is the result achieved by doing things in ways that do not compromise the environment or its capacity to provide for present and future generations. Long-term management is a program that will work with few alterations in the future.

Evaluation Criteria

The following definitions apply to impact descriptions for sustainability and long-term management:

Context: Geographic extent or scope of the impact

Duration:

Short-term – Effects lasting for the duration of the treatment action
Long-term – Effects lasting longer than the duration of the treatment action

Intensity:

Negligible – neither sustainability or long-term management would not be affected, or the effects would be at such low levels of detection and would not have an appreciable effect on neither sustainability or long-term management.
Minor – The effect would be detectable, but would not have an appreciable effect on sustainability or long-term management. If mitigation was needed, it would be relatively simple and would likely be successful.
Moderate – The effects would be readily apparent, and would result in substantial, noticeable effects to sustainability or long-term management within the park. Mitigation measures would probably be necessary and would likely be successful.
Major – The effects would be readily apparent and would result in substantial, noticeable effects to sustainability or long-term management on a regional scale. Extensive mitigation measures would be needed, and their success would not be guaranteed.

Impacts from *Alternative A:* Because this alternative would utilize prescribed fire alone to manage park vegetative resources, fuel loads and areas of forest regeneration will continue to increase in the future. Past park management has shown that, even in the best of conditions, managers have not been able to burn enough area to fully simulate natural fire regimes. This has allowed areas of regeneration to establish, mature, thus adding fuel loads and the continued closure of the forest within the park. Continuation of this activity will not sustain the natural environment, but will promote situations in which we will be faced with catastrophic wildfires.

Conclusion: Due to continued increase in regeneration, forest growth, and fuel loads, this alternative would result in long-term, moderate negative impacts to sustainability and long-term management.

The no action alternative would not produce major adverse impacts on sustainability and long-term management resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of sustainability and long-term management or values as a result of continuation of the no action alternative.

Impacts from *Alternative B:* Because this alternative would utilize mechanical treatment and prescribed fire to manage park vegetative resources, fuel loads and areas of forest regeneration will decline to levels that would closely mimic those found in areas with more natural fire return intervals. Forested areas would open up, fuels would reduce, prescribed fires would be safer to conduct, and ecology would closer resemble a natural system. This alternative would allow forest and grassland sustenance, as well as facilitating the long-term management of park vegetative resources.

Conclusion: Due to the reduction of regeneration, forest growth, and fuel loads, this alternative would result in long-term, moderate positive impacts to sustainability and long-term management.

THREATENED AND ENDANGERED SPECIES

Impacts to threatened and endangered species common to both alternatives:

Since neither bald eagles or peregrine falcons are known to nest in the area, there would be no impact expected on these species. During some fires with heavy fuel loads and high heat intensities, trees may perish and become standing snags. These snags would benefit raptors in the form of perching sites. Due to the rapid mobility of avian species, they would escape from the direct dangers of fire. The American burying beetle can fly to avoid fire, and its larvae are buried below ground, so fire would likely have no impact. Prairie dogs, ferrets, mountain lions and swift fox are also very mobile and would utilize underground burrows and other topography as escape cover from fire and not be effected by burning. Topography and other physical barriers such as drainages and vegetation generally limit the size and extent of prairie dog colonies. The boundary edges of towns generally contain higher vegetation that provides terrestrial predators the ability to approach prairie dogs undetected. The burning of this vegetation would increase prairie dog ability to detect these predators and possibly reduce predation. Prairie dogs have historically colonized areas of grassland disturbance associated with bison and agricultural overgrazing (Hoogland 1995). Areas burned by fire would be a benefit to prairie dogs in the form of a disturbed area that provides nutritious re-growth, high levels of predator detection, and a direction for colony expansion/colonization. The short-term immediate loss of cured forage caused from the burn would be offset by the benefits of the green re-growth. Black-footed ferrets, being obligates of the prairie dog, would also benefit by the potential increase of habitat in the long-term and the increased prey base in the short-term. Swift fox commonly inhabit areas with a high proportion of edge. Fire that creates a mosaic of burned and unburned areas is probably the most beneficial. The potential decrease in the amount of prairie dogs as prey for swift fox after a burn, associated with less cover for foxes and increased predator avoidance by the prairie dogs, would be offset by the increased detection by foxes of other small mammals and birds as prey.

Both alternatives include wildland fire suppression. Fire suppression in grasslands is detrimental to populations of small bird and mammal herbivores due to organic matter accumulation and reduced plant vigor (Wagle 1981). The techniques of fire suppression in National Parks generally entails the use of direct attack with line construction and water, or indirect with fire lines and back-burns. Due to the landscape of the area, hand crews conduct suppression activities, and working under minimum impact suppression techniques, create minimal damage to the landscape. The short-term disturbances to threatened and endangered species, and their habitats, by these human activities would be minimal. Any bald eagles or peregrine falcons will have fled the area during the fire, and most likely would not be affected by suppression activities. Prairie dogs, black-footed ferrets, mountain lions, and swift fox will have fled the area or gone below ground during the fire, and most likely would not be affected by suppression activities.

Evaluation Criteria

The following definitions apply to impact descriptions for the threatened and endangered species category:

Context: Geographic extent or scope of the impact.

Duration:

Short-term – Effect of each impact lasting a few days to weeks.
Intermediate – Lasting from a few weeks to months.
Long-term – Lasting from a few months to years.

Intensity:

Negligible – There would be no direct or indirect impacts on threatened, endangered, or sensitive species.
Minor – Disturbance to threatened, endangered, or sensitive species would be limited to portions of the park.
Moderate – Disturbance of threatened, endangered, or sensitive species would occur throughout the park, but would not extend into lands adjacent to the park.
Major – Disturbance of threatened, endangered, or sensitive species would occur throughout the park and extend widespread into adjacent lands.

Impacts of *Alternative A* to threatened and endangered species: The impacts of fire in the grasslands landscape produce overall benefits to the habitats of the concerned threatened and endangered species at Wind Cave National Park. Suppression of all wildland fires has the potential to decrease this benefit. However, prescribed fire within the park will offset this decrease by burning to increase and improve natural habitats. A small amount of stress would be placed on individual animals in the form of energy demands during fire avoidance and/or human avoidance during suppression activities, but poses little risk to populations.

<u>Conclusion</u>: Based on the benefits of habitat improvements gained through fire on the landscape, and the short-term, minor negative impacts on individuals, implementation of this alternative may affect, but is not likely to adversely affect, threatened and endangered species.

The no action alternative would not produce major adverse impacts on air quality resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of cave resources or values as a result of continuation of the no action alternative.

Impacts of *Alternative B* to threatened and endangered species: Similar to the fire effects in Alternative A, this alternative would show a similar response by threatened and endangered species and their habitats. The reduction of regeneration and forest fuels may further benefit wildlife, in particular prairie dogs in reopening areas where forest expansion has altered habitat.

<u>Conclusion</u>: Based on the benefits of habitat improvements gained through mechanical treatments and prescribed fire on the landscape, threatened and endangered species are likely to experience long-term, moderate positive benefits and implementation of this alternative may affect, but is not likely to adversely affect, threatened and endangered species.

The preferred alternative would not produce major adverse impacts on threatened and endangered species or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of threatened and endangered species or values as a result of the implementation of the preferred alternative.

VEGETATION

Impacts to vegetation resources common to both alternatives:

Researchers are in agreement that fire provides an overall benefit to the continued growth, health, and maintenance of the mixed-grass prairie ecosystem. (Vogl 1979; Wright and Bailey 1980). Although there appears to be some conflict in research findings relative to whether fire benefits or harms particular species during specific stages of growth (and the degree of benefit or harm resulting to affected species), there is general agreement that fire plays an integral role in maintaining the mixed-grass prairie ecosystem. Collins and Gibson (1990) documented the need for an interaction of four different disturbance types, including fire, to maintain diverse community structure in mixed-grass prairie. In the absence of fire, species richness (the number of species per unit area), evenness (the distribution between dominance among species) and patch structure (the association of species at various spatial scales) may change. The absence of fire tends to increase woody species and reduce species richness and patch structure.

Given the rapid growth characteristics and the chemical composition of most mixed-grassland species, decomposition occurs slowly in the absence of fire in this ecosystem. In forested areas, down-dead material also has extended decomposition times. Thus, fires have the direct effect of removing stagnant, dead plant accumulations while converting that mass to ash and charcoal. The blackened, burned areas protect underlying soils by joining remaining unburned vegetation and charcoal bits and help to raise the soil temperature by several degrees, particularly in the spring. The ash/charcoal material returns a number of minerals and salts to the soil, thus recycling them for new plant growth. Indirectly, higher temperatures increase fungal, bacterial, and algal activity, which in turn increases available nitrogen. The increased microorganism activity also helps to increase soil temperatures while aiding in nutrient recycling. Fire generally improves mixed-grassland and forest soils. In addition to increasing nitrification of the soils and increasing minerals and salt amounts in the soil, the ash and charcoal residue resulting from incomplete combustion aids in soil buildup and soil enrichment by being added as organic matter to the soil profile. The added material works in combination with dead and dying root systems to make the soil more porous, better able to retain water, and less compact while increasing needed sites and surface areas for essential microorganisms, mycorrhizae, and roots. In general, fires tend to stimulate plant growth, resulting in larger, more vigorous plants, greater seed production, and increased protein and carbohydrate contents. Fires tend to increase species diversity, and reduce woody species relative to grass and forb species. (Vogl 1979; Wright and Bailey 1980).

Research indicates the species such as western wheatgrass, threadleaf sedge, blue grama, chokecherry, and willow are beneficially affected by fire, although responses vary somewhat depending on seasonality, frequency, and soil moisture conditions. Needle-and-thread is relatively intolerant of fire and may be decreased (Bradley et al. 1992).

Cool-season, non-native grasses are usually decreased by fire, although responses vary somewhat depending on seasonality, frequency, residence time, and soil moisture conditions. Research indicates that both Japanese brome and Kentucky bluegrass may be reduced by spring fire (Gartner 1978; Blankespoor 1987). Research conducted outside the park indicates that crested wheatgrass, smooth brome, and downy brome are also decreased by fire, particularly by repeated spring fires (Lodge 1960; Young and Evans 1978). Native cool-season grasses will also be affected by spring fires.

Generally, a grassland without fire (either prescribed or natural) has an increased abundance of cool season non-native grasses, a lack of native forbs, and an increase in woody vegetation. As the National Park Service strives to restore and/or maintain naturalness at Wind Cave National Park, the altered condition of plant composition and distribution that would result an absence of fire would be a negative, long-term impact to vegetation resources.

Both alternatives provide for the use of prescribed fire for resource benefits. That is, prescribed fire may be used to stimulate the growth of native species or reduce the growth of exotic species, either directly or indirectly. This may be the primary goal of a prescribed fire, or a product of prescribed fire for fuel reduction. In many cases, a prescribed fire unit identified for fuel reduction would be burned during a specific season and with a specific ignition pattern based on the species composition, thus realizing both resource benefits and fuel reduction. Fire monitoring would continue to be used to assess the effects of fire on specific species, following the National Park Service Fire Monitoring Handbook protocols (2003c). The direct and indirect effects of prescribed fires are generally beneficial to the native vegetation species, although individual plants of some species may be destroyed by fire. Indirectly, areas disturbed by fire may be prone to invasion by exotic species such as common mullein and Canada thistle. All prescribed fire units would be assessed before the burn and fire may be excluded from sensitive resources or exotic species populations that increase with fire. A post-burn survey would be conducted as part of the park’s on-going weed management program, and exotic species would be treated with appropriate integrated pest management techniques.

Both alternatives provide for suppression of unwanted wildland fires that would have a direct negative effect on vegetation. The impact of suppression activities would be reduced by the use of minimum-impact suppression strategies. That is, suppression would generally favor wet-line (water) or scratch-line (hand tools) over fire breaks made by heavy equipment. The use of minimum impact suppression strategies would reduce the impact on vegetation resources. However, suppression activities would likely result in trampling or removal of vegetation and compaction of soil along routes of travel and fire lines, thus providing disturbed areas that may be invaded by exotic species such as Canada thistle, knapweeds, and field bindweed.

Evaluation Criteria

The following definitions apply to impact descriptions for the vegetation category:

Context: Geographic extent or scope of the impact.

Duration:

Short-term – Effect of each impact lasting a few days to weeks.
Intermediate – Lasting from a few weeks to months.
Long-term – Lasting from a few months to years.

Intensity:

Negligible – No native terrestrial plant communities and/or aquatic plant communities would be disturbed; and there would be no direct or indirect impacts on native vegetation.
Minor – Disturbance of regionally typical native terrestrial plant communities and/or aquatic plant communities would be small portions within the park.
Moderate – Disturbance of regionally typical native terrestrial plant communities and/or aquatic plant communities would occur. The area of disturbance would be in large areas of the park, but would not extend beyond park boundaries.
Major – Disturbance of regionally typical terrestrial plant communities and/or aquatic plant communities would extend outside park boundaires.

Impacts of *Alternative A* on Vegetation: Under Alternative A, all wildfires would be suppressed. Consequently, there would be suppression activities and impacts to vegetation resources would be greater than if the wildland fires were allowed to burn. However, because prescribed fire would also be utilized under this alternative, fire would be used as a tool to simulate natural conditions and also accomplish management objectives. Through manipulation of the timing of burns fire would be used to promote native species growth and reduce exotic species such as smooth brome (*Bromus inermis*). Prescribed fire can also mimic natural fire return interval to maintain vegetative cover, appearance, and seral stage. Prescribed fire can also reduce fuel loading, thereby minimizing impacts of later wildfire suppression activities.

<u>Conclusion</u>: The direct impacts of fire and equipment on individual plants would result in short term, minor negative impacts on vegetation resources. This would be mitigated by the direct impacts on species composition of the fire dependent plant communities through a planned and timed prescribed fire program. Implementation of this alternative would result in long-term, minor positive impacts to vegetation resources.

The no action alternative would not produce major adverse impacts on vegetation resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of vegetation resources or values as a result of continuation of the no action alternative.

Impacts of *Alternative B* on Vegetation: In Alternative B, impacts through wildfire suppression would be similar to Alternative A. Because mechanical treatment of vegetation would be utilized, impacts to vegetative resources would be minimized in the use of prescribed fire in the reduction of fuel loads.

<u>Conclusion</u>: The direct impacts of fire and equipment on individual plants would result in short term, minor negative impacts on vegetation resources. This would be mitigated by the direct impacts on species composition of the fire dependent plant communities through a planned and timed prescribed fire program. Implementation of this alternative would result in long-term, moderate positive impacts to vegetation resources.

The preferred alternative would not produce major adverse impacts on vegetation resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of vegetation resources or values as a result of the implementation of the preferred alternative.

WILDLIFE

Impacts to wildlife common to both alternatives:

Many researchers have documented that fire provides an overall benefit to the density, diversity, health, and maintenance of native prairie wildlife species. Fire can have direct mortality on small mammals, some invertebrates, reptiles, and amphibians and other non-mobile wildlife. Mobile species may be impacted indirectly by fire through reductions in the amount of potential nesting, resting and foraging habitat and by increased predation. These impacts are usually short-term. Conversely, fire can also provide excellent foraging areas for small mammals and many ungulates after the burn. In general, most researchers believe that fire plays an important role in maintaining the native ecosystems and healthy diverse wildlife populations. Most divergence in philosophy between the positive and negative benefits of fire is found in differences of opinion on the intensity, duration and frequency of fire applied to a particular landscape or wildlife species; large, unplanned and uncontrolled fires can devastate small remnant native species populations. Smaller, managed fires create vegetation mosaics beneficial in the long-term to nearly all native species. Possible direct and indirect effects on some of the common small mammals, ungulates, birds, reptiles and amphibians found within Wind Cave National Park are discussed below.

- *Small Mammals*

  Wildland and prescribed fire may have some direct mortality on small mammal species, as individual animals may perish due to exposure to smoke, flames, or equipment. Indirectly, fire may impact the population as a result of reducing the amount of available cover and increasing the amount of predation by raptors and other animals. Rodent populations in grasslands usually show an initial drop after fire due to high amounts of raptor predation (Cook 1959). Effects of fire on prairie dog towns is addressed in the "Threatened and Endangered Species" section.

  Fires that create a mosaic of burned and unburned areas are probably the most beneficial to small mammal species because their densities have been found to increase in areas where mosaics have been created following a burn (Landers 1987; Taylor 1981; Hooven 1973; Cornely et al 1983). Several studies indicate that many small mammal populations increase rapidly subsequent to burning because of the resulting increase in the quality and quantity of food. As fire stimulates post-burn grass production, a corresponding increase in small mammal populations is evident.

  One larger mammal species in the mesocarnivore category prevalent throughout Wind Cave National Park is the coyote (*Canis latrans*). Since coyotes prey upon many species in the small mammal category, fire may improve coyote foraging habitat and amount of prey available by maintaining prey habitat and make hunting easier by opening up the habitat.

- *Ungulates*

  Fire probably does not have direct mortality on most healthy ungulates because they are able to move away from the flaming front and out of harms way. The fire may kill sick, diseased, or immobile individuals. However, there have been documented cases of mule deer being trapped and killed by fast-moving fires (Davis 1976). Indirectly, fire may cause ungulates to concentrate in specific areas immediately after the burn to search for food or protective areas.

  Effects of fire on mule deer and white-tailed deer habitat are widely varied and well documented in the literature. In general, fires that create mosaics of forage and cover are beneficial. Deer prefer foraging in recently burned areas (once regrowth begins) compared to unburned areas, although preference may vary seasonally (Davis 1976; Davis 1977; Williams et al. 1980). This preference may indicate an increase in plant nutrients, which usually occurs following fire. Burning in grassland communities reduces litter that otherwise inhibits new growth of grasses. This rejuvenates and improves these communities, which are important winter range in some areas, and can increase nutrient content and palatability of forage (Dasmann and Dasmann1963).

  Pronghorn antelope are primarily a forb-eating species with strong requirements for open cover. Pronghorn are favorably influenced by the increase in herbaceous species and reduction of shrubs after fire. Nutritional benefits of fire on forage may last up to 4 years after the fire with an increase in primary productivity for a longer period depending upon plant species (Higgins et al. 1989).

  Studies have shown that forage species preferred by elk experience an increase in nutrient content following fire (Asherin 1973; DeByle et al 1989), however, some studies also conclude that quantity of forage increases more than quality and is important (Bartos and Mueggler 1979; Canon 1985; Leege 1979; Lowe 1975). As with deer, elk usually prefer foraging in burned sites

(Canon 1985; Canon, et al. 1987; Chapman and Feldhamer 1982; Leege 1979; Lowe 1975). It has been shown that intensive grazing can reduce the ability of range to carry fire by reducing fuel buildup (Skovlin 1982). Forbs, grasses, shrubs, edge effect, and snags were increased in a Southwestern ponderosa pine forest following fire and elk utilization of the area increased, peaking 7 years after fire (Lowe 1975).

Bison are also impacted directly and indirectly by fire. Fires commonly occur on bison ranges without causing appreciable bison mortality. Fire is important in creating and maintaining bison habitat by regenerating grasslands and enhancing production, availability, and palatability of many forage species. During pre-settlement times bison habitats were, to a large extent, created and maintained by lightning-caused fires or fires set by Indian Americans. Several studies have shown that bison prefer to forage on recently burned areas. During the first post-fire years following a fall prescribed fire in grassland habitat at Wind Cave National Park, bulls were found less often than cow-calf herds on burned sites. Both cow-calf herds and bull groups tended to use the burn more in June of the first post-fire season than at any other time. However, only cow-calf herds consistently grazed the burn during the rest of the summer (Coppock and Detling 1986).

- *Birds*

Direct mortality from fire probably does not usually occur in most bird species because they are able to move out of harms way. Fire occurring during the nesting season may kill ground nesting bird species such as the sharp-tailed grouse and ferruginous hawk. Indirectly, fire may cause birds to nest in other areas immediately after the burn if specific nesting areas are burned. Fire may cause some nesting bird mortality from asphyxiation if they remain on their nest during a burn. However, this is not usually the case, and fire is believed by most ornithologists to be an important factor in creating and maintaining ground nesting bird habitat. Fires that reduce tall cover enhance lek viability and quality for the sharp-tailed grouse also, because these birds need open habitat with good horizontal visibility. Much of the prairie habitat in which sharp-tailed grouse occur was largely maintained by fire in pre-settlement times (Grange 1948). On native northern mixed-grass prairie in South Dakota, sharp-tailed grouse were absent in an unburned control area, which contained dense grass. They were present on a less dense burned area within a few months following the fire (Huber and Steuter 1984).

Fire-related mortality of burrowing owl, an uncommon bird found in Wind Cave National Park, has not been documented in the literature. Burrowing mammals that stay in their burrows during fire are usually unharmed; burrowing owls in their burrows during fire probably are probably unharmed as well. Some burrowing mammals have asphyxiated in their burrows during fire and this may also happen to burrowing owls. When caught outside their burrows during fire, adult burrowing owls probably escape fire easily; some young that cannot yet fly may be injured or killed. Fire affects burrowing owl in two ways: by altering vegetation and by altering their prey base. Wright and Bailey (1982) identified three major fire-dependent plant associations (grassland, semi-desert grass-shrub, and sagebrush-grass) in which burrowing owls occur. They found that frequent fire can maintain or improve burrowing owl habitat by reducing plant height and cover around burrows and by controlling woody plant invasion. Periodic fire in grasslands probably increases prey diversity for raptors including burrowing owl, and may increase overall prey density. After a 1- to 3-year reduction in prey, rodent numbers usually match or exceed pre-fire levels. Also, at Wind Cave, burrowing owls are generally found in prairie dog towns where vegetation is kept cropped and are thus not likely to support fire.

- *Reptiles and Amphibians*

Very little information is available in the literature on the direct effects of fire on snakes, lizards and turtles but in general, there may be some direct mortality. Small microhabitat areas near, and in woody draws and slumps that do not support frequent fires build up high fuel loads. These areas support a more homogeneous, hotter fire that may have a detrimental effect on turtles because brush fires can be lethal to turtles because they move so slowly (Gibson et al. 1990). Fragments of tortoise shells have been found in burned areas (Woodbury and Hardy 1948). Indirectly, fire may impact snake, lizard, and turtle populations as a result of lowering the amount of foraging cover, thereby increasing predation by raptors and other animals. Very little information is available in the literature on the direct effects of fire on frogs and salamanders. The fact that there are no reports of high mortality for any herptile species may indicate that many amphibians are not highly vulnerable to fire (Means and Campbell 1981). Indirectly, fire may impact amphibian population as a result of lowering cover and increasing predation by raptors and other animals.

- Invertebrates

  The direct and indirect effects of fire on invertebrates are variable. There may be some direct mortality of larvae and adult insects from fire. Generally, however, insect populations in grassland habitats recover quickly from fire. Most grasshopper species increase after spring fire due to increased nutritional quality of new grasses. On native tallgrass prairie in Kansas, grasshopper numbers were highest after early spring prescribed fire, followed by mid-spring burning. Grasshopper numbers were lowest on late-spring burned sites. In a review of fire effects on insects, Warren and others (1987) reported that grasshoppers and crickets (Orthoptera) generally increase after fire in any season; however, "hot" grass fires that occur before Orthoptera have developed wings may reduce their numbers.

Evaluation Criteria

The following definitions apply to impact descriptions for the wildlife category:

Context: Geographic extent or scope of the impact.

Duration:

Short-term – Effect of each impact lasting a few days to weeks.
Intermediate – Lasting from a few weeks to months.
Long-term – Lasting from a few months to years.

Intensity:

Negligible – There would be no direct or indirect impacts on wildlife.
Minor – Disturbance to wildlife would be limited to portions of the park.
Moderate – Disturbance of wildlife would occur throughout the park, but would not extend into lands adjacent to the park.
Major – Disturbance of wildlife would occur throughout the park and extend widespread into adjacent lands.

Impacts of *Alternative A* to wildlife: Because this alternative calls for suppression of all wildland fires, suppression activities could impact and potentially disturb many wildlife species. Wildland fire suppression is completed under situations when pre-burn surveys are difficult if not impossible to perform. However, because prescribed fire would be utilized under this alternative, fire would be used as a tool to simulate natural conditions and accomplish multiple management objectives, including habitat improvement. Prescribed fire can also reduce fuel loading, thereby reducing impacts to wildlife of later wildfire suppression activities.

<u>Conclusion</u>: Based on the potential benefits of habitat improvements in parts of the park, long-term, minor positive impacts to wildlife resources would likely occur.

The no action alternative would not produce major adverse impacts on wildlife resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of wildlife resources or values as a result of continuation of the no action alternative.

Impacts of *Alternative B* to wildlife: In Alternative B, impacts to wildlife resources through wildfire suppression would be similar to Alternative A. However, because this alternative calls for mechanical treatment, wildlife surveys would be conducted in areas being treated. In addition, mechanical treatment of areas aids in the reduction of dense forest thicket uncharacteristic of ponderosa, as well as the reduction of fuel loads that promote hotter, more catastrophic fires. Mechanical treatment along with prescribed fire would be used as a tool to more completely simulate natural conditions and accomplish multiple management objectives, including habitat improvement. Through manipulation of the timing of prescribed fire, fire would be used to promote natural conditions that benefit wildlife. Mechanical treatments and prescribed fire would reduce fuel loading, thereby minimizing impacts to wildlife of later wildfire suppression activities. Habitats and forage would be rejuvenated in large portions of the park in a pre-Columbian timeframe, thus positively impacting many species.

Conclusion: Based on the potential benefits of habitat improvements in parts of the park, long-term, moderate positive impacts to wildlife resources would likely occur.

The preferred alternative would not produce major adverse impacts on wildlife resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, or (3) identified as a goal in the park's general management plan or other National Park Service planning documents. Consequently, there would be no impairment of wildlife resources or values as a result of the implementation of the preferred alternative.

MITIGATION SUMMARY FOR PREFERRED ALTERNATIVE

Mitigation measures to reduce impacts are included in the preceding discussion of environmental consequences specific to each impact topic. In many cases the same mitigation measure may serve to reduce impacts on a number of resources. To reiterate, those actions are presented below by mitigation measure, rather than impact topic. Specific mitigation measures to be utilized for individual fires will be identified in the prescribed fire plan.

Pre-fuel treatment and prescribed fire Vegetation Surveys:

Prior to completion of Fuel Treatment or Prescribed fire Plan for an area, the site would be surveyed by Resource Management staff to:

- Identify locations of fire intolerant, desirable native plant populations. The burn would be planned to exclude fire in those areas where feasible.
- Identify locations of exotic species populations that may increase with fire. The burn would be planned to exclude fire in those areas where feasible.
- Identify long-term research plots that may be adversely affected by fire. The burn would be planned to include or exclude fire in those areas as appropriate.
- Identify and salvage, as appropriate, paleontological resources that would be impacted by fire. If a significant site is located, the site may be evaluated to determine if mitigation measures are needed or if fire should be excluded in that area.

- Identify archaeological artifacts that would be impacted by fire. If a significant site is located, either fire would be excluded from that area or it would be subject to a full site assessment including the impact fire would have specifically on the type of resources associated with the site.

Post-fuel treatment and prescribed fire Surveys:

- A post-burn survey would be conducted by Resource Management staff as part of the park's on-going weed management program, and exotic species would be treated with appropriate integrated pest management techniques.
- Post burn surveys would be conducted by the Northern Great Plains Fire Effects Monitoring Team to evaluate the degree to which fire objectives are accomplished.

Smoke Management:

- All prescribed fire plans will include prescriptions for appropriate smoke dispersal to avoid impacts to park neighbors.

Holding Crews:

- All prescribed fire plans will include identification of needed holding personnel based on formulas developed by the National Wildfire Coordinating Group. The fire will not be conducted without the identified resources in place and ready to prevent escapes.

Designate Routes of Travel:

- In prescribed fire, the information collected in the pre-burn survey would be used to designate routes of travel and/or restrict travel in areas that contain sensitive resources.

Use of Minimum Impact Fuel Treatment and Fire Suppression Strategies:

- Favor wet-line or scratch-line (hand tools).
- Areas recommended for hand lining, trenching, and heavy equipment operation must first be reviewed by Park Resource Management staff and approved by the Park Superintendent.
- Aerial retardant use must be approved by the Park Superintendent.

Long-range Development of GIS Data:

- A detailed set of digital cultural resource and paleontological spatial data needs to be developed and incorporated into the park's geographic information system (GIS). These digital data should also include information that would identify preferred fire management activities in regard to specific sites and site types. Actions that could be identified include site avoidance (buffer area), use of physical or applied barriers, mechanical reduction of fuel loads, collection of certain artifact classes prior to burn, follow-up survey, and collection post-burn. Until a comprehensive set of data for the park is created, each prescribed fire plan will ensure information is known for that specific fire.

CUMULATIVE EFFECTS ANALYSIS

Cumulative impacts are described in regulations developed by the Council on Environmental Quality (CEQ), 40 CFR 1508.7. A cumulative impact is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of who undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Cumulative impacts were determined by combining the impact of the project alternatives with potential impacts of other past, present and reasonably foreseeable future actions. Therefore it was necessary to identify, other ongoing or foreseeable future projects within the surrounding region. The project identified includes:

<u>Wind Cave National Park General Management Plan</u>

The 1994 Final General Management Plan/Environmental Impact Statement and the 1994 Wind Cave Resource Management Plan outline the direction for proposed actions to protect park resources and enhance visitor experiences at the park. Fire management and planning have the potential to affect adjacent lands and sister agencies within the Southern Black Hills. Specific plans that relate to the actions proposed in this environmental assessment are summarized in Table 1.

The implementation of the proposed Fire Management Plan represents a continued commitment to be proactive in fire and fire management capabilities. The proposed action alternatives would not conflict with any ongoing or planned management activities within the park. Fire management furthers the objective of long-term protection and sustainable management of vital park resources.

It is likely that the General Management Plan anticipated and accommodates increased visitation. This increased visitation may result in increased emissions from vehicles, thus an impact on air quality. The cumulative effects of increased emissions from visitor vehicles and emissions from fire events could be adverse, although it is difficult to predict the magnitude of emissions. Smoke from prescribed fire events would generally occur in spring and fall when visitation is generally moderate. During the peak visitor season of mid-summer, smoke would generally be from wildland fires that could occur in absence of this Fire Management Plan. Adoption of the preferred alternative of the Fire Management Plan would implement a fire prevention strategy that would decrease emissions caused by wildland fires overall.

Other impacts associated with the General Management Plan may be construction in developed areas and the potential to impact vegetation or wildlife would be minimized. As a standard policy, all ground disturbing activities, such as would be associated with new construction, are reviewed by the Park Management Team. As needed, excavations are monitored by physical scientists and/or archaeological monitors to protect those resources. Due to the limited extent of new construction proposed by the General Management Plan and the monitoring protocols already in place, significant cumulative impacts to vegetation, wildlife, paleontological resources, and cultural resources are not anticipated.

Table 3. Project Relationship to Other Plans.

Management Activity	Relationship to Proposed Action
Develop a comprehensive vegetation management plan and accompanying compliance documentation. This project is currently underway.	Long-term fire suppression has altered natural processes affecting vegetation in the park. Disturbance in the park has led to increased presence of exotic species in some areas. Implementation of a Fire Management Plan would complement an integrated approach to vegetation management, including exotic species.
Replacement of the failing wastewater treatment facility (NPS 2003b). This project is currently underway.	The park's sewage treatment lagoons and proposed sewer line are adjacent to Highway 385, in the west portion of the park. This project would have no effect on water quality or sewage.
Project to resurface Highway 87 and two bridges within the park. This project is currently underway.	Highway 87 is one of the main north-south access routes within the park. Coordination of construction and burns would be needed to minimize impacts on air quality and visitor experience.
Development of a Bison Management Plan and accompanying compliance documentation. This project is currently underway.	Long-term fire suppression has altered natural processes affecting wildlife habitat in the park. Implementation of a Fire Management Plan would complement the park's bison management planning efforts.
Development of an Elk Management Plan and accompanying compliance documentation. This project is currently underway.	Long-term fire suppression has altered natural processes affecting wildlife habitat in the park. Implementation of a Fire Management Plan would complement the park's elk management planning efforts.
Development of a Prairie Dog Management Plan and accompanying compliance documentation. This project is currently underway.	Long-term fire suppression has altered natural processes affecting wildlife habitat in the park. Implementation of a Fire Management Plan would complement the park's prairie dog management planning efforts.
Construction of a Fire Cache Structure and accompanying compliance documentation. This project is currently underway.	The proposed fire cache structure would be adjacent to the park current fire office. This project complements the need for a fire cache and the ability to consolidate fire management resources.

Energy Development Proposals

There are several proposals for energy development that may impact Wind Cave National Park, primarily from the aspect of air quality. These proposals include coalbed methane development in the Powder River Basin of Wyoming and Montana (2 EIS's have been developed by the Bureau of Land Management), the WYGEN II power generating plant (Wyoming state permit), and the Dakota, Minnesota and Eastern (DM&E) Railroad being developed to haul coal from Wyoming to generating plants in Wisconsin.

The DM&E is seeking a permit from the Surface Transportation Board (STB) to reroute and upgrade a railroad from Wyoming to Minnesota. The primary purpose of this railroad is to transport coal to the east (Wisconsin, Illinois) to supply power plants. The preferred alternative places the railway corridor within twenty miles of the southern boundary of Wind Cave National Park. The National Park Service reviewed the Draft Environmental Impact Statement (DEIS) prepared on the proposed railroad expansion. NPS comments were submitted as part of the Department of the Interior's response on the DEIS. Based on review of the DEIS, the NPS is concerned that the project would result in impacts to air quality at Wind Cave National Park. STB has pushed for permitting the railroad expansion over the NPS concerns. The Final EIS did not fully address NPS concerns.

Extensive coalbed methane development has been proposed for southeastern Montana/northeastern Wyoming. Over 50,000 wells are planned. NPS has found the two EIS's for the project do not adequately address air quality concerns in Class I parks (Badlands and Wind Cave). NPS does not feel BLM has been responsive to our concerns.

The cumulative effects of the DM&E railroad project and other energy development efforts, and the implementation of the preferred alternative of the Fire Management Plan would have adverse effects on air quality. However, the emissions from the trains, generating plants and gas wells would be more long-term and persistent than the short duration of smoke generated by very infrequent fire events.

Implementation of the Fire Management Plan would restore a fundamental natural process to the park, thus having the beneficial effect of increasing vigor of native species, increasing species diversity, and increasing the diversity of plant communities due to the mosaic pattern caused by burning.

IMPAIRMENT

Under NPS *Management Policies*, Section 1.4 *et seq.* (2000), park managers must determine if management activities constitute an impairment to park resources, and that an "impairment of park resources and values may not be allowed by the Service unless directly and specifically provided for by legislation or by the proclamation establishing the park." *Policies* defines impairment as "an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values."

Adoption of the preferred alternative, Alternative B would not constitute an impairment of the resources and values Wind Cave National Park was established to preserve. In fact, the purpose of the Fire Management Plan is to implement a program that enhances the integrity of park resources and the ecosystem with which they are linked by restoring an essential natural process. In the case of non-renewable resources such as archeological resources, actions would be taken in conjunction with adoption of this fire management strategy to mitigate the potential negative impacts to significant resources.

6. CONSULTATION AND COORDINATION

In accordance with the Endangered Species Act of 1973, Section 7 consultation with the U.S. Fish and Wildlife Service concerning impacts to threatened and endangered species was initiated during the writing of this EA (U.S. Fish and Wildlife Service 2004). Once the draft EA is completed and published, the U.S. Fish and Wildlife Service will have the opportunity to comment and concur with the findings, and thus completing consultation requirements. U.S. Fish and Wildlife Service comments and recommendations will be included with the final Fire Management Plan and EA.

In accordance with Section 106 of the National Historic Preservation Act, consultation with the State Historic Preservation Officer was initiated on Feburay 8, 2005. That office will be provided a copy of the entire Fire Management Plan, including this Environmental Assessment, for review and comment during the public review period. The comments of the State Historic Preservation Officer will be included with the final Fire Management Plan and EA.

This EA is being made available to the public and other agencies in a number of ways:

The public and others may request a copy by contacting the superintendent's office, or by visiting the NPS website http://parkplanning.nps.gov/wica.

Copies of the EA have been mailed to the following agencies and organizations:

Federal Agencies and Government
Dept. of Agriculture
  U.S. Forest Service
Dept. of the Interior
  National Park Service
    Badlands National Park
    Jewel Cave National Monument
    Mt. Rushmore National Memorial
  U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency Region VIII
U.S. Congressional Representatives from South Dakota

State and Local Agencies and Governments
Custer County Commissioners
Custer Volunteer Fire Department
Pringle Volunteer Fire Department
South Dakota State Historic Preservation Officer
Tribal Historic Preservation Officer(s)

Indian Tribes
Crow Creek Sioux Tribal Council
Ponca Tribe of Oklahoma
Apache Tribe of Oklahoma
Rosebud Sioux Tribal Council
Cheyenne River Sioux Tribe
Three Affiliated Tribes Business Council
Arapaho Business Committee
Lower Brule Sioux Tribal Council
Fort Peck Tribal Executive Board
Standing Rock Sioux Tribal Council
Ponca Tribe of Nebraska
Northern Cheyenne Tribal Council

Cheyenne-Arapaho Tribes of Oklahoma
Santee Sioux Tribal Council
Oglala Sioux Tribal Council
Standing Rock Sioux Tribe
Cheyenne River Sioux Tribe
Fort Belknap Community Council
Yankton Sioux Tribal Bus. & Claims Comm.
Sisseton-Wahpeton Sioux Tribal Council

Private Agencies
Black Hills Power, Inc
Golden West Companies

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National Park Service
U.S. Department of the Interior

Finding of No Significant Impact
December 2005

Fire Management Plan

Wind Cave National Park
South Dakota

FINDING OF NO SIGNIFICANT IMPACT
FIRE MANAGEMENT PLAN
Wind Cave National Park, South Dakota

Congress established Wind Cave National Park in 1903 to protect Wind Cave. Since the original designation, the purpose of the park has expanded from cave preservation alone to management of both surface and subsurface resources. The primary features of the park are the cave, recognized worldwide as a significant site, and the surface ecosystem which supports plains and hills grasslands and forests, as well as a wide variety of wildlife, including bison, elk, and prairie dogs. In order to preserve these values, an active fire management program is required to maintain the fire dependent ecosystem. The primary values protected include scenic and geologic values, large expanses of remnant native mixed-grass prairie and ponderosa pine forest, associated native wildlife species, and the human occupation story for the past 11,000 years.

Wind Cave National Park contains large tracts of continuous fine fuels and large tracts of, what are now, closed stands of long-needled pine. Fire is a fundamental ecological process that influences plant and animal diversity and distribution as well as abiotic processes such as erosion, nutrient cycling, and soil genesis. Both natural and human-caused ignitions have historically influenced the landscape at Wind Cave National Park. The park implemented its existing Fire Management Plan in 1999, which emphasizes fire suppression and the use of prescribed fire for fuel reduction. The National Park Service has used prescribed fire as a management tool since the early 1970s at Wind Cave. However, prescribed fires have not been sufficient to maintain forest stands in natural situations, which have resulted in forest canopy closure with attendant fuel buildup and forest spread into park grasslands.

The National Park Service's Fire Management Policy (Director's Order #18: Wildland Fire Management) was revised in 2003, with specific guidance (Reference Manual #18: Wildland Fire Management).

The park analyzed two alternatives for management of fire within the park:

- Under the No Action Alternative, the park would continue the existing practice of prescribed fire to reduce fuel loads and to achieve resource management goals. In addition, fire suppression would continue, with no natural ignitions burning under any circumstances.
- Under the preferred alternative, the park would continue the existing practice of fire suppression as well as using prescribed fire to achieve resource management goals and the reduction of fire fuels. In addition, the park would utilize fuel treatments of forested areas to aid in prescribed fire preparation and reduce fire fuel hazards.

Unlike the no action alternative, the preferred alternative actively works to bring forested areas to more safe and manageable conditions for the continued use of prescribed fire within the park. Implementation of the action alternative would result in beneficial conditions to natural resources and provide a safer human environment both in and out of the park.

PREFERRED ALTERNATIVE

Under the preferred alternative, the park's fire management program would continue the use of prescribed fire for fuel reduction throughout the park, as well as to achieve resource management goals. Fire suppression would continue as in the past, as the park would not allow natural ignitions to burn under any circumstances.

Suppression of all wildfires will be a priority in the park, with all suppression efforts directed to safeguarding life and property while protecting park resources from harm. The park will evaluate all fires to determine the appropriate management responses considering vegetation terrain, fire behavior/effects, cultural resources, access, developed areas, and political boundaries.

In addition, the park will use mechanical treatments in preparation for and in conjunction with prescribed fire treatment. Treatments may include the following:

- cutting lower limbs from trees to reduce ladder fuels and the potential for crown fire;
- cutting ponderosa regeneration to reduce fire intensity and restore open ponderosa/mixed-grass ecosystem;
- tree felling to add to ground fuel loads to carry fire or break up canopy for reduction of canopy closure;
- mowing grass to create fuel breaks
- hose lays or the potential use of ATV with tanks; and
- construction of fire breaks.

Mechanical treatments are not to be the park's long-term primary management tool for forested areas. These will be used to move forest conditions to a point where they could be largely maintained by prescribed fire and then their use would be limited and would diminish over time.

OTHER ALTERNATIVES CONSIDERED

An analysis of the purpose and need led to the dismissal of an additional alternative that failed to meet the project objectives.

Wildland Fire Use: Wildland fire use is allowing natural ignitions to burn, with no management action taken. Although this alternative would restore fire to a natural state, this would create a significant risk to lives, property and park resources. Because of staff limitations, small land management size, long response times, valuable cultural resources, and values at risk on neighboring lands, allowing uncontrolled wildland fires would not meet resource objectives and could potentially violate a number of state and federal resource laws; therefore, it was not analyzed further.

No Prescribed Fire: The NPS mission is to protect and preserve the native ecosystems it manages for the enjoyment of future generations. Guided by this mandate, the national fire management program focuses on restoring and maintaining fire as a natural process while protecting human life and property. Furthermore, RM-18 directs parks to scientifically manage wildland fire using best available technology as an essential ecological process to restore, preserve, or maintain ecosystems and use resource information gained through inventory and monitoring to evaluate and improve the program. To help in achieving these long-term goals, the NPS has a comprehensive fire management program including hazardous fuels reduction, prescribed fire, wildland fire for resource benefit, and wildland fire suppression. Native species in Wind Cave National Park evolved with fire, and many are dependent upon fire for their continued survival. Natural fire events are fewer due to land management practices and suppression activities associated with human utilization of landscapes surrounding the park, making prescribed fire necessary to replicate historic fire frequency. Because the absence of prescribed fire would result in degradation of the native ecosystem at Wind Cave National Park, this alternative was not further analyzed or incorporated into other alternatives.

Mechanical Treatment Alone: Under this alternative, removal or manipulation of hazard fuel buildups would be by mechanical means only. Removal of fuel by mechanical means alone would leave the majority of the land within the park with no viable method to remove fuel loads. Approximately 63% of the land cover at Wind Cave is composed of grassland, with the remainder as forest, woodland, or shrublands. The only mechanical treatment available in the grasslands is mowing, however, the rugged terrain and rapid growth of grasses during the summer months preclude mowing as a viable fuel reduction treatment. Furthermore, widespread or frequent mowing would cause unacceptable visual impacts to the park's prairie resources (long lasting tracks from the mower) and tends to encourage encroachment by exotic plant species. Forests cover approximately 29% of the park. This treatment most often employs chainsaws to remove woody fuels (i.e. trees) to reduce fuel loads. Cut materials would require removal, causing additional unacceptable visual impacts to the park's forest areas (long lasting stumps and tracks from vehicles) and again encourages encroachment by exotic plant species. Although this alternative would protect people from fire and minimize impacts of wildfire on park and adjacent lands and resources, it fails to restore fire as a fundamental ecological process within the park. In addition, this alternative would have extremely high costs and would result in substantial damage to the resources from heavy equipment use. Therefore this alternative was not analyzed further.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which is guided by the CEQ. The CEQ provides direction that "[t]he environmentally preferable alternative is the alternative that will promote the national environmental policy" as expressed in NEPA's Section 101b:

a. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
b. Ensure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings;
c. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
d. 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;
e. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
f. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The preferred alternative provides greater flexibility in the management of smoke and prevention of air quality degradation by using prescribed fire, including burning of brush piles, in a wider variety of seasons, prevention of smoke in local communities would be easier to achieve.

Under the preferred alternative, park managers would have better capability to protect cultural resources through fuel treatments and prescribed fires that burn in more predictable patterns. Prescribed fire alone, as outlined in no action alternative, would increase the risk of damage or loss to cultural resources, as fires with little or no pre-treatment have a wider variance in predictable behavior and thus greater potential to harm cultural resources.

As examined, both alternatives present no substantive differences in impact on threatened or endangered species.

The preferred alternative provides greater ability to place fire on the ground in the season and area needed to achieve desired results in the vegetative communities, especially for reduction of exotic species and restoration of natural ecosystem processes. In addition, the preferred alternative also provides greater ability to manage and enhance wildlife habitat within the park through utilization of fuel treatment and fire at the proper time and place.

The Environmentally Preferred Alternative is Alternative B, which is also the agency Preferred Alternative. This alternative has the greatest long-term positive environmental impacts with the least negative impacts. Specifically, the Preferred Alternative has significant long-term positive impacts by restoring a natural process that would support native plant growth and survival, while at the same time providing for safety and security of park and adjacent land resources. By supporting native plant species and communities, the Preferred Alternative would also have long-term benefits for the native mixed-grass prairie and forest ecosystem as a whole.

THE PREFERRED ALTERNATIVE AND SIGNIFICANCE CRITERIA

As defined in 40 CFR §1508.27, significance is determined by examining the following criteria: Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

Implementation of the preferred alternative will produce short-term, minor negative impacts to public health and safety resulting from smoke and smoke dispersion. However, long-term effects would be beneficial to the human environment in that the area would be less susceptible to catastrophic fire events through a reduction of forest fuel, opening of forest canopies, and reducing fire energy.

No significant adverse effects will occur as a result of implementing the preferred alternative. Due to the generation of smoke for short duration during mechanical treatment, prescribed fires, brush pile burning, and wildland fires before suppression, implementation of this alternative would result in short-term, minor negligible impacts to air resources.

The direct impacts of fire and equipment on individual plants would result in short term, minor negative impacts on vegetation resources. A planned and timed prescribed fire program would mitigate the direct impacts on species composition of the fire dependent plant communities. Implementation of this alternative would result in long-term, moderate positive impacts to vegetation resources.

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

As previously discussed, the generation of smoke for short durations during brush pile burning, prescribed fires and wildland fires before suppression, implementation of this alternative would result in short-term, minor negative impacts to public health and safety.

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

There are no prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas within the project area. However, as described in the environmental assessment, the biotic systems of caves are highly specialized, and impacts to these resources are considered long term. Although park cave resources nave no designation as ecologically critical areas, the unique nature of their ecosystem warrants a high level of protection. National Park Service policies require protection of geologic resources and processes. Burned areas may experience increased rates of erosion for short time periods following burns. However, this increase would be negligible given the short duration of the increase and the rapid response of ground cover vegetation that characterize the park landscape. In addition, studies show that fire occurred on regular intervals within the park and would have resulted in materials moving into cave and karst resources. Both alternatives support the establishment of fire return to the park and thus the potential for materials moving into cave and karst resources. Implementation of this alternative would result in long-term, negligible impacts to the geographic area.

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

There were no controversial impacts identified during the analysis done for the environmental assessment.

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

The risks to the quality of the human environment associated with the preferred alternative would be negligible. There were no highly uncertain, unique, or unknown risks associated with implementation of the preferred alternative.

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

The preferred alternative does not establish a National Park Service precedent for future actions with significant effects and does not represent a decision in principle about a future consideration.

Whether the action relates to other actions with individually insignificant but cumulatively significant impacts

Implementation of the preferred alternative will contribute long-term moderate beneficial impacts to public health and safety. The preferred alternative will not significantly impact the surface resources of Wind Cave National Park. Any adverse effects, in conjunction with the adverse impacts of any other past, present, or reasonably foreseeable future actions, will result in long-term negligible to minor impacts to cave and cultural resources, soils, vegetation, and visitor use and experiences.

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

Conducting prescribed fires within the park would be the greatest impact of implementation of the preferred alternative. This alternative has the potential to disturb exposed artifacts, cultural landscapes, and ethnographic resources. Completion of pre-burn fuel treatment projects increases the potential of identifying and protecting unknown cultural resources, thus reducing the potential for impact. Long-term, minor negative impacts to cultural resources may occur. Because wildland fire suppression is completed under emergency situations it is difficult to complete the pre-burn surveys and monitoring needed.

As confirmed by an October 17, 2005, letter received from the South Dakota State Historic Preservation Officer, State Historical Society, the preferred alternative would have no adverse effect to historic properties providing Wind Cave National Park complies with 36 CFR part 800 for all undertakings that have the potential to effect historic properties, such as ground disturbing activities, and all eligible and unevaluated archaeology sites and structures are avoided by activities associated with this plan.

Degree to which the action may adversely affect an endangered or threatened species or its critical habitat

There may be short-term, minor negative effects to threatened or endangered species resulting from implementation of the preferred alternative. The US Fish and Wildlife Service was contacted regarding this project, and the Service agreed through correspondence dated October 18, 2005, with the park's finding of no effect on threatened and endangered species.

Whether the action threatens a violation of Federal, state, or local environmental protection law

The preferred alternative would not violate any federal, state, or local environmental protection laws.

Impairment

In addition to reviewing the list of significance criteria, the National Park Service has determined that implementation of the preferred alternative would not constitute an impairment to Wind Cave National Park resources and values. This conclusion is based on a thorough analysis of the environmental impacts described in the project's environmental assessment, relevant scientific studies, and the professional judgment of the decision-maker guided by the direction in National Park Service Management Policies. Although implementation of the project would cause minor short and long-term adverse effects to air quality, cultural resources, public health and safety, and threatened and endangered species, in all cases these result from actions taken to preserve park resources. Overall, implementation of the preferred alternative would result in long-term moderate positive benefits to sustainability and long-term management, vegetation resources, and wildlife. Implementation of the preferred alternative at Wind Cave National Park would not result in impairment of any park resources or values.

PUBLIC INVOLVEMENT AND CONSULTATION

National Park Service internal discussions led to identification of the main issues addressed in this environmental assessment. To obtain public input on the proposed project, the park sent out two press releases concerning the plan and associated open house, which were printed in local papers. The park hosted the open house on October 6, 2005. Three individuals attended. All expressed support for the preferred alternative.

A number of American Indian Tribes have demonstrated interest in the areas within Wind Cave National Park. The following tribes and tribal representatives received copies of the draft environmental assessment for review and comment.

- Apache Tribe of Oklahoma
- Arapaho Business Committee
- Cheyenne-Arapaho Tribes of Oklahoma
- Cheyenne River Sioux Tribe
- Crow Creek Sioux Tribal Council
- Flandreau Santee Sioux Executive Committee
- Fort Belknap Community Council
- Fort Peck Tribal Executive Board
- Lower Brule Sioux Tribal Council
- Northern Cheyenne Tribal Council
- Oglala Sioux Tribal Council
- Ponca Tribe of Nebraska
- Ponca Tribe of Oklahoma
- Rosebud Sioux Tribal Council
- Santee Sioux Tribal Council
- Sisseton-Wahpeton Sioux Tribal Council
- Standing Rock Sioux Tribal Council
- Three Affiliated Tribes Business Council
- Yankton Sioux Tribal Bus. & Claims Comm.

The park contacted the South Dakota SHPO, who concurred with the park's determination that the preferred alternative would have no effect on historic properties through a letter dated October 17, 2005.

The US Fish and Wildlife Service agreed with the preferred alternative and the park finding of no adverse effect on threatened and endangered species through correspondence dated October 18, 2005.

Wind Cave National Park posted the environmental assessment on the NPS PEPC planning website on September 7, 2005. The park also mailed the Draft Fire Management Plan and Environmental Assessment to a recipient list of state and local agencies and interested parties. The public review period closed on October 22, 2005. There were five responses received through this effort and a summary of responses to public comment are in the attached Errata Sheet.

CONCLUSION

The preferred alternative would not constitute an action that normally requires preparation of an environmental impact statement (EIS). The preferred alternative would not have a significant effect on the human environment. Negative environmental impacts that could occur are short-term and of negligible to minor in intensity. There would be no significant impacts on public health, public safety, threatened or endangered species, or other unique characteristics of the region. There are no unmitigated adverse impacts on sites or districts listed in or eligible for listing in the National Register of Historic Places. No uncertain or controversial impacts, unique risks, significant cumulative effects, or elements of precedence were identified. Implementation of the action would not violate any federal, state, or local environmental protection law nor would it result in the impairment of park resources or values.

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

Recommended: ____

Superintendent Date

Approved: ____

Midwest Regional Director Date

ERRATA SHEETS
FIRE MANAGEMENT PLAN
ENVIRONMENTAL ASSESSMENT
Wind Cave National Park

The environmental assessment for the Draft Fire Management Plan review at Wind Cave National Park was on public review for 30 days, ending October 22, 2005. A total of five comments were received during the review period. The comments were analyzed consistent with the guidance provided in the National Park Service's Director's Order 12, the NPS guideline for environmental compliance. Comments are considered substantive when they: a) question, with reasonable basis, the accuracy of information in the draft environmental assessment, b) question, with reasonable basis, the adequacy of the environmental analysis, c) present reasonable alternatives other than those presented in the draft environmental assessment, or d) cause changes or revisions in the proposal. Comments that state a preference for one alternative (or component of an alternative), state opinions, or are outside the scope of the project, are not considered substantive.

The park received three letters from the public that opposed implementation of the preferred alternative and one letter in support of the preferred alternative. In addition, the three individuals attending the public comment meeting expressed support for the preferred alternative.

Three letters with multiple comments were submitted during the public review period. The issues raised in these letters are addressed below in "Response to Comments".

CHANGES IN THE ENVIRONMENTAL ASSESSMENT TEXT

Appendix R-3, Line 31: Change "Appendix F" to "Appendix J".

Appendix R-11, Line 13: Change "19 prescribed burn units" to "21 prescribed burn units"

Appendix R-11, Line 34: After "wildland fire suppression." Add "Mechanical treatment is a short term need (over the next 5-15 years) to get the park resources back to a point where prescribed fire regimes are possible to manage.

Appendix R-12, Line 27: Change "would" to "may"

Appendix R-13, Line 23: Change "19 prescribed burn units" to "21 prescribed burn units"

Appendix R-25, Line 1: Remove "Journal of Range Management. 31(4):285-289."

RESPONSE TO COMMENTS

Comment: Present and future park managers could use the plan under the preferred alternative to avoid using prescribed fire and leave us with a landscape that looks and feels sterilized by humans.

Response: The Draft Resource Management Plan (National Park Service 2003b) and the Draft Vegetation Management Plan (National Park Service 2005b) both recommend fire as a necessary tool "to meet the park resource management objectives of restoring ecosystems and providing protection for developed areas and cultural resources." (Draft Fire Management Plan or DFMP, p. 8)

The Draft Fire Management Plan states, "Prescribed fire will be the tool to achieve management objectives." and then lists two of the primary goals:

1. Restore and sustain natural ecosystems and reduce hazardous fuels; and
2. Restore the park to its natural fire-adapted ecosystems and to maintain the balance of prairie and forest (DFMP, p. 9).

The Draft Fire Management Plan states, "Mechanical treatments will be used to reduce fuels such as regeneration, hazard trees, and complete work preparation for prescribed fire." (DFMP, p. 11) As such, mechanical treatments are a preparatory tool for prescribed fire and not as stand-alone treatments.

In addition, the alternative of mechanical treatment alone was dismissed as it fails to meet the objectives of the plan.

Although a manager may want to deviate from the confines of the plan, to do so would require revision or a new plan altogether.

Comment: The preferred alternative allows for timber thinning in all areas of the park.

Response: One of the goals of this plan is to restore the park to its natural fire-adapted ecosystems and to maintain the balance of prairie and forest. With this in mind, fire must be applied to all parts of the parks forest, shrub, and grasslands. Forested areas of the park that have conditions precluding safe and successful prescribed fire may require mechanical treatments.

Comment: I do not want to hike through the forested areas of Wind Cave National Park and find a forest that has been "evenly spaced". I want to be able to find dead and down timber, where I can watch birds picking bugs from the decomposing matter. I want a ponderosa pine forest that feels wild.

Response: The Draft Fire Management Plan and Environmental Assessment does not call for or state an "even spacing" of forest. On the contrary, the plan specifically states that, "The goal is to achieve conifer stands that are widely spaced with varied age/size class distributions (including seedling, sapling, pole, mature, old growth, and snags). Individual stands should have a ponderosa savanna appearance of open ponderosa and grassland mosaics, in relative small patches (between 0.20-40.0-acres in size). For the most part, trees within stands will have wide and random spacing, including forest regeneration with seedling areas that are thin and widely spaced. However, some pockets of thick, dense conifer will be retained."

With this in mind, the park is working towards having a wide variety of seral stages within the forest areas. This would include young, mature, dead and down timber, and areas of decomposing matter. Unfortunately, the forests of the park, and perhaps throughout the Black Hills, are now predominantly even aged and have little resemblance to a truly "wild" ponderosa forest. The Summary of the Draft Fire Management Plan states, "The long range goals are to stabilize and/or establish ecosystems that approach pre-European settlement ecosystems that may have existed at Wind Cave National Park and management ignited prescribed fire is a principal tool to accomplish this."

Comment: *The preferred alternative* will remove one more aspect of wilderness and the values which our national parks are supposed to be preserving.

Response: There were many references in comments of "wilderness". It is noted here that Wind Cave National Park has no lands designated as wilderness. However, one of the goals of this plan is to "restore and sustain natural ecosystems." (DFMP, p. 10 and Appendix R-3)

Comment: Stumps should not be painted with herbicides because of the karst topography in the area. This opens the door for accidental contamination of areas with herbicides.

Response: Painting stumps with herbicides is a common practice on species with a propensity to regenerate after cutting. The native forested species within the park would not require this type of treatment. However, removal of some exotic species can only be accomplished by cutting and painting, such as tamarix and Russian olive. The park has recently participated in the completion of the Northern Great Plains Exotic Plant Management Plan and Environmental Assessment, which specifies this as an acceptable treatment for these types of species. If necessary, the park would implement this practice to combat exotic species, while exercising care to protect cave and karst resources.

Comment: Residual trees will be pruned of all branches to a minimum of five feet above the ground. Pruning trees impairs resources for birds and visitors alike. Taken literally, the preferred alternative would have the understory of the forest cut to a minimum of 5 feet above the ground. Many small birds and mammals use understories and downed timber as a habitat. That would affect the wildlife and also the experience of visitors as they hike through the forest. This would be a long term, moderate impairment under the definitions and classifications listed within the EA.

Response: The park agrees that pruning of branches on all residual trees is not desired and as a result will change the wording on Appendix R-12, Line 27 from "would" to "may". There are instances where branches extending to the ground should remain and would not constitute a fire hazard and pruning dictated by the needs of the prescribed fire unit. However, ponderosa pine branches are self pruning, which means that as the tree grows lower branches will fall off over time. As such, the direct impacts of fire and equipment on individual plants would still result in short term, minor negative impacts on vegetation resources, as indicated in the environmental assessment.

Comment: Under no circumstances should feller-bunchers be used (plan p. 48 bulleted item 3). This type of equipment disturbs vegetation, creates a negative disturbance, leaves obvious signs of human machinery, and could increase the number of exotic plants. The use of feller-bunchers will impair the sound scape, the view shed, and will leave deep tracts in the soil which would be seen for many years to come.

Response: Feller-bunchers and other track or wheeled equipment may have certain applications. However, the Draft Fire Management Plan states on page 48, appropriate use of these types of treatments could potentially be when ground is snow covered and frozen in order to mitigate negative disturbance. However, the Superintendent must authorize this use.

Comment: Using the wood from the thinning projects establishes a precedent of consistently using wood from the forests of Wind Cave for human uses (p 48, bulleted item 5).

Response: The use of wood from thinning projects is consistent with present park practices. Current uses of wood resources from the park are park benches, steps, erosion control, and visitors buy park wood for campfires.

Comment: Creating and burning slash piles excuses the use of prescribed fire in too many people's minds. Slash pile burning does not provide all of the benefits of a larger fire because it does not recycle the nutrients. Slash pile burning can damage habitat since it opens areas to exotics.

Response: As was previously stated, one of the main goals of this plan is to restore the park to its natural fire-adapted ecosystems and to maintain the balance of prairie and forest. It is not the intent of this plan to burn slash piles alone. Mechanical treatments and the possible creation of slash piles are pre-treatments for impending prescribed fire. These are not stand alone, but integrated treatments.

Comment: The mechanical treatment states that no new roads will be constructed. Please state that the old fire roads, which are now hiking trails, will not be used by wheeled vehicles.

Response: Although only using fire roads as hiking trails is a lofty goal, the park has and continues to use, on a minimal basis, wheeled vehicles on some of the old fire roads for prescribed fire. In each instance, the Superintendent has approval authority.

Comment: Mechanical thinning should not be contracted out (P48) and wood products should not be kept by contractors, which is essentially logging. Nothing ensures that the contractors will follow the guidelines set forth.

Response: There may be times when the park may not have the resources to accomplish mechanical thinning projects required for a safe and effective burn. In these situations, thinning by private contractors may be the only means to complete a thinning/prescribed burn project to move the area to a more natural ecosystem. Although these would be small acreages, the wood products from these areas may be the only incentive for private contractors to consider this work. The Draft Fire Management Plan states, "The details of hiring contract labor will be handled by the NEKOTA Contract Specialist and oversight will be provided by the park staff." (DFMP, p. 48) Administrative oversight is in place to assure compliance to contracts.

Comment: The impacts of fuel reduction are not comprehensive and do not include wilderness, view shed, soundscape, or visitor experiences.

Response:

Wilderness. The park has no wilderness areas, therefore need not address this topic.

Viewshed. One of the primary considerations of this plan is what the park looks like (viewshed) and its significance in both visitor satisfaction and resource preservation. The effects of fire control over the past 100 years in causing changes to natural patterns of vegetation are one of the influences, along with logging and grazing, that altered park ecosystems, in particular forested areas. The long range goals are to stabilize and/or establish ecosystems that approach pre-European settlement ecosystems that may have existed at Wind Cave National Park. To accomplish this, forested areas, will undergo treatment that will slowly move them from a highly altered, predominantly even aged stands with predominantly uniform basal area to stands that are widely spaced with varied age/size class distributions. The viewshed will change over time, but the "look" and "feel" will be natural and be what visitors expect from a National Park.

Soundscape. Neither of the alternatives addressed in this analysis would introduce long-term, inappropriate noise levels to the park and the proposed action would not alter the baseline, ambient noise level in the park. Therefore, noise was addressed and dismissed as an impact topic in this EA.

Visitor Experience. NPS *Management Policies* require parks to provide for visitor use. Fire events (which include pre-treatment, active burning, and follow up activities) may require visitor use closures for visitor protection. However, the displacement of visitors would be temporary and localized due to the discontinuity of fuels and the burn unit distribution. Generally, similar visitor experiences would be available in other areas of the park.

Comment: I would like WCNP to change it's forested burn plot time frame so that the prescribed burns for forested areas are planned to occur every 4 years. In reality, the forest burns might actually happen every 10 years. I believe that even though the park is behind in its fire plan, we should continue with the philosophy that using natural means to manage the forest and the prairie is the best method. I do feel that the park should be more aggressive in doing prescribed burns. If an area can not for some reason be burned one year, it should be listed again the next year until the park is successful in completing the burn.

Response: The Draft Fire Management Plan addresses this in that the park will need to adjust its prescribed fire strategies. As stated in the plan, "Instead of burning areas of the park every 8-10 years some areas may need to be burned in consecutive years to remove dead fuels created by previous fires and remove seedlings that come up in recently burned areas." (DFMP, p. 9)

Comment: We object to mechanical treatments because of the adverse effects it will have for park visitor, especially those of us that relish hiking in the park. Mechanical treatments of vegetation in the park will detract from the wild, natural experience that visitors presently enjoy in the park's backcountry. Evidence of stumps and chipped material, stacked slash piles, and ground disturbance resulting from thinning operations will stand in sharp contrast to the natural condition of the landscapes we now enjoy.

Response: We recognize there will be intrusions to visitors through prescribed fire treatments. Fire events (which include pre-treatment, active burning, and follow up activities) may create changes to portions of the visual appearance of the landscape. However, as these treatments are completed and the forested areas of the park return to more natural conditions, visitor experiences will be enhanced. Under this program, the park will reduce the impact to the visual environment by flush cutting stumps as close to ground level as possible, scoring or covering stumps with debris to facilitate rapid decay, and placing fire in the area as part of a prescribed burn. The casual visitor to the park may not notice management activities that have taken place in the park, but the evidence is nevertheless there. For example, in the early 1990s, the park cut trees along the west side of Highway 87 to reduce fuel loads. However, the park failed to burn the area resulting in heavy down and dead materials on the ground and residual stumps.

Comment: Mechanical treatment will, in a matter of a few years, alter the appearance of the park. Although the Draft Fire Management Plan indicates that the park desires mechanical treatments to mimic the results of disturbance by fire, in reality the treatments will be human designed and executed. Tree stands are going to become more and more uniform in basal area and stand age. The random mosaic resulting from fires on the ecosystem cannot be duplicated by mechanical treatments. The random mosaic produced by the natural disturbance regimes of fire and insects will disappear. Nor will mechanized thinning and burning slash piles produce the benefits to the parks grasslands that fire brings.

Response: Without careful planning, a mechanical treatment could result in a uniform appearance of forest. Mechanical treatment is only one tool that will be used in conjunction with prescribed fire. However, the Draft Fire Management Plan specifically states, "The goal is to achieve conifer stands that are widely spaced with varied age/size class distributions (including seedling, sapling, pole, mature, old growth, and snags). Individual stands should have a ponderosa savanna appearance of open ponderosa and grassland mosaics, in relative small patches (between 0.20-40.0-acres in size). For the most part, trees within stands will have wide and random spacing, including forest regeneration with seedling areas that are thin and widely spaced. However, some pockets of thick, dense conifer will be retained."

With this in mind, the park is working towards having a wide variety of seral stages within the forest areas. This would include young, mature, dead and down timber, and areas of decomposing matter. Unfortunately, the forests of the park are now predominantly even aged stands, which have predominantly uniform basal area.

Comment: Mechanical treatments will experience more problems with invasive plant species.

Response: We assume this comment is referring to the use of wheeled or tracked vehicles and the potential for opening up soil resources. The Draft Fire Management Plan states that, ". . . track or wheeled equipment (could potentially be used when ground is snow covered and frozen, but must be authorized by the Superintendent)", recognizing the need to take precaution from disturbing soil and allowing seed introduction. With this mitigation and post-fire monitoring, exotic species infestation should be no more than that expected through normal prescribed fire operations.

Comment: Visitor experience is going to be marred by the noise generated by mechanical treatment of vegetation. Visitor experience is also going to be interrupted by closure of areas within the park during periods when mechanical treatments are going on and when slash piles are being burned.

Response: Neither of the alternatives addressed in this analysis would introduce long-term, inappropriate noise levels to the park. No actions are proposed that would introduce long-term noise sources to developed or remote/undeveloped portions of the park, and the proposed action would not alter the baseline, ambient noise level at Wind Cave National Park. The displacement of visitors would be temporary and localized and, generally, similar visitor experiences would be available in other areas of the park.

Comment: If mechanical thinning is implemented the park is going to experience an increase in off-road mechanized travel. Equipment and personnel will be moved across and into areas that are presently unroaded. There will be evidence of such movements, and some of those disturbances are going to last longer than others.

Response: Off-road vehicle use within the park is under the discretion of the Superintendent. Past authorized off-road vehicle uses include fence maintenance, utility construction, fire preparation, and prescribed and wild fire activities. The park will take every precaution to minimize impacts of implementation of this plan. For example, if track or wheeled vehicles are deemed necessary, they would "be used when ground is snow covered and frozen, but must be authorized by the Superintendent)". The park does not operate under a "no tread", rather a "tread lightly" policy.

Comment: We do not believe the park has the legal authority to implement mechanical vegetative treatment as a part of its fire management policy. Such activity is outside and contrary to management contemplated by the Organic Act. The park should be managed to conserve its natural landscape and condition; management activities should not impair the values for which the parkland is held.

Response: The National Park Service operates under a tiered management structure. The Organic Act of the National Park Service (16 U.S.C §1 *et seq.*) provides the primary authority for implementation of this plan. Under this guidance, the Superintendent's responsibility is to ". . . conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as to leave them unimpaired for the enjoyment of future generations." Under present conditions, forested areas within the park are not natural due to preclusion of fire. The intent of this plan is to return the park to conditions that are as natural as can be given the lack of natural fire. To accomplish this, an integrated approach is necessary to ensure the safety of people and resources. This document is mandated by and complies with National Park Service directives and policy.

Comment: The non-fire fuel treatment plan included in the Draft Fire Management Plan as appendix m is not sufficient to relieve the park of its obligation to submit each proposed mechanical treatment to NEPA analysis and review before implementing the treatment. Factors influencing the degree of treatment, such as wildlife habitat requirements, basal areas, stand age and composition, etc., all have to be analyzed and reviewed before any mechanical thinning project is implemented. Action without the requisite analysis is arbitrary and capricious.

Response: The Draft Fire Management Plan and Environmental Assessment closely align the park and its management programs with NEPA. Each proposed prescribed burn (which many include preparatory mechanical treatment) will be analyzed to ensure compliance with this plan. A prescribed burn that falls within the guidelines of this plan is categorically excluded from further review. Any prescribed burn that exceeds the intent of this plan is required to undergo further analysis through the environmental analysis and even environmental impact.